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GEOLOGY AND PALÆONTOLOGY

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BY

S. A. MILLER



CINCINNATI, OHIO

1889

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PREFACE.

A GENERAL knowledge of Geology is probably of greater importance to the people of the United States than a like amount of information in any other department of natural science; but every one will admit the state of learning in this branch is not of a very high grade. There is a common complaint among well-informed people who have given Geology no special study that the language used is technical, the names long, difficult to understand, and not unfrequently bear upon their face the evidence of affectation, as if those coining the words had attempted to make them as obscure as possible. It is a fact, however, that technical names are absolutely essential to a correct understanding of every branch of Natural History; and when the system of nomenclature is once learned the names are readily understood, and much more easily remembered, than the arbitrary names of individual things possibly can be. In this work an effort has been made to popularize the rules of nomenclature, and to define the technical words in the text or in the Glossary.

Generic and specific names, which have been used by authors where the fossils are not known to occur in the Palæozoic rocks of North America, are printed in italics. Synonyms, names not described as required by the rules of nomenclature, preoccupied names, and those condemned for any other reason, are also printed in italics. When an author has referred his species to a genus to which it does not belong, the specific name will be found in italics under such generic name, and referred to the genus to which it belongs, and at the latter place the original erroneous generic reference will be found in parenthesis.

An attempt has been made to define all genera known from the Palæozoic rocks of North America; the name of the author of each genus is given, the date of coining the word, and an abbreviated reference to the book and page where published, and the etymology of the word and name of the type species. The names of all the species, arranged in alphabetical order, will be found under the genera to which they belong; and also the authors of them, the dates and places of publication, and very frequently

references to two places of publication, especially where, in the first instance, the species was defined without illustration, as has been too frequently done in society publications, the place above and beyond all others where no species should be described unless accompanied by proper illustrations.

An attempt has also been made to correct the misspelling of words so as to perfect the nomenclature, and we call special attention to the Index of Genera, where a few corrections are made that were overlooked in the text, and where the gender of each genus is indicated.

After the author had commenced the preparation of this work, which was several years ago, knowing the great expense attending the making of illustrations, he applied to several State Geologists and others for the privilege of taking electrotypes from the wood-cuts belonging to the State Governments and to the individuals; and he has now to express his acknowledgments to Alfred R. C. Selwyn, F. R. S, F. G. S., Director of the Geological Survey of Canada, who placed at his disposal all belonging to the Canadian Survey, and he availed himself of about one hundred and sixty of the original figures used by the late Prof. Billings; and also to express his obligations to the late Prof. A. H. Worthen, from whom he obtained nearly all those used in the Geological Survey of Illinois. After a very large number of figures had been made by the expensive process of wood-engraving, he learned of the much cheaper electrotype process, and engaged the services of the Kline Photo-engraving Company, of Cincinnati, and for the accuracy and faithfulness with which many figures have been reproduced he is indebted to the skill of the artists in that company.

CINCINNATI, November, 1889.

NORTH AMERICAN GEOLOGY.

CHAPTER I.

DEFINITIONS AND LAWS OF GEOLOGY.

§ 1. GEOLOGY is the science which comprehends the structure of the earth and investigates its history. It does not extend to the beginning, nor throw any light upon the astronomical theory that the world was, at one time, in a gaseous state, and later in a condition of fluidity. It commences at the most ancient rocks found upon the surface of the earth. These had their origin, in sedimentary deposition, at the bottom of an ocean. The world was then as large as it is now, and beyond the fact that these rocks were once merely sedimentary layers at the bed of a sea, the previous history of the earth is unknown, and all prior time is impenetrable darkness. Geology commences at the lowest discovered rocks, and investigates the overlying strata, the changes that have taken place, the lapse of time, and the development of organic life, to the present moment. If the strata of rocks on the surface of the earth were horizontal, the science would extend over a short period of time, and might be learned as rapidly as we progress in zoölogy, anatomy, or other branches of Natural History; but the rocks are inclined at various angles, and form synclinal troughs and anticlinal ridges, and expose, in the order of sedimentary deposition, at the maximum more than forty miles in thickness. Mountain regions rarely afford so good opportunities for the study of Geology as a country unbroken, except by the exposures in stone-quarries and the banks of streams. In some States the dip of the strata is quite uniform for a hundred miles or more, without any folds or flexures. It is in these areas the student will find the most inviting fields for the study of the science.

§ 2. The laws of the science have been ascertained, from observation and investigation of the changes now taking place, from a knowledge of those which have occurred within the historical period, from the evidence of change in more remote ages, from the study of the skeletons and harder parts of animals and plants, and the process of infiltration of mineral matter into these organisms, which fills up the cavities and produces petrifications, and from the study and determination of the characters of the petrifications found in the rocks of nearly all ages. Neither plants nor animals turn to stone; flesh can not petrify. When a body is sufficiently firm to preserve its form until water, holding lime or silica in chemical solution, can penetrate the cavities, saturate it, and deposit the stony matter as the organism decays, we have a fossil or petrification. The laws of nature are uniform in their operation. The diversified character of the rocks has resulted from general causes, and the uplifting and inclination of sediments did not occur in one period of time, but are distributed through and belong to all geological ages. We do not assume

the intensity of any forces exceeded, in times past, those which are now in activity. The changes which the earth has undergone within the scope of geological investigations were produced by the same laws, acting with the same degree of power, as those we may daily witness. This is true of aqueous and igneous action and of all organic and inorganic movements.



FIG. 1. Anticlinal axis at *a*. Strata disturbed, folded, and denuded, and afterward unconformable strata deposited upon them, followed by conformable layers.

§ 3. An *anticlinal axis* is that line from which strata dip to either side. The ridge of a house-top, the slope of the roof representing the dip of the strata, will convey an idea of an anticlinal axis; but an upheaval may be in the form of a dome, or the arc of a circle, and, in such case, the strata incline in all directions from a given point, which is the anticlinal axis. A *synclinal axis* is the reverse of an anticlinal axis. Rocks are called *stratified* whether the planes of the beds are parallel to each other, or rest unconformably. *Conformable strata* have the planes of the beds parallel to each other, and *unconformable strata* have the planes of the strata of one bed resting upon the edges of the strata of another. This must necessarily mark an interval of time between the two which is not represented by a deposit. A *fault* is a dislocation of strata so that the continuity of the



FIG. 2. Section of the Jura Mountains, illustrating the folding of strata, anticlinal axis at *A* and *B*. Synclinal axis between *A* and *B* and between *B* and *C*. Strata unbroken at *A* and *B*, but broken at *C*, *a*, *b*, *c*, and *d*. Strata conformable, though disturbed and thrown into waves.



FIG. 3. Escarpment on the right, *ab* representing the slope from the escarpment. Outliers, lone rocks, or standing columns in the center and to the left of the illustration. The central figure is a form sometimes called a cheese rock.

§ 4. The erosion of the earth never ceases. Decomposed and disintegrated substances are being constantly removed by rain and superficial waters to a lower level than they previously occupied. The erosion or denudation must be followed by the deposition of the materials. The deposit at one place can only progress at the rate with which it is transported from another. All strata consist of transported matter, and, as Lyell said, the evidence of the work of denudation is defective, because it is the tendency of every destroying cause to obliterate in great part the signs of its own agency. Stratified rocks, therefore, indicate only part of the erosion which the earth's surface has undergone,



FIG. 4. Strata inclined but conformable. Fault from *f* to *2* and dyke in the fault.

because the same materials in a multitude of cases have been broken up again and again, and re-stratified, presenting for our observation only the last of the many forms through which they have passed. The oldest rocks, as well as the most recent, were formed from the waste of older rocks than themselves, therefore we can never see any part of the primitive earth or original solidified matter.

§ 5. The atmospheric forces, in activity and disturbing the surface of the earth, are generally combined with the aqueous, as in frost; or the chemical, as in the union with carbonic acid; but the effects of air and wind are, by no means, inconsiderable. The surface of all exposed rocks and earthy materials bear the evidences of disintegration and denudation. The sun dries up the mud and cracks the earth and soils, while the winds sweep the dust from roads and barren places. Grains of sand, driven by the wind, will groove and polish the hardest rocks and minerals, and sometimes fairly dissolve and carry away limestone and more friable substances. Sand blowing is used in the arts for etching hard materials. All soils have resulted from the disintegration of rocks, and when not transported, the quality depends upon the character of the parent rock immediately below; and the penetration of the soil to the unaltered parent rock will reveal the different stages of the change effected by atmospheric agencies, aided more or less by the effects of frost and water. The winds, blowing inland from large bodies of water, carry sand from the beaches, and pile it in mounds and ridges, called sand-dunes; and the same effects are produced upon the deserts, and to a greater or less extent wherever light or loose materials are exposed to its action. A wind-storm blew a standing locomotive off the railroad track at East St. Louis, and other storms have been known to move bodies weighing several tons. The geological effects of the wind therefore are conspicuous in some parts of the world, while in others they are so slight as to be quite overlooked.

§ 6. Water is an active solvent of rocky substances, and the solvent power increases with heat and pressure. It is also a powerful mechanical agent. It will enter the minute openings in the hardest rocks, freeze, and chip up minute scales; and so it will enter larger cracks and orifices, freeze and break open large rocks, or burst from ledges immense masses. Ice, freezing at the margin of lakes and ponds, by expansion, crowds the loose rocks on the shores in the form of ridges of boulders, and freezing around the free rocks at the bottom in shallow water or near the shore, will, when broken up by partial thawing, and assisted by the force of waves and winds, transport such rocks to distant places. Mud, sand, gravel, and pieces of rock are transported down stream by all rivers, and the transportation is aided by the ice in the temperate and colder latitudes. On the shores of the St. Lawrence transported boulders are found weighing many tons.

§ 7. The capacity of the atmosphere to take up aqueous vapor in suspension, increases with the temperature, and when saturated the least interference with the currents of the air will precipitate rain. Hence there is more rain in warmer than in colder latitudes. Clouds drifting against mountains and high lands will discharge rain. The rain falls upon the ground, disintegrates earthy substances, and transports the disintegrated materials resulting from its own action, and from atmospheric agencies, down the valleys to the ocean. It is said the Ganges annually carries to the sea 6,368,000,000 cubic feet of sediment, which, being spread over the whole basin of the river, comprehending 400,000 square miles, would make a layer 1-1751 of a foot thick. The Ganges, therefore, erodes its basin one foot in 1,751 years.

The area of the Mississippi basin is 1,244,000 square miles, and the annual discharge of sediment by the river is estimated at 7,471,411,200 cubic feet, an amount sufficient to cover the whole basin 1-4640 of a foot. Therefore the Mississippi River removes from its basin a thickness of one foot in 4,640 years.

§ 8. The greater number of valleys in North America have been carved out by the streams flowing in them at substantially the same rate of excavation that is now in progress. All the valleys in Ohio, Indiana, and Illinois, have been excavated by the slow process of the action of rain and the rivers. The Mississippi and all its tributaries have excavated their own valleys, with the exception of a few in the mountain regions. Not only have the valleys been thus excavated, but much of the intervening land has been denuded of many feet of surface rocks. While the beds of the older streams sink extremely slow, if at all, the valleys are gradually widening by the wear and tear of rain and storm. This erosion has taken place since the close of Palæozoic time. The hills are usually terraced because the strata are of different degrees of hardness and durability, the softer and more easily disintegrated are gradually removed by atmospheric influences and the transporting power of rains and springs, leaving the harder and more solid standing out in more or less abrupt slopes and cliffs.

§ 9. The lower limit of perpetual snow under the equator is 16,000 feet above the sea, in the Swiss Alps, in latitude 46 N., it is 8,500 feet, and in the arctic and antarctic regions it reaches the level of the sea. The isothermal lines, around the earth, being affected by the distribution of the land and water surface and the ocean currents, do not follow the degrees of latitude; therefore, in ages past, when the land and water occupied different areas, and the ocean currents moved in other routes, the isothermal lines were correspondingly changed. Above the line of perpetual snow there is an augmentation from year to year, and below it, during the colder seasons, the snow falls many feet in thickness. An equilibrium is preserved by the melting of the snow in sunshine, by occasional rains to which it is subjected, and by the natural tendency to creep down the mountain side by the force of its own gravity. This movement gives rise to glaciers, which follow the depressions or ravines on the sides of the mountains to a considerable distance below the perpetual line of snow. They move very slowly, but transport sand, gravel, and masses of rock, and smooth, polish, and groove their rocky channels, because fragments of rock get interposed between the glacier and the rocks of the valley. The stones carried along on the ice are called the "moraines" of the glacier. There is always one line of blocks on each side, these are called the "lateral moraines." Where there are confluent glaciers the lateral moraines of the tributary glacier are carried into the larger stream of ice, and are called "medial moraines."

§ 10. The effects of glaciers upon the face of the earth are not important, notwithstanding so much has been said about them, and it is evident they have not been much more imposing in past geological ages than they are now. There are probably no evidences of glacial action upon the continent of North America where they do not now exist, except in a few places in the Rocky Mountain region, where they have departed on account of the drainage of adjacent lakes, and some indications in the New England Mountains where they are unknown now, either because that region is somewhat depressed, or because the Arctic Current does not hug the shore as far south as it did in the Pliocene or Post-pliocene period.

§ 11. In high northern and southern latitudes glaciers descend into the sea, where fragments are broken off, which are called "icebergs." Icebergs bear all the earth and rocks they did when constituting part of a glacier, and they soon fall in with ocean currents, and are drifted great distances before they are dissolved, and let the "moraines" fall to the bottom of the sea. In this manner the submarine surface is strewn with foreign mud, sand, gravel, boulders, and fragments of rock. Coast-ice acts in the same manner when blown out into the sea by off-shore winds. The ice sinks into the ocean eight times as deep as it projects above the surface, and when in shallow water it impinges upon the submarine bottom, the force of the current or the winds may cause it to polish or groove the rocks, if fragments intervene, in the same manner that glaciers will polish or groove their valleys. Icebergs drift from Baffin's Bay to the latitude of the Azores, from Greenland to the mouth of the Gulf of St. Lawrence, from the antarctic regions to the Cape of Good Hope, and also to Chili, in South America. Darwin saw one in the southern seas bearing a rock visible twelve feet above the surface, 1,400 miles distant from any known land. Icebergs have a transporting power more than a thousand-fold greater than glaciers, and an eroding power but little inferior, and yet the action of icebergs is inconspicuous now, and has been, so far as we know, in all the ages gone by.

§ 12. A large part of the rain sinks into the ground, takes up mineral matter in chemical solution, flows out in springs, and transports its load to the ocean. In this manner many caves and caverns are excavated. The waves produced by storms and tides beat down the shores of large bodies of water, and deposit the materials at other places. The ocean currents have a drifting and denuding action where the water is shallow. The wear and tear of the earth by the action of water never ceases, and the more we contemplate the subject, the better able we are to realize the magnitude of the never-ending destruction.

§ 13. The violence of earthquakes, and the fires of the volcanoes, the elevations and depressions of land with respect to the sea, seem to have operated within the historical period on as grand a scale as we are warranted in believing they did in past geological ages. Earthquakes and volcanic fires are intimately connected, and neither penetrate the earth to any great depth. Earthquakes have been felt upon the surface of the earth when miners, at a depth of 1,000 feet or more, have not experienced the sensation. The transmission of the vibration is more distinct, and phenomena more apparent where the strata are hard rocks than where they consist of sand and gravel, or softer material. All volcanoes are near large bodies of water, and observation has shown that water gains access to the volcanic foci, and that steam is a powerful agent in all eruptions. The pressure or force of gravity of the layers of the surface of the earth develops the latent heat, so there is an increase of temperature at the rate of about one degree for every sixty feet penetrated for the first 2,000 or 3,000 feet. The deeper borings have not shown the regular continuing increase of the heat, nor is the increase uniform through different kinds of rock, or at different places. The better opinion seems to be that neither this increase of heat, nor the volcanic fires afford any evidence of the internal fluidity of the earth, but, on the contrary, the earth is probably solid, with exception of local caverns near the surface, and local masses of melted matter resulting from chemical causes which are in operation at no great depth.

§ 14. All are more or less familiar with the story of the buried cities of Hercu-

laneum and Pompeii, and the great eruptions of Vesuvius. In 1669 a current of lava flowed from Etna, having a width of 600 yards, and a depth of 40 feet when it reached the sea at the distance of fifteen miles. In 1783 Skapter Jokul, in Iceland, sent forth two currents of lava in opposite directions, one of which extended fifty miles, and the other forty-five. The extreme breadth of the one in Skapter valley was fifteen miles, and the other had a breadth of seven miles. The ordinary height of the current was 100 feet, but in narrow defiles it sometimes amounted to 600 feet. There is no evidence of a volcanic eruption on the continent of North America in past geological ages that surpassed this in volume.

About midnight, August 11, 1772, a luminous cloud appeared to envelop Papandayang, a volcano on the island of Java, and in a short time it actually fell in with a great noise. Immense quantities of volcanic substances were thrown out and distributed for many miles around. It is estimated the mountain for fifteen miles in length and six in breadth was swallowed up in the earth by this commotion. Forty villages were engulfed or destroyed, and 2,957 inhabitants perished. It seems in this instance the eruptions had formed a corresponding cavity beneath the surface, and when the weight above overcame the resistance, the volcano suddenly fell into the abyss beneath.

A volcano forced its way from beneath the sea into the atmosphere off St. Michael's, Azores, in 1811. It was first seen above the sea on June 13th. The appearances were exceedingly beautiful, the volcano shooting up columns of the blackest cinders to the height of between 700 and 800 feet above the surface of the water. When not ejecting ashes, an immense body of vapor or smoke revolved almost horizontally on the sea. The bursts were accompanied by explosions resembling a mixed discharge of cannon and musketry, and a great abundance of lightning. By the 4th of July an island was formed a mile in circumference and 300 feet high. In the center there was a crater full of hot water, which discharged itself through an opening facing St. Michael's. The island subsequently disappeared beneath the water.

Twelve islands constitute the Hawaiian Group, four of these are mere barren rocks; the remaining eight have an area of about 6,000 square miles. All of these islands are volcanic, and no other rocks than volcanic are found upon them save a few remnants of sea-beaches. They are all mountainous, and the deep sea surroundings have shown the islands are only the summits of gigantic mountain masses. Mauna Kea, on Hawaii, is 13,900 feet above the sea, and Mauna Loa 13,700 feet. If the ocean were driven away, it is said these mountain peaks would stand 30,000 feet above the foot of the mountain range. On Hawaii the volcanic forces are still in operation. On Maui they rested at a recent epoch, or within a few hundred years. On the other islands they have long been extinct, and the piles built up have been greatly eroded. On Hawaii there are two grand foci of volcanic eruption where the fires are now raging, Mauna Loa and Kilauea. Mauna Loa is the largest volcano in the world, and none approach it in the magnitude of its eruptions. A moderate eruption represents more material than Vesuvius has emitted since the days of Pompeii, and the flow of 1855 would have nearly built Vesuvius. On the whole, it appears there are as many active volcanoes, and some as vast and frightful in eruptive power as seem to have existed at any other single period in geological time.

§ 15. An earthquake in New Zealand in 1856 raised a tract of land comprising 4,600 square miles, from one to nine feet. In 1822, and again in 1835, the coast of Chili for several hundred miles was elevated from one to three or four feet or more. The estimated area raised in 1822 amounted to 100,000 square miles. In 1819 an earthquake at Cutch, in the delta of the Indus, raised an extent of country about fifty miles long and sixteen miles wide, ten feet, while a considerable tract in the delta of the Indus sank down. Such are a few of the effects produced by earthquakes in the present century; they are similar to those which have occurred in every century during the historical period, and are quite as extensive as any we are warranted in believing occurred in any of the earlier geological ages.

§ 16. It is said large tracts of land are elevated and depressed without the intervention of earthquakes. It is said there has been an elevation of land bordering the Baltic, during the historic period, of about three feet in a century. The whole coast of Scandinavia is said to be gradually rising at a very slow pace. A large area in Greenland is reported as slowly subsiding. At Fort Lawrence, in the Bay of Fundy, there is a pine and beach forest covered at high tide by about thirty feet of water. And it is claimed there is some evidence of subsidence on part of the New England Coast, where we have the most indubitable evidence of an elevation of several hundred feet since the beginning of the Post-pliocene period, but these elevations and depressions may have been accompanied with earthquakes.

§ 17. Earthquakes and volcanoes have a common origin, the former always accompany the eruption of the latter, and it is not likely any great areas of land rise or fall without the intervention of the same energies. The proximate cause of volcanic and earthquake phenomena is not fully known, and it is much easier to show the improbability of the many theories offered for their explanation than to present one free from objections. Volcanoes are intermittent in their eruptions; they act by spasms of activity, separated by intervals of repose. If they were vents to internal fluidity of the earth, the streams of flowing fire would be constant, not intermittent explosions. If they were vents to any great mass of melted matter pent up until strength enough were obtained to force a passage way to the surface of the earth, when the vents would open the reservoirs would exhaust themselves and close forever. Volcanoes are not to be attributed to the remains or residue of enormous heat contained in the globe, at some remote period of its physical evolution, or considered as lending any support to the nebular hypothesis, or the theory that the earth was at one time in a gaseous or fluid condition.

Geysers (from the Icelandic word *geysa*, to gush,) is a periodically eruptive or intermittent hot spring, from which the water is projected in a fountain-like column. The analogy between it and a volcano is so striking that it might be called a volcano erupting hot water instead of melted lava. In the case of a geyser, cold water is supposed to sink from the surface to heated rocks; it starts as a passive liquid, and by its molecular absorption of heat is converted in the depths into an elastic, explosive gas, which ejects it through another orifice to the surface. The gas forces out the column of water and escapes; then quiet ensues until a new supply of water is furnished. This accounts for the intermitting flows. Grant the local heated condition of the rocks below, and all the phenomena of the geysers may be accounted for.

The melted lavas of volcanoes bring up with them great quantities of the vapor

of water, having an enormous expansive power which is given off as steam at the moment of eruption. Lava is generally a sponge-like mass of myriads of visible vesicles formed by the sudden exclusion of the water-vapor in the act of solidification. There is abundant evidence of the participation of water and its constituent gases in volcanic phenomena. From the proximity of volcanoes to or occurrence in the sea, it has been supposed their active state is produced by the percolation of sea-water to metallic bases of the earths, or alkalies, at various depths, which bases become inflamed and chemical action ensues, producing the eruption. The oxygen of the water is supposed to unite with the metallic base, the hydrogen to unite with sulphur, forming sulphureted hydrogen gas, and with the chlorine forming muriatic acid gas, etc. The gases evolved from volcanoes are muriatic acid gas, sulphur combined with oxygen or hydrogen, carbonic acid gas, nitrogen, and aqueous vapor. Electricity is a factor in all earthquakes and volcanic eruptions. Its action is manifest in the atmospheric disturbances, in the undulatory movement on the surface of the earth, and in the speed with which the earthquake wave travels. An earthquake moves in the direction of the wave at a rate frequently exceeding fifty miles in a minute, and when the movement is communicated to the waters of the ocean, the waves follow at a pace hundreds of times slower. Suppose a powerful current of electricity near the surface of the earth, to be broken, and suddenly restored, the shock may be supposed to resemble that of an earthquake. Fusion might result in consequence of such restoration. The crystallization of stratified rocks might break such electrical currents, if any exist in the earth, or it might disturb the equanimity of the electricity if it exists in a passive state, to the same extent as if it were a broken and restored current. In other words, subterranean electric currents, if once excited, may melt the rocks and produce the heat necessary, when assisted by the presence of a sufficient quantity of water, to produce volcanic eruptions. Such are some of the theories to account for the instigating or proximate causes of earthquakes and volcanoes.

The mouth of a volcano is called a *crater*, though the pit on Kilauea has been called a *caldera*. If steam alone escapes through a vent, it is called a *fumarole*; but if sulphurous vapors also escape, it is called a *solfatara*. When hot springs deposit lime, it is called *tufa*; but if the deposit is silicious, it is called *sinter* or *geyserite*. Lava consists of silica, alumina, lime, magnesia, soda, potash, and iron oxide. If the silica is in excess, it is *trachyte*, and belongs to what lithologists call the acidic group, from the large quantity of silicic acid it contains; but if there is a large proportion of soda or potash and lime or magnesia, and not more than 50 per cent of silica, it is a *basalt*, and belongs to the basic group, from the larger quantity of alkaline and earthy bases it contains. Trachyte is a grayish igneous rock, of rough fracture owing to the grains of glassy feldspar which mainly constitute it. Basalt may be light-colored crystalline or granitoid, or dark colored, compact, massive, like dolerite; but in addition to labradorite and pyroxene, it contains chrysolite in disseminated grains. When lava becomes glassy, it is called *obsidian*.

§ 18. The most important change taking place upon the earth is in constant operation at the bed of the ocean. Near the shore it is a littoral deposit; farther away it is a chalky deposit, consisting of foraminifera and shells, and in deeper water it is a red, silicious clay. The character of the deposit is dependent upon the depth of the ocean, except where washings from land affect it. The depth of the pure

globigerina ooze, or chalky deposit, is limited to about 2,250 fathoms, and at greater depths the deposit gradually passes into fine pure clay, and below 2,500 fathoms it consists almost wholly of a silicate of the red oxide of iron and alumina. At moderate depths shells fall upon the bottom, in perfect condition; as the depth increases they become more and more brittle, and finally break up and disappear by the chemical action which affects them, until, having passed through 2,500 fathoms of water, nothing is left save an insoluble residue, which constitutes the red clay. The simple fact of the increasing depth of the ocean gives variety to the character of the deposits. But at the greatest depth to which the dredge has descended, which exceeds five miles, the silicious shells of Radiolarians exist as abundantly as they do in the shallower depths of the ocean. Such deposits, in the process of induration, become stratified and laminated, and form calcareous, argillaceous, and arenaceous or silicious rocks.

§ 19. Animals, secreting carbonate of lime, have played an important part in modifying the surface of the earth. The coral-making polyp has wrought great changes, because the reef-forming genera continue the accumulation, on the same spot, for centuries, and the influence of the Bryozoa, which produce only delicate corals, is everywhere conspicuously engraved. There are other agents, inferior in operation, affecting the surface of the earth, and all combined have served in times past to deposit in water all the rocks constituting the continent of North America, and to elevate the land above the seas and lakes, after such deposition, and again to denude it and present it to us with its mountains and valleys as they now exist.

§ 20. Every part of the surface of the earth has been covered with water, and much of what is now dry land has been several times inundated; and it is supposed a large part, if not the whole area covered by the oceans, has, at some period of time, been above the water line. The elevations and depressions have been in the form of ridges, with intervening basins, in different ages of the world; and basins, existing in the same age, have been filled with deposits of different kinds and in different degrees of rapidity,—some being filled with drifted materials, and others with the secretions of animal and vegetable organisms. Consequently there is a great diversity in the structure of the land of different continents, and they must be separately investigated. The most recent deposits may be made on the most ancient rocks. Cretaceous deposits may occur upon the Silurian, or Jurassic on the Devonian; hence, many difficulties are encountered in ascertaining the chronological order of the strata upon each continent; and this would be utterly impossible were it not for the animal and vegetable remains, which have followed the progress of time in evolutions of type and structure in different oceanic basins, so as to furnish the means of approximately parallelizing the strata. Different kinds of rocks are forming at unequal depths of the ocean, at the same time; conglomerates and sandstones in shallow water and near the shores; chalky, and slaty or shaly in deeper water, and silicious farther from land and at still greater depths. Strata of the same kind are not continuous over large areas; but change within short distances from sandstone to shale or limestone; hence, it is never safe to trust to the character of the rock for the testimony to prove its age. We must go to the fossils for the evidence, because it has been ascertained that species did not generally live beyond a geological period, and characterized different Groups of rocks, and thus become infallible guides to the order of superposition. No two periods are represented by like assemblages of fossil

forms, and this dissimilarity furnishes the facts upon which the Groups of rocks are distinguished from each other. Comparison of the fossils shows a progression in development along an ascending scale toward the higher and more enduring plants and animals, and the extinction of lower or less highly organized forms.

§ 21. *Sandstone* is a rock made of sand derived from a silicious rock. When pure it is used for making glass. Iron usually colors it red or yellowish, and often cements it into good building stone. When a little clay is intermixed it is called freestone, and if it contains gravel it is conglomerate, or if loosely cemented in the air and not under water a pudding-stone. When sandstone is subjected to heat and pressure it is metamorphosed and becomes quartzite.

Shale is a soft, fine-grained, aluminous rock, in layers. If it is pure it is clay shale; if it contains sand it is sandy shale; if bituminous matter, bituminous shale. When the shale is hardened it becomes slate. Slate rocks among the metamorphic series are called schists. The clay slate used in North Carolina for making slate-pencils is called phyllite.

Limestone is ordinarily composed of lime and carbonic acid, with impurities of clay, sand, and iron. Hydraulic limestone contains clay and magnesia. Magnesian limestone is called dolomite, after Dolomieu, a mineralogist. Lithographic stone is a very even-grained, compact limestone, usually of buff or drab color. Chalk is a soft limestone, and marble is a hard crystalline limestone. Gypsum, alabaster, calcite, dogtooth spar and satin spar are names given to crystalline limestone.

§ 22. The general order of superposition of the rocks of North America has been ascertained, and they have been divided into Systems and Groups. Another division has been made, founded on the organisms that occur in the rocks, viz: Eozoic, Palæozoic, Mesozoic and Cænozoic. Some use the word Archæan instead of Eozoic. The Eozoic includes the Laurentian and Taconic Systems. The Palæozoic includes the Lower Silurian, Upper Silurian, Devonian, Subcarboniferous and Carboniferous Systems. The Mesozoic includes the Triassic, Jurassic and Cretaceous Systems. The Cænozoic is synonymous with the Tertiary System. These Systems may be very closely parallelized with the strata of Europe and other parts of the world. The words "System" and "formation" are in use with this nomenclature, as Devonian "System" or Devonian "formation," but more generally they are both omitted as unnecessary appendages to the names of the divisions.

The Taconic is introduced in many places with conglomerate layers resting unconformably upon the Laurentian; the Lower Silurian commences with the Potsdam sandstone, the Upper Silurian with the Medina sandstone, the Devonian with the Oriskany sandstone, the Subcarboniferous with the Waverly sandstone, and the Coal Measures with the Carboniferous Conglomerate. Each of these great divisions commences with drifted materials, and important changes of the fauna. They are each capable of subdivision into Groups, and they are not only convenient in the discussion of the science, but they are, to a certain extent, founded in nature.

§ 23. For the purpose of more definite classification these larger divisions are subdivided. Each subdivision is called a "Group," and it generally bears the name of the place where first studied and described; as, the Potsdam Group, so named because the strata were first studied and described at Potsdam, New York. This method is preferred to any other, because the geographical name, when combined with the word "Group," is sufficiently technical. It can not be used for any other

purpose; it can never mislead as to the mineral structure or relative position of the strata, and it indicates the typical locality of the exposure. Sandstones, conglomerates, limestones, and shales, occur in nearly every Group, and for this reason geological subdivisions can not be established upon the mineral or chemical characters of the rocks. The rocks which form these Groups are composed of a few simple minerals, which are repeated over and over again in the different layers, but not in chronological succession, nor in any other way indicative of age or position. To speak of a rock as a limestone, sandstone, shale, slate, or clay, conveys no idea of its geological age or place. It is merely the expression of a mineralogical character.

§ 24. Prof. Rogers conceived the idea of improving the nomenclature of the palæozoic rocks by dividing them into fifteen parts, and giving them names significant of their relative ages. This he did by using words suggesting metaphorically different parts of a day, as follows: Primal, Auroral, Matinal, Levant, Surgent, Scalent, Premeridian, Meridian, Post Meridian, Cadent, Vergent, Pouent, Vesperine, Umbral, and Seral, meaning respectively the formations of the Dawn, Day-break, Morning, Sunrise, Mounting Day, Climbing Day, Forenoon, Noon, Afternoon, Declining Day, Descending Day, Sunset, Evening, Dusk, and Nightfall. Unfortunately for his attempt to substitute another for the geographical nomenclature then quite well established and susceptible of indefinite expansion, without the use of conflicting terms or words that could mislead the student, there were several extensive Groups of rocks full of the remains of animal life, then unexplored, and consequently quite unknown to his system. For obvious reasons the nomenclature suggested by Mr. Rogers has not been adopted.

§ 25. The words series, strata, layer, deposit, zone, bed, horizon, period, age, epoch, and era are not technical names, but are used in geological descriptions, because expressive and convenient. Each Group must, in all cases, depend upon the palæontological characters, and can never rest upon the structure of the rocks. When properly defined, it is established, and no one has a right to substitute another name for it, nor to propose a name, simply because of inability to properly distinguish it at a particular locality. For example, the Trenton, Utica, and Hudson River Groups had been long established, when some one, being unable to distinguish the Utica in the vicinity of Cincinnati, and not knowing whether the rocks are Trenton or Hudson River, proposed to call the exposure the "Cincinnati Group." The black slate, which characterizes the Utica in New York, does not exist at Cincinnati, though calcareous slates and shales of the same age do, and they contain *Triarthrus becki*, *Leptobolus lepis*, and other characteristic fossils, while the Hudson River is plainly distinguishable above, and the Trenton as readily determined below. If the Utica had thinned out in its extension westward from New York before reaching Cincinnati, there would have been no excuse for calling the Trenton or Hudson River, or both of them together, by a new name, nor is there any excuse for so doing when the Utica is easily distinguished.

§ 26. Another kind of synonymy to be deplored exists where a Group has been named and thoroughly defined, and for some trivial reason, the geologists of another locality use another name for rocks of the same age without regard to priority in nomenclature. For example, the Calciferous Group was established and defined so as to include rocks other than Calciferous sandrock, and ten years after-

ward rocks of the same age on the Mississippi were called the "Lower Magnesian Limestone," and geologists of that locality persist in the use of the latter name, because they say the word Calciferous is not admissible from the lithological character of the rock. It is to be regretted that the name Calciferous has come down to this generation as the name of a Group of rocks, but it is as well established as the name of any other Group, and like the word Tertiary, which has no application to the rocks to which it is applied, is fastened upon the science, and so interlocked with it that it can not be eradicated even were it desirable so to do. With how much less reason should we encourage the use of another mineralogical name, having more limited application, in its stead!

§ 27. The rule is, the law of priority should be rigorously enforced where a Group has been named, and the fossils have been so described and illustrated that it may be identified by a palæontologist elsewhere than at the typical locality. Synonymy is always the result of ignorance, and much of it has come from those whose work has been absolutely worthless.

§ 28. Experience has shown the impracticability of making lesser subdivisions for the purpose of geological nomenclature, than Groups, especially in the present state of the science, though it is eminently fit and proper to speak of the marl-beds or sandstone layers in any Group, or of the *Glyptocrinus* or *Orthis* beds at any locality. Minute and careful definition and description of the characters of each and every part of a Group is one thing, and the suggestion of a geological subdivision, founded upon a marked peculiarity at one locality, which can not be distinguished at another, is quite a different thing. It must not be supposed none of the Groups will be subdivided, but proposing a name is not establishing a Group. The Coal Measures ought to be divided into Groups because of the great thickness of the fossiliferous rocks, and a temporary division in some localities is indicated by the use of the words Upper, Middle, and Lower Coal Measures, but great palæontological information must be acquired before any practicable subdivision can be made.

§ 29. The stratigraphical division of the rocks of North America into Groups bearing geographical names, with an approximate thickness in ascending order, is as follows:

	Laurentian System, not divided into Groups,	40,000 feet.
Taconic.	{ Lower Taconic, not divided into Groups,	25,000 "
	{ Georgia Group, including St. John Group,	10,000 "
	{ Swanton Group,	10,000 "
Lower Silurian.	{ Potsdam Group,	4,000 "
	{ Calciferous Group,	2,000 "
	{ Quebec Group (very doubtful),	6,000 feet ?
	{ Chazy Group,	1,000 "
	{ Black River Group,	150 "
	{ Trenton Group,	1,100 "
Upper Silurian.	{ Utica Slate Group,	600 "
	{ Hudson River Group,	1,200 "
	{ Medina Group,	2,500 "
	{ Clinton Group,	500 "
	{ Niagara Group,	800 "
	{ Guelph Group, }	1,200 "
	{ Onondaga Group, }	2,000 "
	{ Lower Helderberg Group,	2,000 "
	Carried forward,	102,050 feet.

		Brought forward,	102,050 feet.
Devonian.	{	Oriskany Group,	300 "
		Upper Helderberg Group,	900 "
		Hamilton Group,	1,400 "
		Portage Group,	1,400 "
		Chemung Group,	3,000 "
		Catskill Group,	7,500 "
Subcarboniferous.	{	Waverly Group,	500 "
		Burlington Group,	500 "
		Keokuk Group,	200 "
		Warsaw Group,	100 "
		St. Louis Group,	400 "
		Kaskaskia Group,	720 "
		In Pennsylvania, where the Subcarboniferous can not be separated into Groups, there is a thickness of 5,000 feet, and in Nova Scotia 6,000 feet.	
Carboniferous.	{	Carboniferous Conglomerate, or Millstone Grit,	6,000 "
		Coal Measures,	10,000 "
		Permian Group,	1,000 "
		Triassic not divided into Groups,	25,000 "
		Jurassic not divided into Groups,	10,000 "
Cretaceous.	{	Dakota Group,	1,000 "
		Fort Benton Group,	900 "
		Niobrara Group,	500 "
		Fort Pierre Group,	1,200 "
		Fox Hills Group,	4,000 "
		Fort Union or Laramie Group,	7,000 "
Tertiary.	{	Eocene,	15,000 "
		Miocene,	3,000 "
		Pliocene,	3,000 "
		Post-pliocene,	1,000 "

CHAPTER II.

LAURENTIAN SYSTEM.

§ 30. THE Laurentian System was so named from the Laurentian Mountains, and not from the St. Lawrence River. The name was applied to the metamorphic rocks of Canada as a scientific term, by Sir William Logan, in the Report of Progress of the Geological Survey of Canada for the years 1852-53. His special study of these rocks began as early as 1846. He applied the name to all rocks lower than the Potsdam; but Emmons had preceded him in defining the Taconic System, which rests unconformably upon the rocks that comprise nearly all which Logan studied; and hence the Laurentian is confined to the rocks below the Taconic. The rocks consist of sedimentary strata altered to a highly crystalline condition — great vertical thicknesses of gneiss and granitoid rocks, separated by masses of crystalline limestone and quartzite. Previous to this geographical name they were called azoic, metamorphic, or primary rocks.

Granite is a word derived from the granular texture of the rock to which it is applied. It is crystalline and composed of quartz, felspar, and mica. The felspar usually gives the predominating color. When the granite is stratified, the laminae being separated by thin scales of mica, it is *gneiss* or *granite schist*; if mica is in excess, it is *mica schist*; when hornblende displaces the mica, it is *syenite* (named

from Syene, in Egypt); and if it only partially displaces it, it is *syenitic granite*. Many of the granites and syenites are intrusive, while others, not distinguishable from these, take the place of sedimentation and pass into gneiss or mica schist. *Felspar* signifies rock-spar from the German word *fels*, a rock, though it is usually spelled *feldspar* from the German word *feld*, a field, and therefore made to signify field-spar. There are several species of felspar, dependent upon the potash, soda, or lime they contain. That which usually enters granite is *orthoclase*, or potash felspar, and is compact laminated, or compact crypto-crystalline, consisting of about the following substances: silica 64.6, alumina 18.5, and potash 16.9. When soda enters into the composition of the felspar, it becomes *albite*, and the granite is then disposed to undergo spontaneous disintegration, which sometimes takes place below direct atmospheric influences at great depths in the earth. The kaolin of the Chinese is derived from felspar from the disintegration of granitic rocks, and porcelain clay is often from the same source. Garnets are common in gneiss and mica schist. The most common mica, and that which generally enters into granite, gneiss, and related rocks, is called *muscovite*. Other species in the mica group are called phlogopite, biotite, lepidomelane, astrophyllite, lepidolite, and cryophyllite.

§ 31. Logan said of the Laurentian System: "Stretching on the north side of the St. Lawrence from Labrador to Lake Huron, this series occupies by far the larger portion of Canada, and its strata probably possess a great thickness. To determine the superposition of the various members of such an ancient series of rocks is a task which has never yet been accomplished in geology, and the difficulties attending it arise from the absence of fossils to characterize its different members. Bands of the crystalline limestone are easily distinguished from bands of the gneiss; but it is scarcely possible to know from local inspection whether any mass of limestone in one part is equivalent to a certain mass in another. They all resemble one another lithologically, and although masses dipping in the same direction are met with, running for considerable distances rudely parallel with one another, it is scarcely ever safe to take for granted that they are stratigraphically distinct. The dips avail but little in tracing out the structure; for in the numerous folds of the series the dips are frequently overturned, and the only reliable mode of pursuing the investigation and working out the physical structure, is patiently and continuously to follow the outcrop of each important mass in all its windings as far as it can be traced, until it becomes covered up by superior, unconformable strata; is cut off by a great dislocation, or disappears by thinning out."

§ 32. The surface area occupied by the Laurentian series in Canada and British America, exclusive of any exposure that may exist in the Cordillera or Rocky Mountains, is not less than 250,000 square miles. The northern limit is the Arctic Ocean; from here it may be traced south upon the western side of Hudson's Bay, and appearing upon its eastern side it spreads over the greater part of Labrador, and extends to the Gulf of St. Lawrence. The southern limit is the St. Lawrence from Labrador to Cape Tourmente, a distance of 600 miles, except a narrow border of Taconic on the Strait of Belle Isle; another at the mouth of the Mingan River; a third near the Seven Islands, and two on Murray Bay River, and the Gouffre. Extending westwardly it occurs 30 miles north of Montreal, and follows up the Ottawa River for a distance. It then strikes off to the Thousand Islands, and crosses over into New York, where it exposes an area of 10,000 square miles. From there it

extends north-westerly a short distance north of Lake Huron, and bordering upon Lake Superior, a great part of its length, it appears at Lake of the Woods, north of Rainy River, though an arm extends south of Lake Superior into Michigan and Wisconsin. The western boundary of this great area extends from Lake of the Woods in a sinuous northerly direction among the lakes, and following the highlands that divide the waters which flow into Hudson's Bay from those flowing in other directions, to the Arctic Ocean. There are some patches within this general outline covered with Taconic rocks, or those of Post-pliocene age.

§ 33. The arm of this great exposure, which appears in the Upper Peninsula of Michigan, has an area of about 1,839 square miles, consisting of several tracts, one of which touches Lake Superior west of Marquette. The rocks are chiefly granite, gneiss, syenite, and crystalline limestone, which thus far have afforded no useful minerals. The surface area in Wisconsin is somewhat greater. Other exposures in the United States are confined to irregular areas in the mountain regions. North Carolina exposes about 20,000 square miles, or nearly half the State. One belt from twenty to twenty-five miles wide, crosses the northern part of the sub-eastern section of the State upon which the capital is situated. It extends northward into Virginia, and southward beyond Cape Fear River. It consists generally of gneiss, which passes into granite or mica schist. Another belt extends from the southern border of the State at Catawba River in a north-east direction, almost to the Virginia line near Roxboro, and reappears eight or ten miles to the eastward and crosses the northern border about midway of Granville County. There is another small area in the southern part of Orange County. Limited areas are found in Georgia, Virginia, Pennsylvania, New Jersey, Vermont, New Hampshire, and at other places in the Appalachian chain. A small area occurs in Missouri near Iron Mountain, and another in Arkansas. In the Rocky Mountain region there are many exposures, some of which are quite large. They generally trend in the direction of the mountain chain, and are found in Mexico, New Mexico, Arizona, Nevada, Utah, Colorado, Idaho, Nebraska, Wyoming, and Montana.

§ 34. A section taken by Logan in the region where he studied the rocks, is as follows:

1. Orthoclase gneiss, composing Trembling Mountain,	5,000 feet.
2. Crystalline limestone of Trembling Lake,	1,500 "
3. Orthoclase gneiss,	4,000 "
4. Crystalline limestone of Great Beaver and Green Lakes, with interstratified garnetiferous rock and hornblendic orthoclase gneiss,	2,500 "
5. Orthoclase gneiss, garnetiferous gneiss and quartzite below the Grenville limestone,	3,500 "
6. Crystalline limestone of Grenville, with interstratified gneiss,	750 "
7. Orthoclase gneiss,	1,580 "
8. Proctor's Lake limestone,	20 "
9. Orthoclase gneiss, passing gradually into Anorthosite between Proctor's Lake and Morin band,	3,400 "
10. Anorthosite above the Morin band,	10,000 "
Total,	<u>32,250 feet.</u>

This is about the thickness in New Hampshire, and not equal to the estimated thickness in Wisconsin. Enough is known, however, to show this section of Logan's by no means represents the total thickness in Canada. The better opinion seems to be that the Laurentian series has a thickness in Canada of more than 40,000 feet,

and probably more than eight miles, or quite as great as it is in Bohemia or any other European country.

§ 35. While these are the oldest rocks known, they were, in their unmetamorphosed condition, ordinary sediment in water derived from materials that preceded them. They were formed by the disintegration, denudation, and redeposition of older rocks, which in their turn preceded others, in how many cycles of change we have no means of knowing. Their upheaval above the surface of the sea was the beginning of the North American continent. The trend of the range in this upheaval is as nearly east and west as the later elevations of the Appalachian and Rocky Mountain chains are north and south. These rocks were until recently supposed to have preceded the existence of both vegetable and animal organisms, and were, therefore, called azoic, but in addition to the fossil *Eozoon canadense* there are other evidences of organic life, as follows:

1. The iron ore evidences organic life, because all the accumulations of iron now in progress are formed by the agency of organic matter. The peroxide of iron existing in the rocks is not soluble in water alone, but the addition of decomposing organic matter deoxidizes it, and carbonate of iron is formed, which is soluble and may be precipitated. Peroxide of iron being insoluble, the infiltrating waters which take up soda, lime, and magnesia from sediments, can not remove this metal unless they contain organic matter. The evidence of the reducing and dissolving action of organic matter is, in the great thickness of sediments, almost destitute of iron and in the extensive beds of iron ore.

2. The masses of limestone tend to prove the existence of organic matter, because limestone in process of formation is almost wholly composed of shells, corals, tests of foraminifera, and other animal secretions, and nearly all the unmetamorphosed limestones of past ages are largely composed of organic relics.

3. Graphite occurs in beds, imbedded masses, and in scales; in granite, gneiss, mica schist, and crystalline limestones; it results from the alteration by heat of coal in the Coal Measures, and is a common product of furnaces. Its presence is, therefore, an evidence of organic matter, because we know of no other source for its derivation, and are able to trace its origin to vegetable matter in rocks of a less remote date. It is inferred the carbon was collected by marine vegetation at that early period.

4. In the lowest non-metamorphosed rocks, and in the shales and limestones of the Taconic System, several classes of the animal subkingdom are represented, which indicates, if we judge by analogy with subsequent changes and progress of life, that the seas in much earlier times must have teemed with life. This is the only view consistent with the modern theory of evolution and the present state of knowledge concerning the development of animals and vegetables.

5. The *Eozoon canadense*, a fossil rhizopod, is found in the Grenville band of limestone near the middle of the series. The limestone is thus described: "The general character of the rock connected with the fossil produces the impression that it is a great foraminiferal reef, in which the pyroxene masses represent a more ancient portion, which, having died and become much broken up and worn into cavities and deep recesses, afforded a seat for a new growth of foraminifera, represented by the calcareo-serpentinous part. This in its turn became broken up, leaving, however, in some places, uninjured portions of the organic structure. The main difference

between this foraminiferous reef and more recent coral reefs seems to be, that while with the latter are usually associated many shells and other organic remains, in the more ancient one the only remains yet found are those of the animal which built the reef."

6. The relatively large amount of potash in the Laurentian series indicates an abundant marine vegetable life, because later fossil fucoidal layers frequently abound in potash, and living algae secrete potash from the ocean in such form as to retain it in the sediments now accumulating, and in which they are buried.

7. And, negatively, we have no good reason to think the Laurentian Age was lifeless; beside, the actual elements composing the Laurentian rocks are not different from those in succeeding formations; indeed, oxygen, hydrogen, silicon, aluminum, magnesium, calcium, potassium, sodium, iron, and carbon constitute .99 of all the rocks in the world.

§ 36. The change which sedimentary strata of sands and clays, composed of silica, alumina, and potash, underwent to form granite, gneiss, and mica schist; the transformation of sand into quartzite, and all other changes caused by crystallization and new combinations, are supposed to be owing to chemical and molecular forces, acting under the conditions of pressure, heat, and moisture. The pressure of a deep sea would develop a high degree of heat. The mountain ranges have undergone volcanic and earthquake upheavals which may have accompanied the metamorphism as active agencies. It would seem to be a law that mountain upheavals follow great sedimentary deposits, and the chemical action is most powerful under the grandest accumulations; but the idea that such accumulations bend the crust of the earth, or the crust of the earth contracts and wrinkles up mountain chains in the act of cooling, is too chimerical for consideration.

§ 37. Sedimentation ceased when the beds were forced above the ocean, but continued elsewhere. When the beds were elevated, the wear and wash from atmospheric and aqueous forces began, and deposits ensued upon the margin of the land and in the depths of the ocean. The denudation of the anticlinal heights has furnished many geological sections, but the older rocks remain hidden from view, and will forever remain unknown. There is absolute nonconformability of the Laurentian rocks with overlying Groups at every locality which has been examined. The Taconic is introduced by total nonconformability, and frequently with a conglomerate containing pebbles derived from the adjacent Laurentian. Here is an unrevealed chapter of geological history, one that has not been reached and read, and never can be unless some region is unearthed where the Taconic rests conformably upon the Laurentian. The Laurentian is the home of granite, marble, gneiss, and other valuable building rocks, and the best mica quarries; but the precious metals have been found only in the intrusive, altered, or sedimentary rocks of later times.

CHAPTER III.

TACONIC SYSTEM.

§ 38. IN 1842, Ebenezer Emmons, in his Report on the Second Geological District of New York, described the rocks lying on the sides of the Taconic Mountains, parallel with the boundary line between New York and Vermont, under the name of the Taconic System. He found the belt on the western border of the mountains more than fifteen miles wide, and on the eastern side nearly twenty-five miles, making a total width of nearly forty miles. The rocks occur in Westchester, Columbia, Rensselaer, and Washington Counties, and stretching the whole length of Vermont, enter Canada, and extend beyond Quebec. He mentioned a typical locality in Berkshire, Massachusetts. The general character of the rocks was given as follows:

1. A coarse, granular limestone of various colors called Stockbridge limestone from the quarries at that place.
2. Granular quartz rock, generally fine-grained, in firm, tough crystalline masses of a brown color, but sometimes white, granular, and friable.
3. Magnesian slate.
4. Sparry limestone.
5. Taconic slate, which is extremely fine-grained and only slightly coherent.

He traced the rocks in a north and south course for 150 or 200 miles, and observed the fact that they underlie the Potsdam sandstone wherever it does not rest upon the gneissoid strata.

§ 39. In 1844 he published the "Taconic System," reviewed his former work, furnished numerous evidences in support of the existence of these rocks below the Potsdam and above the gneissoid rocks, or what are now known as Laurentian, and ascertained they had a thickness, as shown by a single section, of more than two miles. He said, taking one broad view of the whole system, it might be described as consisting of fine and coarse slates, with subordinate beds of chert, fine and coarse limestones, and gray, brown, and white sandstone; these admitting, however, of further divisions. The leading divisions recognized were:

1. Granular quartz, or brown sandstone, resting unconformably upon the older gneiss. It is the least regular in its continuation of any of the rocks of the Taconic System, and generally appears in insulated mountain masses, as at Oak Hill between Adams and Williamstown, Mass., at Monument Mountain, in the south part of Berkshire, in the east part of Bennington, Vt., and in Dutchess, Putnam, and Westchester Counties, New York.

2. Stockbridge limestone, generally known as Stockbridge marble, and occurring in New York, Vermont, Massachusetts, and Connecticut. Commencing at Sing Sing, it runs a northerly course through Westchester, Dutchess, and Columbia Counties, and extends into Connecticut. It passes up the valley of the Housatonic into the upper valleys of the Hoosic, and onward into Vermont, and is well represented at Williamstown, Massachusetts.

3. Magnesian slate, which composes the highest mountains in the Taconic ranges. The range of mountains composed of this slate, extending along the western

border of Massachusetts and through Vermont, often rising to the height of fifteen hundred feet, known as the Taconic range, furnished the name to this System. It crosses the Hudson about thirty miles above New York City, and passing south through New Jersey, enters Pennsylvania.

4. Sparry limestone, a name given to it many years before by Prof. Amos Eaton. It occupies a belt of country in the eastern part of Dutchess, Columbia, Rensselaer, and Washington Counties, and passing north strikes the west line of Arlington, Vermont.

5. Taconic slate, with its subordinate beds of roofing-slate and coarse brecciated layers, occupies almost the whole of Columbia, Rensselaer, and Washington Counties, and extends to the base of the Taconic range, which separates New York from Vermont and Massachusetts, and has an immense thickness. It crosses the Hudson above Newburg, and passes through Orange County into New Jersey. From the roofing-slate he defined *Diplograptus simplex*, and from the Taconic slate in Washington County *Bythotrephix flexuosa*, *B. rigida*, *Palæochorda marina*, *Nemapodia tenuissima*, *Nereites deweyi*, *N. gracilis*, *N. jacksoni*, *N. lanceolatus*, *N. loomisi*, *N. pugnus*, *Myrianites murchisoni*, and *M. sillimani*.

6. Black slate, forming, so far as he knew, the highest member of the Taconic System, and from which he defined *Elliptocephala asaphoides* and *Atops trilineatus*.

§ 40. He identified the Smithfield limestone in Rhode Island with the Stockbridge limestone, and an accompanying slate with the Magnesian Slate, and in Blackstone Valley found the brown sandstone and fine granular quartz. He recognized in the slates at Waterville, Maine, the Taconic Slate of New York, and found the *Nereites* at Kennebec. The fine roofing-slates on the Piscataqua he found subordinate to the Taconic Slate, in like manner as they exist in New York. And, jointly with Douglas Houghton, the Taconic System was found largely developed in the Upper Peninsula of Michigan; the slates of the formation with their fucoidal impressions and the granular quartz were both recognized. In 1846, he reproduced his work on the Taconic System in a book on the Agriculture of New York, with an appendix describing a conglomerate at the base, resting unconformably upon granite rocks.

§ 41. In this manner this geological subdivision was first determined, defined, and established, and it should have been recognized from that time forward. But others, much less informed, disputed the existence of the rocks, erroneously referred his fossils to more recent genera; and some, finding the same rocks, gave them different names, which added to the confusion, and seriously retarded the progress of knowledge respecting them. It may be later researches have not, in every respect, sustained his determinations, but Ford's work near Albany, New York, where the position taken by Emmons was most violently assaulted, has not only corroborated him, but has forever set the questions at rest in that locality. Wing, Dale, Marcou, and Dwight have sustained his assertions respecting the want of conformability of the Hudson River Slates with the Taconic. All the surveys of Michigan and Wisconsin have sustained him, though the geologists apply the later name, Huronian, to the Strata. His determinations of the rocks in North Carolina have been most fully confirmed by later geologists, though some use the word Huronian when referring to them.

§ 42. In 1849, Alexander Murray, an assistant on the Geological Survey of

Canada, in the Report of Progress for the year 1847, described the rocks on the north side of Lake Huron, and constituting many of the adjacent islands, under the name of "quartz rocks and sandstones, conglomerates, slates, and limestones," and correctly identified them as resting unconformably upon the older granite and syenitic gneiss, and succeeded unconformably by the Potsdam, but he did not call them by any geological name. If he had read Emmons's "Taconic System," it is difficult to conceive why he should have hesitated in referring the rocks to that System. In the Report of Progress of 1856, he redescribed the rocks, under the name of the "Huronian Series," which was adopted by the officers of the Canadian Survey, without once mentioning the Taconic System. From that time forward authors have generally used the name Huronian, and have almost annihilated the name Taconic. The word Taconic, however, has priority over Huronian. It is equally appropriate, and the definition of the fossils in the Upper Slates at once furnished the means of tracing it and determining it at different and distant places. The word "Huronian" is, therefore, a synonym for Taconic, and comprehended, as used originally by the Canadian Geologists, substantially the same series of rocks, though not ascending quite so high.

§ 43. A section of the so-called Huronian, but more properly called the Lower Taconic, between Missisquoi and St. Mary's Rivers, in ascending order, is as follows :

1. Gray quartzite,	500 feet.
2. Greenish, red-weathering chloritic and epidotic slates,	2,000 "
3. White quartzite, etc.,	1,000 "
4. Slate conglomerate,	1,280 "
5. Limestone,	300 "
6. Slate conglomerate, etc.,	3,000 "
7. Red quartzite, etc.,	2,300 "
8. Red jasper conglomerates, etc.,	2,150 "
9. White quartzite, etc.,	2,970 "
10. Yellowish chert, etc.,	400 "
11. White quartzite, etc.,	1,500 "
12. Yellowish chert, etc.,	200 "
13. White quartzite,	400 "
Total,	18,000 "

Another section adds to this one 4,000 feet, and even then the maximum thickness of the series in that locality has not been reached.

§ 44. Throughout the Huronian region, the whole series bears evidence of great disturbance, and is frequently cut with intrusive masses of greenstone, granite, or other igneous rocks. The more recent disturbances frequently bear metalliferous veins, which give to the country its value as a mineral region. Copper and iron are the chief minerals, and abound in nearly every section. Gold and silver sometimes occur. The Taconic of Michigan contains vast beds of iron ore. The ores are magnetic, red specular hematite and soft hematite resembling the brown hematite of other States. The magnetic and specular ores are the most prized, and usually contain from 60 to 70 per cent of iron, and hardly a trace of phosphorus or sulphur. (Phosphorus makes iron brittle when it is cold, and is therefore called cold-short, though it is malleable when hot, while sulphur makes it brittle when it is hot, and it is therefore called red-short.) The Lake Superior region is the chief locality of the world for native copper. It is so pure the aborigines manufactured it into implements. The copper-bearing rocks extend eastward

along the south shore of the lake for more than forty miles, then forming a narrow belt stretch in a north-east direction for about a hundred miles to the extremity of Keweenaw Point. The copper occurs in a rock called melaphyre, associated with beds of conglomerate, and appears to be interstratified with them. Sometimes bands of slate separate beds of melaphyre. The native copper exists in sheets, strings, and masses, and is sometimes associated with silver. In Ashland County, Wisconsin, the copper-bearing series has a thickness of more than four miles, though not very rich in the ore. The Taconic area in Minnesota is large. It extends across the northern border, and forming an elbow in the north-east extends diagonally through the State to the south-west corner. Here there is a hard, reddish, metamorphic sandstone, called the Sioux quartzite, interstratified with which is a layer of red indurated clay or pipestone, one foot thick, called Catlinite, largely used for the manufacture of pipes. The quarry is thirty miles north of the south-west corner of the State, and four miles east of the west line. The Sioux quartzite occurs in the north-west corner of Iowa.

§ 45. The geographical extent of these rocks in Canada is very great. They may be traced from near Lake Temiscaming 80 miles north-west of Lake Nipissing, south-westward to Lake Huron, and from thence westward on the north shore of the lake and the north shore of Lake Superior, and on beyond Lake of the Woods, a distance in all of about 800 miles. They pass beneath the lakes and expose a large area in the Upper Peninsula of Michigan at Marquette and Menominee, and a great thickness, extending from the lowest to the highest Taconic, as first ascertained by Houghton; thence they pass into Wisconsin, exposing a large area and quite as complete a representation of the series, while another arm extends from Duluth into Minnesota. The thickness in Michigan is about four miles; but in Wisconsin, including the copper-bearing series, which is three-fourths of igneous material, the thickness is much greater; and even excluding the igneous material the thickness exceeds four miles. The upper part of the Taconic System in Wisconsin, formerly called the "Copper-bearing series," has received the unattractive name of the Keweenawan formation, from the Keweenaw Point; but as it is part of the Taconic System the preferable name is the older one of the "Copper-bearing series." The rocks appear between Scoresby Bay and Cape Cresswell, in Lat. $82^{\circ} 40' N.$, where Nares and Feilden called them Cape Rawson beds.

§ 46. In 1856 Emmons divided the System into Upper and Lower Taconic. The Canadian Geologists in 1863 placed his Upper Taconic in the Silurian System and called it "Lower Potsdam," which name therefore became a synonym. The only geographical names which have been used to subdivide the Upper Taconic into Groups, which seem in the present state of learning to be worthy of retention, are, in descending order, the Swanton Group, the Georgia Group, and the St. John Group—if in fact the latter is below the Georgia, and therefore not a synonym. Emmons placed the Stockbridge limestone in the Lower Taconic; but it would seem from the examinations made by others, that his division would have been more clearly marked if the Stockbridge limestone had been retained in the Upper Taconic. The Paradoxides beds at Braintree, Mass., in Newfoundland and New Brunswick, and wherever found on the continent, belong to the Upper Taconic. The same difficulty exists in the West, in separating the Upper Taconic from the overlying rocks of the Potsdam, that has led to so much discussion in the East; and the confusion is

increased by the addition of numerous synonyms—the ready weapon to which ignorance resorts.

§ 47. In 1863 G. F. Matthew named the rocks exposed at St. John, New Brunswick, the “St. John Group.” He described them as arenaceous, argillaceous, and carbonaceous shales, and clay slates; often sandy, with sandstone and quartzite, having a thickness of 4,500 feet, and having an exposure about 30 miles long and 4 miles wide. He collected *Paradoxides*, *Conocoryphe*, *Obolella*, *Orthis*, *Orthisina*, *Stenotheca*, *Hyolithes*, and *Lingula*. In 1865 he and Bailey and Hartt correlated these rocks with the slates of Vermont having *Elliptocephala asaphoides*, and the schistose beds at Braintree, Mass., holding *Paradoxides harlani*, and thus proved their “St. John Group” to be a synonym for Emmons’s “Black Slate,” in the Upper Taconic System. Furthermore, they identified the slates with some found in Newfoundland containing *Paradoxides* and *Conocoryphe*. Later they divided the Lower Taconic of New Brunswick, which they called Huronian, into the “Coldbrook Group,” the “Coastal Group,” and the “Kingston Group,” and estimated the thickness as exceeding 10,000 feet.

§ 48. The Vermont Geologists in 1861 called the Black Slate, Taconic Slate, and Roofing-slate of Emmons the “Georgia Group.” The name has priority over the “St. John Group,” and if the Taconic System is to be divided into Groups with geographical names, and these three divisions of Emmons are to be thrown together in one Group, then they must under the laws of nomenclature bear the name of the Georgia Group. The Black Slate has, however, been called the Swanton Group, and if this name should become desirable then the Upper Taconic would be divided into the Swanton Group and the Georgia Group, and their maximum thickness in Vermont exceeds two miles. This division is that adopted by Perry, who has shown the Potsdam sandstone rests directly upon the Swanton Group, or Black Slate, as originally asserted by Emmons, and that both the Swanton Group and the Georgia Group are fossiliferous.

§ 49. The Taconic rocks extend from Canada East and Maine to Georgia and Alabama, flanking almost continuously the ranges of mountains upon both the eastern and western slopes. Their thickness in New Hampshire is over four miles, and in Vermont the maximum must exceed five miles. The slate belts of York and Lancaster Counties, Pa., and the rocks containing the valuable ores of nickel and copper belong to this System. There are five extensive outcrops in North Carolina, and three or four subordinate ones. They rest unconformably upon the belts of the exposed Laurentian, and very much resemble in their character the subdivisions in Vermont and New York. The largest outcrop is from twenty to forty miles wide, and extends quite across the State. The maximum thickness exceeds five miles. There are large outcrops in Virginia, South Carolina, Georgia, and Tennessee, and limited outcrops in Alabama. Gold, silver, copper, lead, iron, and other valuable minerals, occur in these rocks not only in veins, fissures, and dykes, but in seams following the stratification and as part of the sedimentary materials. In Northern Georgia gold exists in seams, with milky quartz, following the stratification of hornblende schists, and constituting as truly sedimentary rocks as the schists themselves do. The seams are stratified within the slaty sediments, and are of the same age as the Taconic System. These seams are so constant they characterize the slates or schists in the Appalachian System. They are metalliferous,

and frequently auriferous, or cupriferous. The magnetic and specular iron ores also occur with the material of the slates as a deposit of the same age, and constituting part of the same system. This mineral wealth is so distributed it is practically inexhaustible. The Taconic appears in Missouri, Arkansas, and Texas. The iron ore district about Iron Mountain and Pilot Knob containing porphyry rocks is of this age, but the granite to the east is Laurentian. The ore is found in very thick veins in Iron and Shepard Mountain, and Pilot Knob. It is specular ore, containing between sixty and seventy-five per cent of iron, free from sulphur and bearing no more than a mere trace of phosphorus. The rocks appear in numerous places in the Rocky Mountain ranges from Mexico to British Columbia, often exposing great geographical areas and an immense thickness, and they are usually metalliferous.

§ 50. The genera, regarded as typical of the Taconic fauna, and which do not pass up into Silurian rocks, are *Paradoxides*, *Microdiscus*, *Atops*, *Elliptocephala*, *Conocoryphe*, *Anoplenus*, *Bathynotus*, *Solenopleura*, *Acrothele*, *Salterella*, *Scenella*, *Iphidea*, *Hyo-lithellus*, *Archæocyathus*, and *Ethmophyllum*. There are some others peculiar to these rocks, but they are either obscure or limited in their distribution. Some genera closed their existence in Silurian time, others reached the Devonian age, and some from this remote period, as *Orthis*, *Orthisina*, *Orthoceras*, and *Leperditia*, continued to live to the Carboniferous, though *Orthoceras* reached its most remarkable development in the Black River Group, and *Orthis* in the Hudson River. Not a single species belonging to the Upper Taconic system crossed over the line that separates it from the Potsdam Group of the Lower Silurian, so far as any reliable determination has thus far been made. This, supported as it is by a want of conformability, indicates a vast lapse of time between the deposit of the Upper Taconic and the commencement of the Potsdam period. The Taconic is composed in part of the disintegrated materials of prior Laurentian rocks, while the Potsdam represents the washings of the Laurentian and Taconic. The order Graptolida appeared in this system, and reached its maximum development of genera, species, and numbers (if the Point Levis beds referred by the Canadian Geologists to the Quebec Group belong to the Upper Taconic, as claimed by Marcou and others, and as the author believes), and became extinct in the Upper Silurian System. This is the first order of animal life to reach the highest stage of its existence, and the first to become extinct. It is referred to the class Hydrozoa, but if more was known of it, very likely it would form a distinct class.

§ 51. The Cupriferous series of the lake region, called also the Keweenaw, Keweenian, Keweenawan, and Nipigon series, is supposed to underlie nearly the whole basin of Lake Superior, or an area of about 28,000 square miles, and a surface area upon the borders of the lakes and their immediate vicinity of about 18,000 square miles. This series has been divided into an upper and lower division, with an estimated maximum thickness of 15,000 feet for the upper division, and 35,000 feet for the lower, which rests upon the slates and quartzites of the Taconic System, the last having a variable thickness that reaches a maximum of at least 22,000 feet. The Cupriferous series consists of eruptive flows and detrital rocks, with massive dykes. The region was, in Taconic days, represented by a volcano, which has sunk beneath the waters of the lake. The flows were followed by detrital rocks, representing the intervals of time between them; but these detrital rocks are com-

posed largely of conglomerate layers and large-sized pebbles, indicating strong currents of water. The flows visible upon the borders of the lakes were forced through fissures by volcanic energies. The copper which occurs in the conglomerates, amygdaloids, epidote veins, and otherwise, is supposed to have been precipitated from water holding it in solution, or leached from detrital rocks where it was originally deposited in a sulphureted form. R. D. Irving, who has studied closely the copper-bearing rocks of this region, says the explorer for transverse veins should bear in mind that epidote, prehnite, and chlorite are favorite associates of copper, while laumonitic veins, and those bearing a predominating quantity of calcite, are not so rich; that a wide vein in amygdaloidal or other soft rock will pinch to a mere seam within the massive and compact layers; and in sandstone and conglomerate deposits the valuable belts have been found where the conglomerate is overlaid with trap, or in sandstone very rich in basic detritus. Any of the conglomerate seams from Keweenaw Point to Minnesota may be cupriferous. All of the upper division of the series is noncupriferous, except the Nonesuch sandstone belt in the Porcupine Mountains; and all the belts and areas of acid rocks, such as the central area of the Porcupine Mountains, and the great spread of red rock in the Brulé Lake country in Minnesota, and all belts and areas of coarse-grained basic rocks, such as the great area of coarse gabbro in the Bad River region in Wisconsin, and the similar area which occupies the belt of country from Duluth to Brulé Lake, are also noncupriferous. The slates and quartzites of the Taconic System which lie below the Cupriferous series on the north shore of Lake Superior, have been called the Animikie Group. About three-fourths of the great thickness of the rocks is referred to volcanic overflows, and does not, therefore, belong to the geological column, the whole of which is the result of sedimentary deposition.

CHAPTER IV.

SILURIAN SYSTEM.

§ 52. In 1833, Sir R. I. Murchison, in a memoir read before the Geological Society of London, divided the fossiliferous rocks below the Devonian into six Groups. He founded this subdivision upon the fossils, and mentioned such species as were then defined. This was followed in the succeeding year by other memoirs, and in 1835 he concluded all these Groups might be placed in one System, and in honor of the ancient tribe of Silures, who inhabited Wales, he named it the Silurian. He placed three Groups in the Upper Silurian, and three in the Lower Silurian. Before this time no knowledge of the order of the strata had been ascertained, and hence he is entitled to the credit of the name. Subsequently palæontologists found his discoveries were world-wide in their application, and it was not long until the distinction between the Upper and the Lower Silurian had been observed in North America, and the base of the Lower Silurian had been recognized in the Potsdam sandstone, and the base of the Upper Silurian in the Medina sandstone.

§ 53. Some years later, the word Cambrian was applied in England to the rocks which belong to the Lower Silurian, and to inferior strata which are the equiva-

lent in part of the Taconic System. It was not used in the sense of a "Group," but in the higher sense of a "System," as these words were then understood. It was never well defined, and it crossed one of the grandest and most important breaks in geological time—that which separates the Taconic and Silurian Systems. No careful geologist or palæontologist uses the word in the nomenclature of American strata, though it occasionally occurs in incoherent geological papers, and sometimes we see such monsters in nomenclature as Cambro-Silurian and Siluro-Cambrian.

§ 54. The Lower Silurian in North America is divided, in ascending order, into the following Groups: viz., Potsdam, Calciferous, Quebec, Chazy, Black River, Trenton, Utica Slate, and Hudson River. The Upper Silurian is divided, in ascending order, into the Medina, Clinton, Niagara, Onondaga, Guelph, and Lower Helderberg.

POTSDAM GROUP.

§ 55. Prof. Ebenezer Emmons, in the Annual Report of the Geological Survey of New York for 1838, described the sandstone at Potsdam in St. Lawrence County, and proposed for it the designation "Potsdam Sandstone." It was subsequently described quite fully in the New York Reports, and finally the Canadian Geologists in 1863 called the rocks the Potsdam Group. The lowest portion at Potsdam is a granitic conglomerate, in which large masses of quartz, the size of a peck measure, are sometimes inclosed. These were water-worn and rounded before being enveloped in the deposit. The sandstone is quite variable in texture and color, but its composition is uniformly silicious. At some places it is an even-grained mass in compact layers, and at others it is traversed by joints. In some localities a dark, slaty sandstone, about ten feet in thickness, intervenes between the Potsdam and Calciferous, at others a coarse brecciated rock, and at others the passage is very gradual into the Calciferous sand-rock. The thickness in New York is from 100 to 200 feet. The exposure is narrow, but extends from near the Thousand Islands to Lake Champlain, and enters Vermont with a thickness of about fifty feet.

§ 56. It extends from New York into Canada, where it attains a thickness ranging from 300 to 700 feet, and at the summit the sandstone is interstratified with magnesian limestone that constitutes a passage to the Calciferous. There is more diversity in the rocks in Canada than in New York, and limestones and slate sometimes occur with the sandstone. It rests unconformably upon the Laurentian, and fills up inequalities where the Taconic System does not intervene, and it also rests unconformably upon the Taconic when it is present. The sandstone appears to have been deposited in shallow water along the margin of a sea. The tracks and wind marks support that view. In its extension westerly, by the way of Lake Huron and Lake Superior, across Wisconsin and into Minnesota, the same variations in thickness occur. Sometimes it attains a thickness of 3,000 feet, and again thins out to 40 or 50 feet. For several miles in distance near Beauharnois, Canada, the strata are marked by the tracks of *Protichnites*. The surfaces on which the tracks are impressed are sometimes smooth, and sometimes beautifully ripple-marked. On the latter the tracks have often beaten down the ripple-marks, and the sand of the ridge has been dragged into the furrow, in such a way as to show the direction in which the animal was progressing. Fucoids are abundant in the upper part of the Group, and *Scolithus* so common as to be quite

characteristic, and near St. Genevieve the rock is completely honey-combed with it to the depth of three feet.

§ 57. It is largely distributed in Northern Michigan, and striking into Wisconsin north of Green Bay gradually widens southerly as a surface rock, until it reaches the central part of the State, where it has a width of 100 miles. It then curves northwardly and enters Minnesota, forming the high hills on the Mississippi River. It is unconformable with the rocks below, and rests upon an exceedingly irregular surface, sometimes filling depressions in the quartzite or metamorphic rocks of several hundred feet. Its upper surface is uniform, and graduates into the Calciferous Group or the Lower Magnesian limestone, as the rocks in these States are called. The exposed area in Wisconsin is about 12,000 square miles, the thickness very irregular by reason of the great depressions and elevations at the base, and the maximum thickness is fully 1,000 feet. The rock is chiefly composed of cemented grains of silicious sand, but presents several varieties, as the calcareous, argillaceous, ferruginous, and green sand, and the waters issuing from it in places contain a small percentage of lime salts. In the argillaceous class the clayey material becomes so abundant as to render the rock shaly, and so impervious to water that valuable springs occur at its upper exposed surface. In the calcareous class the lime becomes so great in some layers that they are more properly limestones than sandstones, and so associated with magnesia that they become arenaceous dolomites. In the ferruginous class, at one extreme, the amount of iron oxide is barely sufficient to color or cement the mass, and at the other so great as to make an iron ore. In the green sand there are two classes, one in which the grains are colored by iron, and the other consisting of deep green grains of glauconite. The green sand is not restricted to the Potsdam in Wisconsin, for it also occurs in the Calciferous and St. Peter's Sandstone. It is almost identical with the Cretaceous green sand of New Jersey, and similar deposits in existing seas. The surface area in Michigan, Wisconsin, Iowa, and Minnesota is estimated at 25,000 square miles, which is about half the surface area on the continent; but it is generally believed to exist under many of the more recent deposits, and, therefore, to cover several hundred thousand square miles. Springs and streams of soft water are abundant where it forms the surface rock, and a good supply of soft water has been found wherever it has been penetrated with the drill; its existence, therefore, becomes a question of much economical interest where a supply of good water is desired from artesian boring. The drill has never reached it in Ohio, though a supply of good water is imperatively demanded in some parts of the State; and it is to be hoped an effort will be made to determine whether it exists below the Calciferous, which has been reached with the drill many times.

§ 58. It is exposed at numerous places in the Appalachian System from New York to Tennessee. In New Jersey it reaches a thickness of 3,000 feet, and if both the Chilhowee sandstone and Knox Group in Tennessee belong to it, it has a thickness of 9,000 feet, but probably 5,000 feet of this belongs to the Taconic. In the southern and south-eastern counties of Missouri it has a thickness of 700 feet. It appears in several counties in Northern Texas, along the margins of the Big Horn, Laramie, and Wind River ranges, at the Black Hills, and in other regions of the Rocky Mountain System from Mexico to British America. The erosion by water and weathering has left picturesque scenery in the sandstone at many places. The

“Pictured Rocks” of Lake Superior, the “Dalles” of the Wisconsin, and the “Chasm of the Au Sable” in New York are examples.

§ 59. Everywhere it is essentially an accumulation of sandstone and pebbles from the adjacent Laurentian gneisses, granites and syenites, and Taconic quartzites and schists, resulting from the disintegrating influences of air and water. It contains ripple-marks, wave-lines, mud cracks, animal tracks, and worm burrows, which evidence shallow seas and shore lines. The continent at the time of its deposit did not have one twentieth its present area. There is nothing known to indicate the climate was different then from what it is now, except so far as the relative difference of land and water surface would necessarily change it. Some species of fossils prevailed over great areas, as *Hyolithes primordialis*, *Lingulepis pinniformis*, *L. prima*, *Dicellocyphalus minnesotensis*, *D. osceola*, and *Ptychaspis minuta*, and therefore become somewhat characteristic of the Group. Though composed almost wholly of sand it was slowly deposited. The sandstone is frequently charged with fossils to its full capacity, indicating a formation almost as slow as marine limestone is now made. There is no doubt that Calcareous mud was forming in the depths of the ocean at the same time the sand was deposited nearer the shore, but no limestone group of the Potsdam age has been found, unless it exists in the Eureka district of Nevada.

CHAPTER V.

CALCIFEROUS GROUP.

§ 60. THIS name was first applied by Prof. Eaton to a gray rock consisting of lime and fine grains of sand, so intimately blended as to appear homogeneous. It contains calcite and a sparkling surface, but passes into a carbonate of lime, containing beds of magnesian limestone and a small amount of iron. The Group was defined by Vanuxem in 1842, in the Geology of the Third District of New York. He united the silicious layers above the Potsdam, the calciferous sand-rock, and the fucoidal layers in one Group. The rocks consist in general of three varieties—silicious, magnesian, and carbonate of lime, with intermediate grades of composition. They pass from compact to granular, and granular to porous, the latter having cavities lined with crystals of quartz, calcareous spar; or, instead of being lined, possessed of a single beautiful perfect crystal of limpid quartz, nearly filling the space. Middleville and Little Falls are noted localities for these crystals, some of which contain a fluid or anthracite, which enhances their value as cabinet specimens. The structure of the rock is often oolitic, passing into thick layers having a concretionary structure, as in agate. The typical localities are in Montgomery and Herkimer Counties.

At Chazy the following ascending section occurs:

1. Silico-calcareous beds, more or less interspersed with sparry masses, 30 to 35 feet; fossils rare and cherty.
2. Limestone, in which the plates of Cystideans abound, 20 feet.
3. Dull, gray, earthy mass, without fossils, and passing into oolitic beds, 10 feet.
4. Cystidean limestone, similar to the first though of a brighter red color, 15 feet.

5. Massive earthy and silicious limestone containing trilobites, 20 feet, followed by beds of similar character of greater thickness containing brachiopods.

6. Red Cystidean limestone, susceptible of a fine polish, 15 feet.

7. Drab-colored, thin-bedded, earthy magnesian beds, suitable for hydraulic lime, of considerable thickness; fossils rare, except fucoids. Toward the top of the rock it is blue and frequently cherty, oolitic, and concretionary, the upper masses from 20 to 30 feet thick.

§ 61. The Group is persistent, and surrounds the irregular dome of Laurentian rocks, which form the northern highlands of New York, in a belt, overlying the Potsdam. It is chiefly a hard calcareous sandstone or arenaceous limestone, resting upon the margin of the Potsdam sandstone, from Lake Ontario eastwardly to Vermont, and from New Jersey north, near the line of New York and Vermont, into Canada. It forms a narrow belt of surface exposure, with a variable thickness from 50 to 350 feet. Lake Champlain has cut a channel through it for twenty miles. In Canada, adjacent to New York and Vermont, it is, in the lower part, a dark, bluish-gray, crystalline, strongly coherent dolomite or magnesian limestone, and in the upper part a bluish-gray, calcareous argillite, but its characters are different in different localities. It is usually found as a narrow belt following the sinuosities of the Potsdam Sandstone, from west of Lake of the Woods to the Atlantic sea-board; but where the rocks have been disturbed by volcanic energies it may be absent or difficult of detection. The surface area of its distribution in Canada is several thousand square miles, and in its undisturbed condition the maximum thickness rarely exceeds 450 feet, though in Newfoundland, where it is a definitely stratified limestone, it has a thickness of more than 2,000 feet. In the region of the Mingan Islands, in the Gulf of St. Lawrence, the fossil casts and shells are in a good state of preservation.

§ 62. In Northern Michigan and on the Menominee and Escanaba it preserves its New York characters in a remarkable degree, although its thickness may not exceed 50 feet. The upper portions are highly calcareous, and on fresh fracture show the peculiar granular structure so characteristic in New York. It is thin-bedded, and contains small cavities lined with crystals of calc-spar, quartz, or hornblende. The surfaces of the layers are often covered with fucoidal impressions. From St. Mary's River westerly to the Wisconsin and the Mississippi there is a gradual augmentation in the thickness of the rocks and a material change in their composition. The Group enters Wisconsin from Michigan a few miles from Green Bay, and striking south-west upon the border of the Potsdam it forms a serrated margin from five to fifteen miles in width, until it reaches the streams that flow into the Mississippi in the south-western part of the State, where it is exposed upon some of the streams for a distance of 75 or 100 miles. It crosses the Mississippi and the north-eastern corner of Iowa, appearing in the bluffs and hills more conspicuous than the Potsdam, though not so thick, because it is a much firmer rock. It is a buff-colored dolomite, without uniformity of texture or stratification, and weathers into rough, bold, and often picturesque fronts along the valleys, and has a thickness of about 250 feet.

§ 63. From Iowa the area of exposure is a little west of north through Minnesota, reaching as far west as the second tier of counties from the Mississippi and following the bluffs with limited outcrops in Wisconsin to Lake Pepin, north of

which and east of the St. Croix it forms the surface of nearly two large counties of Wisconsin. It follows the Mississippi north of Minneapolis for several miles before it is covered with later formations. The conspicuous perpendicular walls of rock, cropping out from the hills and bluffs along the Mississippi from the St. Croix to the mouth of the Wisconsin, belong to this Group. Throughout the exposures in Wisconsin, Iowa, and Minnesota, it is conformable with the underlying Potsdam, and unconformable with the overlying rocks. The lower surface is plane, while the upper surface is undulating, and in some instances the undulations are said to swell in short distances into elliptical domes, rising 100 feet above their bases, like billows on the sea. These undulations are the work of denudation during the interval that elapsed before the deposition of superimposed strata. The Group in Wisconsin is frequently called the Lower Magnesian limestone, and some one in Minnesota has called it the Shakopee Group, because the stone has been quarried at a village bearing that Indian name. The Magnesian limestone is usually sufficiently pure to burn to a serviceable quicklime. The chief impurities are quartz, clay, iron, and green sand. The dolomite occurs in the earthy, granular, crystalline, and crypto-crystalline forms, and chert is irregularly distributed. Argillaceous material is not abundant, except in shaly bands, where it may constitute 20 per cent of the whole; and the amount of silica disseminated through the rock varies from 1 to 10 per cent. The difference in the composition and hardness of the layers causes the surface rocks to present great irregularities, which are much enhanced and exaggerated by weathering, and hence outliers have a rough and often grotesque exterior.

§ 64. The Group is displayed in grand proportions in the southern counties of Missouri, where it consists of an upper and lower division of magnesian limestone with an intermediate division of sandstone. These received the names, in descending order, of the "Second Magnesian limestone," the "Second Sandstone," and the "Third Magnesian limestone." The upper division is generally composed of beds of earthy magnesian limestone, interstratified with shale-beds and layers of white chert, with occasionally thin beds of white sandstone, and near the lower part thick, cellular, silico-magnesian limestone-beds. It constitutes many of the bluffs of the Osage and its tributaries, and also of the Missouri from Osage to Jefferson City. It is often a lead-bearing rock, as in Cole County. The thickness rarely exceeds 200 feet, though on the Meramec it is 300 feet. The middle division is usually a brownish sandstone, stratified in firm, regular beds from 2 inches to 3 feet in thickness, though sometimes friable. The surfaces are often ripple-marked. The thickness rarely exceeds 150 feet. The upper part often occurs in thin strata with beds of intercalated chert abounding in fossils. The third division is generally a thick-bedded, coarsely crystalline, bluish-gray magnesian limestone, with occasional thick chert-beds. It is the chief lead-bearing rock of South-east and Southern Missouri, and is frequently exposed along the streams in bold escarpments from 200 to 300 feet high. The ores of lead, zinc, copper, nickel, and cobalt, occur in fissures and caves, or disseminated in small masses in the limestone itself. The lead occurs sometimes in masses of galena accompanied with copper pyrites disseminated through layers of limestone, while the ores of nickel and cobalt occur in clay slate. At other places bands of red clay inclose calamine (silicate of zinc), galena, and heavy spar (sulphate of baryta). The maximum thickness is about 600 feet, though it seldom exceeds 300 feet. The maximum thickness of the three divisions is more

than 1,000 feet, but the Group at no single locality displays so great a thickness. From Missouri the Group extends southerly across Arkansas into San Saba, Llano, McCulloch, Menard, Mason, and Lampasas Counties, in Texas, where the maximum thickness is more than 400 feet. It is exposed in narrow belts in the Appalachian chain from New York and New Jersey to Tennessee and Georgia, but has not been very clearly distinguished in the mountain regions of the West.

§ 65. It is said this Group in some localities graduates into the Quebec; but on the other hand it is claimed the Quebec belongs to the Taconic System, and is below the Potsdam. It is certain many of the rocks referred to the Quebec Group belong to the Taconic, and some of them may belong to the Calciferous or the Chazy, or may form passage beds from one to the other. The oldest known Lamellibranchiata are found in this Group. Among the fossils having the greatest distribution, and which are most characteristic, we may mention *Ophileta complanata*, *O. uniaugularis*, *Holopea turgida*, *H. dilicula*, and *Orthoceras primigenium*. *Pleurotomaria canadensis* and *Leptena barabuensis* occur in this Group and in the Potsdam. *Pleurotomaria calcifera*, *P. postumia*, *Holopea dilicula*, *Helicotoma perstriata*, *Machurea matutina*, *M. sordida*, *Eccyliomphalus canadensis*, *Camarella calcifera*, *Lingulella mantelli*, *L. irene*, *Amphion salteri*, *Buthyurus cordai*, *B. conicus*, and *Asaphus canalis* have been described from this Group and from the Quebec. These identifications may well be doubted, unless the rocks containing all these species really belong to the Calciferous.

CHAPTER VI.

QUEBEC GROUP.

§ 66. THE Quebec Group was first characterized and its position between the Calciferous and Chazy asserted, upon palæontological evidence, in 1862, by Prof. Billings. His position was supported by the Canadian Geology in 1863, and in Decade 2 of a later date. The limits of the Group are still a subject of discussion, and part of the rocks originally referred to it belong to the Upper Taconic; but another part of them may form passage beds from the Calciferous to the Chazy, and occupy a position which warrants the name of an independent Group. The name was derived from the city of Quebec, where it was subdivided into the Levis, Lauzon, and Sillery divisions. The Levis was named from Point Levis, where it is fossiliferous, and has a thickness of 6,145 feet; the Lauzon from Lauzon, where its thickness is 4,000 feet, and it is non-fossiliferous; and the Sillery from Sillery Cove, where it is 2,000 feet thick and almost barren of fossils. The Lauzon division is below the Levis, and, from fragments of fossils found in pebbles, it has been since ascertained that it belongs to the Upper Taconic. A great fault at the Island of New Orleans and another near the Falls of Montmorency, with lesser faults, are said to account for the erroneous reference of this division to the Quebec. It was supposed at one time that the Sillery and Lauzon were upper members of the Quebec Group; but both of them belong to the Upper Taconic.

§ 67. The Group has been traced from Vermont to Newfoundland, a distance of 1,000 miles, and the Levis division noted at several localities, where it consists of a variety of shales, with some sandstones and conglomerates, distinguished by

the general black or dark color. In Newfoundland the Levis division consists of graptolitic shales, having a thickness of 4,000 feet, which are followed by about 1,000 feet of serpentines and diorites referred to the Lauzon division; and these by black slates and limestones, having a thickness of 4,000 feet, referred to the Sillery division. Serpentines, diorites, and slates sound like Upper Taconic, and it may be undiscovered faults have given rise to an erroneous determination of the order, and therefore the so-called Lauzon and Sillery may be below the Levis; or it may be an erroneous identification of the Lauzon and Sillery; and yet the true solution may be found in the fact that all three divisions belong to the Upper Taconic, for the trilobites described by Billings, from these rocks in Newfoundland, have a primordial or Taconic aspect. The author has never had an opportunity to examine the rocks of the Quebec Group, but an examination of the present state of the learning respecting it, makes it very doubtful whether or not the name should be retained. If the Group belongs to the Taconic System, as most of it undoubtedly does, possibly the name should be retained. If that part of it in the East from which Calciferous fossils have been obtained, constitutes all of it except that which belongs to the Taconic, then probably the name should be stricken from Lower Silurian nomenclature, and the part containing such fossils should be included in the Calciferous Group, in which event the Chazy Group would include some of the rocks referred to the Quebec in the Western mountains, and the rest would belong to the Upper Taconic.

§ 68. The Quebec Group has been recognized in the Wahsatch Range, in Utah, at Pogonip Mountain, Nevada, and other places in the Western mountain chains, where the Calciferous and Chazy have not been distinguished from it. In the Pogonip mountain-beds the following species are said to pass from clearly distinguished beds of the Potsdam Group up three or four thousand feet into as certainly determined beds of the Quebec Group, viz.: *Lingulepis maera*, *L. minuta*, *L. manticula*, *Acrotreta gemma*, *Agnostus communis*, *A. bidens*, *A. neon*, *Crepicephalus haguei*, and *C. unisulcatus*.

§ 69. In this Group we find the first illustration of an important branch of the animal kingdom reaching its highest stage of development, and subsequently declining, and finally becoming extinct. The first known *Graptolites* appear in slates of the Upper Taconic System, and reach the climax of evolution in the Quebec Group, and become extinct in the Upper Silurian era. The development of these forms seems to have been wonderful. About thirty genera have been distinguished in America, and to these have been referred about 170 species. The Group is said to be connected specifically with higher Groups by *Maclurea atlantica* and *Asaphus canalis*, that occur in the Chazy, and by *Leptæna sericea*, which is common to all the Groups in some of its varietal forms as high as the Clinton.

§ 70. This Group is said to graduate up into the Chazy without lithological lines of separation, and without an abrupt break in the chain of fossils. Clear passage-beds occur where the Groups are well developed, and even where there is non-conformability some fossil species are said to be common to the two Groups. The geographical surface distribution is confined to limited areas east of the Appalachian System, and to small exposures among the Western chains; but it must represent a vast period of time, as evidenced by the great development and evolution of its animals, and by the erosion of the Calciferous where it does not exist.

§ 71. Bitumen, or mineral pitch, is a product resulting from the distillation of vegetable and animal matter within the earth. It has a pitch-like odor, and burns with a bright flame without any ash, and varies from liquid naphtha to solid asphaltum. Naphtha is a nearly colorless fluid, having a pungent smell, that issues from the rocks in Persia. Its specific gravity is about 7-10, and by exposure it loses its transparency and odor, and acquires a yellowish or brown color, becomes thicker and heavier, and approaches petroleum. Petroleum is so called from exuding as an oil from the rocks. Its specific gravity is 87-100, and by exposure to the air and the application of heat it may be converted into asphaltum. Asphaltum was so named from a lake in Judea, where it rises in a liquid form to the surface of the water and then hardens. Its specific gravity varies from 1.07 to 1.65. It is quite brittle and electric, though coal is not. Bituminous matter occurs in the limestones and dolomites of the Quebec Group, and the odor may be detected in many places by striking or heating the rocks. A black, combustible, coal-like matter is found with crystals of bitter spar and quartz, sometimes coating the crystals or the walls of cavities, and at other times in the form of buttons or drops, evidently having been introduced in a liquid state and subsequently hardened. It fills veins and fissures in limestones, shales, and sandstones, and even in the trap-rocks which traverse these. It is very pulverulent, brittle, of a shining black color, and yields from ten to twenty per cent of volatile matter. It approaches anthracite in its characters. The volatile matter is a hydrocarbon gas. It has resulted from the slow alteration of liquid bitumen in the fissures of the strata. The bitumen was derived from marine vegetation or marine animals, which underwent a special mineralization, producing the bituminous matter instead of coal. It is due to chemical reactions, by which it retained a greater proportion of hydrogen in its combination than would have been retained if it had been converted into coal.

CHAPTER VII.

CHAZY GROUP.

§ 72. THE Chazy Group was first defined in the Report of the Second District of New York in 1842, by Prof. Emmons, under the name of the Chazy limestone. The name was derived from the town of Chazy, where it has a thickness of 130 feet, reposes unconformably upon the Calcareous, and is succeeded by the Birdseye limestone. It is a dark, irregular, thick-bedded limestone, containing many rough, flinty, or cherty masses, and extends as a belt into Vermont, where it exposes more surface area than any other Group of the Lower Silurian, and has a maximum thickness of 300 feet. It was called the "Chazy Formation" in the Geology of Canada for 1863, because shales and sandstones are there associated with the limestone. It occupies a narrow area about the Ottawa and Montreal, and extends to the Mingan Islands and Newfoundland, its thickness not exceeding 300 feet. The western extension of the belt appears in cliffs on the coast of Lake Winnipeg, in the region of Lakes Huron and Superior, in Michigan, Wisconsin, Iowa, and Minnesota. In the lake region it consists of arenaceous and arenaceous-

calcareous beds, sometimes difficult to distinguish from the Calciferous layers, followed by beds of argillo-calcareous composition.

§ 73. In 1852 David Dale Owen called it the "St. Peter's Sandstone," after the river of that name, now sometimes called the Minnesota River, where it is usually made up of grains of limpid and colorless quartz, remarkable for whiteness. It occupies part of the slope between the first and second terrace at Prairie du Chien, forms the base of the bluffs at the St. Peter's, and the lower nineteen feet at the Falls of St. Anthony. It rests upon the billowy surface of the Calciferous, fills up the depressions, and is followed conformably by the Trenton. In the lower part there is some shaly material and conglomerate matter washed from the Calciferous and older rocks, but above this it is a remarkably uniform, white or yellow, friable quartzose sandstone, substantially free from silt and calcareous or ferruginous cement. There are oblique and discordant lines of stratification, supposed to be due to the shifting of the waves during deposition, and near the upper surface there is more or less argillaceous material. In some localities it is tinged yellow or red by the oxides of iron, and cemented in streaks, and weathers irregularly. The outliers and standing rocks are brightly colored, and are called pictured or painted rocks. The thickness will exceed 200 feet where filling a depression in the Calciferous; but the average thickness does not exceed 100 feet. Occasionally ripple-marks, fucoidal impressions, and tubes of *Scolithus* occur in the harder layers, but the only fossil yet described from this region is *Lingulepis morsei*. The absence of fossils is due to want of preservation.

§ 74. Prof. T. C. Chamberlin says the constituent grains of sand in this Group are derived in the main from granitoid and schistose rocks, which are composed of particles of quartz intermixed with a variety of softer and more decomposable crystalline minerals. In the metamorphism the quartz was usually last in crystallization, and occupied the angular interstitial spaces between the crystals that had already taken shape, and hence while crystalline in internal structure it molded itself about the crystals of the previously formed minerals. It was thus angular, but not in its own crystalline form. Upon decomposition the associated minerals were mainly reduced to earths and clays, while the undecomposable quartz remained in angular grains. By the action of streams in carrying these down to the sea, and by the agency of the waves in distributing them, the grains were sifted, assorted, rolled, rounded, and finally deposited in the forms in which we now find them. The majority are worn into somewhat spherical grains; others less acted upon remain quite angular. The angularity, however, is not what is characteristic of freely forming quartz crystals, but is due to the circumstances under which it was formed. In the original crystalline rock occasional cracks and cavities occurred filled with secondary quartz, which in such a situation assumed its own crystalline form; and in the sandstone itself secondary crystals might have been formed after deposition, just as they have been in adjacent limestone-beds where their secondary origin is unquestionable, and the degradation of the rock inclosing these would furnish points and fragments of true crystals of quartz, which might not be so far worn as to lose their characteristic form.

§ 75. It occupies a narrow area fringing the Calciferous, or exposed in river banks, stretching in an irregular course from the Lower Menominee River on the north-eastern border of Wisconsin to the mouth of the Wisconsin River. It occurs

in North-eastern Iowa and the eastern part of Minnesota, where its dip is westerly. It occurs in Illinois, at Oregon, on Rock River, and at La Salle, on the Illinois, caused by a local uplift. The unevenness of the Calciferous bed, as proven by artesian boring, is greater near the margin or shore-line of the oceanic deposit than elsewhere. It is known, by artesian boring, in Minnesota more than 100 miles from the Mississippi, and in Illinois more than 100 miles from its exposure in Wisconsin. In some places the sand mingles with the calcareous materials and forms passage beds to the Trenton, and at other places the transition, while conformable, is abrupt. In Missouri the upper part of the Group received the name of the "First Magnesian Limestone," and the lower part the "First Sandstone" and the "Saccharoidal Sandstone." The latter presents very few characters not found in the exposures in Illinois and Wisconsin; while the former is limited in its distribution, and indicates local changes in the deposition of the upper part of the Group. It is usually a gray or buff crystalline, cherty, magnesian limestone, filled with silicious patches, breaking readily with the hammer, and extremely variable in thickness. In New Jersey it consists of a fine, even-grained limestone, sometimes a pure dolomite, except near the base, where there are sandy and calcareous layers. It occurs in long, narrow belts, in a north-east and south-west direction, corresponding to synclinal and anticlinal axes. From this State and from Pennsylvania it is exposed in numerous places within the Appalachian System as far south as Alabama, and may generally be detected by the presence of *Maclurea magna*. In Tennessee the lower part is an argillaceous limestone, varying in thickness from 50 to 600 feet; and if the marble of Knox County is referred to it, its upper part will have a thickness of more than 400 feet. It occurs in the Wahsatch Range in Utah, in the White Pine district of Nevada, in the Wind River Mountains of Wyoming, and in numerous other localities in the great system of mountain ranges of the West, where it also bears the name of the Quebec Group. It has been identified in the Arctic regions, on King William's Island, North Devon, and Depot Bay, in Bellotis Strait, where it is a dolomitic limestone. It graduates into the Black River wherever the latter is separable from the Trenton, and especially where the Birdseye limestone is present. Numerous fossil species connect it intimately with the overlying rocks, many of which occur as high as the Hudson River, viz.: *Strophomena alternata*, *S. incrassata*, *Orthis perveta*, *Leperditia canadensis*, *L. louckana*, *L. amygdalina*, *Orthoceras multicameratum*, *O. bilineatum*, and *Modiolopsis nasuta*. The most characteristic fossil is *Maclurea magna*.

CHAPTER VIII.

BLACK RIVER GROUP.

§ 76. THE Black River Group was defined by Lardner Vanuxem, in the Geological Report for the Third District of New York in 1842, and named from its exposures on Black River. The name "Black River limestone" was applied to the cliff extending from Boonville through Lewis into Jefferson County, the cliff being composed of the Birdseye limestone of the Mohawk and the rocks upon which the well-characterized Trenton limestone is placed. We find the name Birdseye limestone applied to rocks in the report of 1838, but not in the sense of the name of a Group of rocks, as the term Black River was used in 1842, and if the name had been so used it would necessarily give way to the geographical name. The Birdseye limestone was distinguished on the Mohawk by its light dove-color, thick layers, and the presence of crystalline particles representing *Phytopsis tubulosa* or other organisms, which caused the rock to break readily or possess a kind of brittleness, and when broken to clearly show the crystalline spots. This character is not persistent in geographical distribution, and the greatest thickness of the rocks is only about 30 feet. The Black River limestone is distinguished by the abundance of Cephalopoda, and especially by remarkably large *Orthoceras*, some of which are 10 feet in length and a foot in diameter; beside, it has quite an extensive distribution. The thickness on Black River is about 50 feet.

§ 77. From New York it extends into Vermont, where about 12 or 14 feet in thickness becomes a black, finely granular mass, susceptible of a high polish, and has received the name of the Black Marble of Isle La Motte. In Vermont it rarely exceeds 20 feet in thickness; but it outcrops in Pennis Valley, Pennsylvania, with greater thickness than it possesses in New York. It crosses into Canada, and forms a belt upon the margin of the Chazy, but rarely attains any great thickness, though on the St. Lawrence, 90 miles below Quebec, it has a thickness of 130 feet. It has been identified by the presence of gigantic *Orthoceras* on the north-west side of Lake Winnipeg; and its existence has been noted in the Lake Superior region, on St. Mary's, Escanaba, and Menominee Rivers, and on St. Joseph and Sugar Islands. It has been identified at various places in the Appalachian System, but it thins out westwardly and has a limited area of surface distribution. By some it is regarded as a local and peculiar phase of the lower part of the Trenton, or as constituting merely beds of passage from the Chazy to the Trenton, but there are palæontological reasons for retaining the name as a geological subdivision. It contains many species unknown in the Trenton, though others pass up, as the two Groups are conformable, and both represent the deeper oceanic deposits of limestone. But the strongest reason for holding to the geological separation of so small a thickness of limestone from other Groups is that the family *Orthoceratidæ*, which commenced its existence in the Upper Taconic, increased in genera and species in succeeding ages until it reached its maximum development in this Group. Subsequently, it diminished in number of species and size of specimens, though it found a home in every Group, until it became extinct in the latest Carboniferous epoch. The *Cyrtoceratidæ* and *Endoceratidæ* were highly developed, and the *Gomphoceratidæ*,

Phragmoceratidæ, and *Gyroceratidæ* here first developed their essential characters. In the Birdseye limestone at Montmorency, Canada, petroleum exudes in drops from fossil corals, supposed to have its origin either in the marine animals or fu-
coidal vegetation.

CHAPTER IX.

TRENTON GROUP.

§ 78. THE Trenton Group was named from Trenton, Oneida County, New York. The limestone at the Falls, where it is more than 100 feet thick, was called the Trenton limestone long prior to the use of the words in a geological sense. In 1838 Vanuxem referred to the Trenton limestone, but it was not until 1842 that he and Prof. Emmons so described the Group as to establish it. At Trenton Falls there are two kinds of stone—one a dark, fine-grained limestone, in thin layers, separated by black shale, and abounding in fossils; the other a gray, coarse-grained limestone, in thick layers, forming the top of the mass, and much less fossiliferous. The Group has quite an extensive surface distribution in belts upon the margin of the older rocks in New York, and varies somewhat in its characters, but seems at all times to be a limestone, with the exception of shaly partings. It is 400 feet thick at Chazy, the greatest exposed thickness, and from here it thins toward the east.

§ 79. It enters Vermont from New York in three narrow outcrops, consisting of black layers and seams of limestone and occasional argillaceous matter, with a maximum thickness of about 400 feet. It enters New Jersey, and crosses the counties of Warren and Sussex, with a maximum thickness of about 200 feet. It is frequently exposed in the broken-up hills and mountains of Pennsylvania, showing a thickness from 300 to 700 feet. The exposures continue to occur southerly in the Appalachian Mountains in crossing Virginia, North Carolina, and Tennessee, where, in the eastern part of the latter State, there is a thickness of 1,100 feet, and in the middle part of about 500 feet. It is exposed by an ancient uplift in the central part of Kentucky over several counties, forming a large part of what is called the Blue-grass Region, and reaches as far north as the Ohio River. The thickness is about 700 feet.

§ 80. It has an extensive geographical distribution in Canada. The Montreal and Ottawa sections have each a thickness of 600 feet. The sections in Western Canada, on the Trent River and at Collingwood, have a thickness of 750 feet, but it thins westerly, and in following the outcrops around Lakes Huron and Michigan the exposures rarely exceed 50 feet in thickness. In passing south of Lake Superior it crosses Sulphur, St. Joseph's, and Great Encampment Islands, and thence stretches west and south-west near Little Bay de Noquet and Green Bay, and enters Wisconsin near the mouth of the Menominee River. From here the exposure extends south-west across the State, displaying a large area in the south-western part, and, entering the State of Illinois, occupies more or less of the surface in four or five of the north-western counties. From here the exposures bear north-west and north, occupying several counties in North-eastern Iowa, with a continuing belt across

Minnesota to St. Paul and the Falls of St. Anthony. In Wisconsin, Illinois, and Iowa, the Group is separable into two divisions, the lower one being a blue limestone called the Trenton limestone, and the upper a dolomite called the Galena limestone, which is the lead and zinc bearing rock of that region. The thickness of these divisions is variable, but where most persistent, as in South-western Wisconsin, the upper or Galena has a thickness of 250 feet, and the lower or blue limestone 120 feet. It thins northward through Minnesota, and the Galena division gradually disappears. The layers of limestone become thin and shaly, with sometimes ferruginous oolitic layers. The Galena appears as a lenticular mass or as thinning toward the east and north, and was apparently derived, so far as detrital matter occurs, from western sources, though a great part, like that of other limestones, was a deposit from the harder parts of animal organisms. Erratics and boulders found in Northern Dakota indicate the existence of Galena limestone in the mountains of British America. The Galena contains about 86.6 lead and 13.4 sulphur, and occurs in fissures and crevices in the limestone, and not in true veins. The ore is supposed to have been precipitated from an aqueous solution. It was called the Galena limestone from the lead or galena, and from its typical exposure at Galena, Illinois. The lead area is about 4,000 square miles, two-thirds of which is in Wisconsin and the rest about equally divided between Illinois and Iowa.

§ 81. It forms some large surface exposures in Southern Missouri, where outcrops occur 400 feet in thickness. Numerous outcrops occur among the Western mountain ranges and in the Arctic regions, on King William's Island, at North Somerset, Boothia, and other places. It was found by the artesian boring at Louisville, Ky., at Columbus, Ohio, and it is expected it will be found by boring at almost any place upon the continent, save where the rocks of older date are exposed upon the surface. It was not formed upon the margin of an island or continent, but is a regular sea deposit of general distribution where the depth did not exceed 2,000 fathoms. The materials are marine, the mass being remains of organic secretions, with little detrital matter. The fauna was abundant, and embraced representatives of nearly all the great subdivisions of invertebrate life that now have an existence in the ocean, and several orders and classes, as the Graptolites, Cystideans, and Trilobites, which have become extinct. The Graptolites and Trilobites were then on the decline, while Crinoids, Cystideans, Brachiopods, Corals, Gasteropods, and Lamellibranchs were on the increase.

§ 82. *Receptaculites oweni* is peculiar to and characteristic of the Galena division of this Group, and it is usually accompanied with *Lingula quadrata*, *Murchisonia major*, *Fusispira elongata*, and other characteristic species. The species most characteristic of the Trenton Group, and which may be relied upon as determining its age wherever they occur, are *Orthis tricenaria*, found in New York, Canada, Kentucky, Missouri, and Nevada; *Orthis pectinella*, found in New York, Canada, and Kentucky; *Cyrtolites compressus*, found in New York, Canada, Wisconsin, and Minnesota; *Hyboerinus tumidus*, *H. conicus*, *Amygdalocystites florealis*, *A. radiatus*, *Blastoidocrinus carcharidens*, found at Ottawa, Canada, and High Bridge, Kentucky; *Leperditia fabulites* and *Conularia quadrata*, found in New York, Canada, and Kentucky; and *Orthis borealis*, found in Canada, Wisconsin, Minnesota, and Kentucky. The genus *Amygdalocystites* has a wide geographical distribution, though a rare fossil in every locality, and, so far as known, is confined to this Group. Other char-

acteristic species are *Bythotrephis succulens*, *Monticulipora lycoperdon*, *Schizocrinus nodosus*, *Stictopora elegantula*, *Orthis bellarugosa*, *O. æquivalvis*, *Trochonema umbilicatum*, *Subulites elongatus*, and *Helicotoma planulata*.

§ 83. There are numerous species which continued to live until the Hudson River age, and are therefore common to three Groups, as *Strophomena alternata*, *S. rhomboidalis*, *Leptena sericea*, *Zygospira modesta*, *Rhynchonella capax*, *Calymene callicephalæ*, *Asaphus gigas*, and *Ceraurus pleurexanthemus*. Such species are usually quite variable in form and size, and seem to have changed to suit the conditions of their habitat, and also, in accordance with the theory of evolution, to have reached the climax of development, and subsequently gradually declined. *Strophomena rhomboidalis* occurs in Trenton, Utica Slate, Hudson River, Clinton, Niagara, Lower Helderberg, Upper Helderberg, Hamilton, Chemung, Waverly, Burlington, and Keokuk Groups. Its vertical range exceeds that of any other species in any of the rocks of the known world, and its geographical distribution is common to every continent where strata of these ages have been studied and described. The varietal forms have been called *S. tenuistriata* from the Lower Silurian, *S. depressa* from the Upper Silurian, and *S. rhomboidalis* from the Devonian and Subcarboniferous. The Lower Silurian specimens are usually smaller, and have fewer concentric wrinkles over the visceral region, than those from the Upper Silurian and Devonian, while the length of the front and lateral margins from the geniculation is usually greater in the Upper Silurian than it is in the Lower Silurian, Devonian, or Subcarboniferous specimens; but these differences are not so constant as to form inflexible characters, and hence it is that many of the learned and better palæontologists have classed them all together under the first and oldest specific name. The various forms which *Strophomena alternata* assume in the same Group of rocks are wonderful; the radiating striæ differ in size and number; the hinge line is sometimes longer and at other times shorter than the greatest width of the shell. The shells are sometimes much longer than wide, and at other times as much shorter. The lateral sides are sometimes straight, and at other times rounded. Some shells are nearly flat, others are deeply concave on the dorsal side and highly convex on the ventral. Age in some specimens appears to have materially thickened the shells, and preserved strong imbricating lines of growth, while in other cases we have much larger shells that are very thin and destitute of imbrications. Like differences may be distinguished in other species having great vertical distribution, as in *Rhynchonella capax* and *Zygospira modesta*.

§ 84. The rocks of this Group are composed almost entirely of remains of the hard parts of animals that swarmed in the seas of that age. Some shells are preserved in good condition, but generally the comminuted fragments are held together by lime cement, forming the limestone strata, leaving well-preserved specimens to be found only in the shaly partings. It is common to find that one animal has grown upon another, as a *Lichenocrinus* upon a brachiopod, and a bryozoan upon the former, under such circumstances as to show the shell was at the bottom of the ocean during the growth of the *Lichenocrinus*, and that the latter must have ceased to grow before the bryozoan attached. From this we infer the clearness of the water, for otherwise mud would have intervened; and we also infer a slow deposition of materials, for the lives of two animals transpired before the deposit was

sufficient to cover a thin shell. There is no evidence of any difference between the temperature of the water then and now, nor between the climate then and now.

§ 85. Wherever the Black River limestone exists, the Trenton is conformable with it; and where the Black River is not distinguished, the Trenton is usually conformable with the Chazy. The Trenton is conformable with the Utica Slate above, in New York and Canada; but there is an abrupt change in the character of the rocks, and a marked difference in the fauna, while in Kentucky it graduates up into calcareous shales of the age of the Utica Slate by imperceptible grades, so the line of separation can not be determined, except as based upon a slowly changing fauna.

§ 86. Light carbureted hydrogen gas is often the product of the transformation of organic matter at ordinary temperatures, and is abundant in the palæozoic rocks from the Chazy to the Permian. A spring at Caledonia, Canada, issuing from the Trenton Group, evolves 300 cubic inches of carbureted hydrogen gas per minute. It is saline water. Another discharges somewhat less, and another discharges large quantities of sulphureted hydrogen gas. This is not considered surprising when it is remembered the Chazy Group in the Ottawa Valley includes a considerable thickness of shales and argillaceous limestones, and the Quebec Group offers successions of limestones and shales, whose slow decomposition from infiltrating waters will furnish such gases. In higher strata, however, the carbureted hydrogen gas escapes in much greater quantities, as at the burning spring near Niagara Falls, and in the region of the oil-wells. Carbureted hydrogen gas is the well-known "fire-damp" of the coal-mines. It collects in ill-ventilated galleries of collieries, and when sufficiently mixed with the atmosphere, if it comes in contact with an unprotected flame, it explodes with great violence. It exudes from all rocks charged with petroleum or naphtha, and was known and used for fuel before the Christian era on the Caspian Sea, where it is evidently inexhaustible. Petroleum occurs in the cavities of fossils, *Orthoceras* sometimes holding several ounces of it, at Pakenham and Lancaster, Canada. While both carbureted hydrogen and petroleum occur in the rocks of the Quebec and all succeeding Groups, yet none has been found of commercial value as low as the Trenton. The reasons are, absence of porous strata and cavities for its collection, and because the animal and vegetable matter was not collected in sufficient quantity at any single locality. It has been asserted the gas in Western Ohio and Northern Indiana is from this Group, but the author thinks all the evidence is against such conclusion.

CHAPTER X.

UTICA SLATE GROUP.

§ 87. THIS Group was named the Utica Slate from Utica, New York, and quite fully defined as a geological subdivision in 1842 by both Vanuxem and Emmons in their respective reports. It is in typical localities a dark-colored slate or shaly mass, highly charged with carbon, and agreeing in its composition with the dark layers that separate the limestone strata in the Trenton Group. The surface exposure forms a belt resting upon the Trenton, extending from New Jersey across New York into Vermont, passing under Lake Champlain and entering Canada. The greatest thickness in New York is about 600 feet, and in Vermont about 100 feet. It exposes considerable surface in Canada, never exceeding 500 feet in thickness, and extends from Lake Huron, where it thins out, to the eastern shores of the continent, appearing on the Saguenay, in Newfoundland, and the Island of Anticosti. It is very fossiliferous, and everywhere characterized by the presence of *Triarthrus becki*; and in the vicinity of Ottawa *Triarthrus spinosus* is abundant, and the Scotch fossil, *Siphonotreta scotica*, occurs. It is often interstratified with thin bands of limestone.

§ 88. It is exposed in numerous places in the Appalachian System, and attains a thickness in Huntingdon County, Pennsylvania, of more than 1,000 feet. It thins out westerly, and loses its character as a black slate before reaching the Ohio River, where it is composed of blue calcareous shales and marls with interstratified thin limestones, apparently forming beds of passage from the Trenton to the Hudson River without any want of conformability. The change in its lithological characters would have prevented forever its identification in the banks of the Ohio, had it not been for the tell-tale fossils. The abundance of *Triarthrus becki* and *Leptobolus lepis* and associate fossils settled the question of its identity. It is unknown farther west, but exists in the Arctic regions as a more or less calcareous slate. The fossils of the greatest geographical distribution, and by which it may generally be recognized, are *Triarthrus becki*, *Leptobolus lepis*, *Asaphus canadensis*, *Lingula progne*, and *Graptolithus quadrimucronatus*. The rocks are composed in part of mechanical sediment, derived from sources east of the Appalachian System, and not almost wholly of shells and the harder parts of animals, as the Trenton is below and the Hudson River above. It thins westerly, and as the mechanical sediment disappears the marine deposits form continuous passage beds from the Trenton to the Hudson River. The strongest reason for its retention as a geological subdivision is found in the fauna with which it abounds; for at many localities, *e. g.*, Cincinnati, Ohio, and Jefferson County, New York, it can only be separated from the Hudson River Group by an arbitrary line; and at other localities, *e. g.*, Deerfield, New York, and in Kentucky, the Trenton Group is so blended with it that the line of demarcation is wholly obscured. The Galena limestone of Northern Illinois, Eastern Iowa, and South-western Wisconsin occupies substantially the same geological position, though its affinities are more closely allied with the Trenton, while the relations of this Group are nearer the Hudson River; beside, none of the characteristic fossils of this Group are found in the Galena, and none of the

characteristic fossils of the Galena occur in this Group. A petroleum spring rises from this Group on the Grand Manitoulin Island, and saline springs at Varennes evolve large volumes of carbureted hydrogen gas. At one of these springs the gas has been collected in a holder, and employed in lighting a house. The black shales of this Group contain variable amounts of combustible matter, and when distilled they give, beside inflammable gases, portions of oily matter, which in the shales of Collingwood are equal to four or five per cent.

CHAPTER XI.

HUDSON RIVER GROUP.

§ 89. THE Hudson River Group was named from an exposure near Hudson River in New York, and first defined in the geological report by Vanuxem in 1842. At the typical locality it consists of shales, shaly sandstones, slates, and thick-bedded grits, stratified and conformable, alternating many times without any regular order of alternation. It was called the Lorraine Shales by Emmons, who mentions, as occurring at one place in New York, that structure called "Cone within Cone," which is so common in the Devonian and later formations. Its maximum thickness in New York is about 800 feet.

§ 90. The Group is largely exposed in Pennsylvania and other States in the Appalachian System, as far south as Tennessee, and has a thickness in some places of 1,200 feet. In the latter State it has been called the Nashville Group. It is the surface rock of many counties in Kentucky, extending from above Maysville on the Ohio, to near Louisville. In the south-eastern part of Indiana and the south-western part of Ohio, it consists of alternating layers of blue calcareous clay and limestone, and has a thickness of about 800 feet. It has been called in this section the Blue limestone. It occurs in the northern part of Illinois, southern part of Wisconsin, and north-eastern part of Iowa. Its thickness in these States does not exceed 240 feet. In the south-eastern part of Missouri its thickness is about 250 feet, and it appears in Texas and New Mexico. It has a wide geographical range in Canada, extending from the Island of Anticosti and the eastern border west, by way of the Great Lakes, to the Red River of the north, and again appearing in the mountain ranges bordering the Pacific. In the vicinity of Toronto its thickness is about 1,100 feet, but it is much thinner in its western extension, and in the region of the Great Lakes rarely exceeds 100 feet. Its greatest thickness in Eastern Canada is about 2,000 feet.

§ 91. This Group is persistent and of almost universal distribution, except upon the older rocks that were dry land before its deposition. We would expect to find it almost anywhere on the continent by boring through more recent deposits. It is the equivalent, to some extent, of the Caradoc sandstone, or Bala Group, of England and Wales, and is represented in different European exposures. Like the Trenton and all earlier Groups, it is a marine deposit made in water of considerable depth, not a littoral or shore-line deposit as the Potsdam Group was, though the sandstone occurring in many of the northern exposures was evidently mechanical and derived from land at no great distance to the north.

§ 92. The seas swarmed with animal life and fucoidal organisms, and the rocks are composed almost wholly of their remains. It is literally a graveyard of invertebrate life. The Brachiopoda and Bryozoa reached in this age the stage of their greatest varietal development, and possibly the highest state of their existence.

§ 93. As the exposure in Ohio, Indiana, and Kentucky is very large and quite characteristic of it in other places, it may be fit and proper to further define it. To go from the Ohio River, at Cincinnati, west 51 miles to Osgood, Indiana, or north to Dayton, or north-east to Xenia, Ohio, one will pass across the upturned edges of this Group, and reach the Niagara. The rocks dip westerly and northerly at the rate of about ten feet in a mile. The hills at Cincinnati expose about 400 feet in thickness, constituting the lower half of the Group; and the upper half, or about 400 feet, occurs between the top of these hills and the bordering Niagara Group, about 50 miles distant to the north and west. The area of its exposure in Ohio is all of Hamilton, Butler, Warren, Clermont, and Brown Counties, and part of eight counties that border upon these. The exposure in Indiana is about half as great, reaching as far north as Richmond, and bordering the Ohio nearly half-way from Madison to Jeffersonville. The exposure in Kentucky is greater than in Ohio, for it surrounds the Trenton Group in that State. Throughout the whole area it is composed of alternate layers of calcareous clay and limestone of varying thickness. In some places calcareous clay is 6 or 8 feet thick, without a layer of stone. At other places one layer of stone, 4, 6, 8, or 10 inches in thickness, follows another, with intervening layers of calcareous clay of much less thickness, for 40 or 50 feet. It is rare to find a layer of limestone more than a foot in thickness. All the layers are broken into small, irregular pieces of suitable size for cellar and other light stone-work, for which they are used. The blue calcareous clay exposed to the action of the weather for a few years loses its color and becomes of a dull gray hue. The sulphuret of iron occurs in the blue rocks, but instead of this we find iron oxide and sulphate of lime in the gray. The silicious matter prevails over the carbonate of lime in the layers of calcareous clay, while the carbonate of lime is much in excess of the silicious matter in the stone, due, in part at least, to the fact that the stones are a mass of more or less comminuted shells, corals, and crinoids. There is nothing in the general character and appearance of the rocks and calcareous clays to indicate the changes which the fossils undergo; that is, the changes are not to be attributed to surrounding conditions without the aid of that law of animal evolution which the science of palæontology teaches us has taken place in all past geological ages.

§ 94. Some fossils, as *Calymene callicephala*, *Asaphus megistus*, *A. gigas*, *Beyrichia chambersi*, *Leptæna sericea*, *Bellerophon bilobatus*, *Zygospira modesta*, *Strophomena alternata*, and *Orthis testudinaria*, pass from the extreme lower part to the extreme upper part of the Group; and all of them save *Beyrichia chambersi* are known from lower rocks, and *Leptæna sericea* occurs in higher ones. *Streptorhynchus hallianum* has a limited range in the lower part, *S. planoconvexum* and *S. sinuatum* a limited range below the middle of the Group, *S. nutans* and *S. sulcatum* in the middle of the upper half of the Group, and *S. subtentum* and *S. filitextum* in the upper part. *Lichenocrinus crateriformis*, *L. dyeri*, and *L. patterni* are confined to the lower half, and *L. tuberculatus* and *L. affinis* to the upper part. *Acidaspis crossotus* occurs in the lower part, *A. anchoralis* and *A. cincinnatiensis* in the middle part, while *A. onealli* occurs in the

upper part. *Rhynchonella capax*, *R. dentata*, *Streptelasma corniculum*, *Favistella stellata*, *Tetradium fibratum*, *Cypricardites haynesi*, etc., are confined to the upper part. Such are a few illustrations of the changing fauna at different elevations. To completely present the subject would require the enumeration of all the species. Crinoids, as a rule, are limited vertically, and hence each species is sought in its particular range. Species having a wide geographical distribution, and characteristic of the Group are *Aulopora arachnoidea*, *Stomatopora inflata*, *Orthis occidentalis*, *O. subquadrata*, *O. retrorsa*, *Pterinea demissa*, *P. insueta*, *Cyclonema bilix*, and *Glyptocrinus decadactylus*.

§ 95. With this Group the Lower Silurian closes, because at its top we have the greatest break stratigraphically and palæontologically that occurs from the base of the Potsdam to the top of the Lower Helderberg, and because it approaches nearer the line of division established by Murchison, between his Lower and Upper Silurian, than any other line, if, indeed, it is not identical with it. Wherever the Hudson River has been examined on the continent, the superimposed rocks are unconformable with it, no passage-beds are found, and the palæontological break is almost complete. In the Western States the Niagara Group succeeds it, and rests unconformably upon it. In the Eastern States it is succeeded by the Medina and Clinton Groups before the Niagara is reached, but the Medina rests unconformably upon it. On the Island of Anticosti it has a thickness of 950 feet, and is followed by rocks apparently conformable with it, although there is an abrupt palæontological break. Of 121 species known to Prof. Billings from Anticosti, 80 disappear at once below the dividing line, and 41 only appear above it, where they are joined by 45 species that are not found below. This palæontological break is less than it is at any other known place on the continent; but it is so great as to show that probably the strata are not strictly conformable.

§ 96. There is an important period of time indicated by this want of conformability and palæontological change. Vast ages must have intervened, which are not represented by any known rocks on the continent. More than 400 genera have been described as existing previous to this time, more than three-fourths of which had become extinct. Or, in other words, less than one-fourth of the genera which had come into existence prior to the close of the Lower Silurian Age continued to have an existence afterward. No evidence of the existence of land-plants has ever been discovered in Lower Silurian rocks. We are convinced, however, that land had existed above water for ages; that it was necessarily refreshed by sun and rain, by warmth and air, and that it may have sustained some kind of land vegetation. If the land vegetation did not possess hard parts capable of preservation, of course none will ever be found. Neither has any evidence of the existence of land or fresh-water animals of this era ever been discovered.

CHAPTER XII.

UPPER SILURIAN.

§ 97. ALL the rocks of the Upper Silurian System are marine; but land-plants, or such as may have existed in marshes, and received support from sunlight and air, have been found within them. No remains of land or fresh-water animals, or marine vertebrates, have been discovered in North America. There is no radical difference in the general character of the Lower Silurian and Upper Silurian fossils, because vertebrates had not made their appearance, and the same orders of invertebrates were represented in each era; but the separation into two Systems is very convenient, because both are introduced with sandstone Groups, and the Trenton in the Lower Silurian, and Niagara in the Upper Silurian, are alike extensive in geographical distribution, and some analogy may be traced between the upper Groups in each System. On the whole, the calling of one System Lower Silurian, and the other Upper Silurian, was a happy hit in nomenclature as well as correct in science.

MEDINA GROUP.

§ 98. THIS Group took its name from Medina, New York. The rocks were described by Vanuxem in 1842, under the names Oneida Conglomerate, Gray Sandstone of Oswego, and Medina Sandstone. At the typical localities they are conglomerate, and gray and red sandstone. The conglomerate is hard and gritty, and composed of quartz pebbles and sand so firmly cemented as to be used for millstones. The sandstone is argillaceous, thinly laminated, and of red, gray, and mottled colors. Where it is not fragile, but firmly cemented, it makes a good building stone, and has been largely used for paving streets, as it readily breaks into stones of regulation size. The Group borders Lake Ontario on the south, and extends in an east and west line of exposure about three-fourths the length of the State, and, entering Canada at the Niagara River, continues to Lake Huron. In Oneida and Oswego Counties the thickness is from 500 to 600 feet; at the west end of Lake Ontario 614 feet, and at Lake Huron 100 feet. It thins so rapidly that few, if any, traces have been discovered west of this lake. A small surface area in New Jersey has a thickness of 900 feet, and a larger one in Pennsylvania has a thickness of 2,500 feet. It occurs in patches among the broken ranges of the Appalachian System in Maryland and other States, as far south as Tennessee; but is unknown in the Western States.

§ 99. The conglomerate is 500 feet thick in the Shawangunk Mountains, and 700 feet in the Kittatinny Valley in Pennsylvania. It graduates into the gray sandstone, and then into the red sandstone, so they can scarcely be distinguished except by color; and the gray sandstone in like manner graduates into the conglomerate by enlarging and increasing the number of its pebbles; so there is no reason, stratigraphical or palæontological, for subdividing the Group, as was done in early work on the New York Survey. It always rests unconformably upon the Hudson River Group, and bears the internal evidence of having been derived from land immediately north and east, and of having been deposited in shallow water, subject

to waves and currents which transported the materials only short distances. The conglomerate indicates a shore-line and rapid deposition, and is almost non-fossiliferous, though a few fragments of fucoids and shells, generally too imperfect for definition, have been found in it. The sandstone, too, bears the evidence of having been deposited near the land in shallow water, not only in wave-lines, rill-marks about shells, and ripple-marked slabs, but in mud-cracks produced by sun-drying. In all these respects it compares with the Potsdam, which separates the Taconic from the Lower Silurian.

§ 100. In the more argillaceous part of the sandstone, fossils are sometimes fairly well preserved. The characteristic fossils are *Arthrophyceus harlani*, both genus and species being confined to this Group, and having a wide distribution, and *Lingulella cuneata*, a strongly marked species. Saline springs are common throughout the whole extent of these rocks, and brine is universally found by boring. The brine is frequently impure from the presence of muriate of lime and iron. Carburated hydrogen gas rises in many places on the Erie Canal east of Lockport, and at Gasport it was collected and used for illuminating purposes a half century ago.

CHAPTER XIII.

CLINTON GROUP.

§ 101. THIS Group was named from the town of Clinton, in New York, and defined by Vanuxem in 1842; and re-defined by Hall in 1843 in the Geological Survey of that State. The rocks have no uniformity in color or composition. At the typical locality there is green and black-blue shale; green, gray, and red sandstone, often laminated; calcareous sandstone and red fossiliferous iron ore beds; at other places, it consists of shaly sandstones and shales of various colors, impure limestones, conglomerates, and oolitic iron ore, with concretions. It occupies a narrow belt of country in New York, commencing near Canajoharie, and stretching westward south of Lake Ontario, resting on the Medina Group, with the greatest width in Wayne County, and, entering Canada at Hamilton, extends west to Lake Huron, appearing on Drummond, Manitoulin, Cockburn, and other islands, and probably enters the Peninsula of Michigan with a thickness of less than 50 feet, and rapidly thins out. The maximum thickness in New York is about 400 feet. The two upper bands of limestone included by the New York geologists in the Clinton Group, are now generally classed with the Niagara, as they possess no fossils peculiar to the Clinton, and the shales which separate them thin out in their extension into Canada. In its easterly extension from New York, outcrops occur as far as Anticosti Island and Newfoundland. On Anticosti it is described as one of the divisions of the Anticosti Group, which there includes the rocks from the Hudson River to the Niagara, and has a maximum thickness of about 500 feet. It occurs in the Appalachian chain as far south as Georgia and Tennessee, and in crossing Pennsylvania develops a thickness of more than 2,000 feet. The Group thins out before reaching the Western States, and is unknown except upon the borders of the Appalachian and Laurentian elevations. It appears to have resulted from the mechanical deposition of materials derived from land lying north and east

of it, and to represent a border-land and shallow water deposit, that extended only a short distance from the primitive source of its materials.

§ 102. In Western New York the dividing line between the Medina and Clinton is sharply defined, and the materials of which each are composed are quite distinct; but in the central part they graduate into each other, the Clinton being largely composed of sandstone. There is strong resemblance between the marine vegetation which abounds in the two periods. Westerly the Clinton is more calcareous and more fossiliferous, and graduates up into the Niagara in its lithological and fossil characteristics. The Medina, Clinton, and Niagara are clearly defined in some localities; but in others the Medina graduates into the Clinton, and in others the Clinton blends with the Niagara. There is no want of conformability between them where best developed, and the lines of separation show only a changed condition or altered circumstances under which the deposition was continued from one Group to the other. *Pentamerus oblongus*, *Spirifera radiata*, *Meristella cylindrica*, and *Lingulella lamellata* are among the species accredited both to the Clinton and Niagara, and which show the intimate relation between the Groups. The Clinton abounds in fucoids, tracks, and trails, the former being more abundant than in any earlier Group. The fossils having the greater distribution and being most characteristic are *Ichnophycus tridactylus*, *Graptolithus clintonensis*, *Helopora fragilis*, *Athyris naviformis*, *Leptocelia hemispherica*, *Triplesia congesta*, *Cyelonema cancellatum*, and *Cornulites distans*. The iron ore beds are frequently thick enough to be valuable, and are worked successfully. They are sometimes very fossiliferous, and the quantity of iron is decisive proof of the vegetable character of the fucoids of that age, and the absence of land-plants among the fossils is almost conclusive against their existence at that period.

CHAPTER XIV.

NIAGARA GROUP.

§ 103. This Group was named from its development at Niagara Falls, where the rock over which the water is precipitated belongs to it. It was defined by Vanuxem in 1842, and by Hall in 1843. It is the most persistent in its geographical distribution of any Upper Silurian Group; indeed, wherever the Upper Silurian is found it is present, except with the exposed belts of the lower Groups, and not unfrequently it constitutes the whole formation. It generally consists of limestone and shales, but sometimes becomes arenaceous, argillaceous, or highly ferruginous. In New York it exposes an east and west belt almost the entire length of the State, a short distance south of Lake Ontario, with a maximum thickness of 300 feet. Near Niagara Falls there are 165 feet of limestone (directly at the falls 85 feet) overlying 80 feet of shale. In its western extension it crosses the Niagara River into Canada, appears at Lake Huron, on Manitoulin and Drummond Islands, occupies the southern part of the northern peninsula of Michigan, spreads over the south-eastern part of Wisconsin and the northern part of Illinois. Keeping south of the Lower Silurian area in the north-western part of Illinois, it enters Iowa below Dubuque, and presents a surface exposure 160 miles in length by 40 or 50 in

breadth. In Wisconsin, Illinois, and Iowa it is principally a magnesian limestone, sometimes too porous or friable for building purposes, but suitable for lime, as at Chicago and Racine; at other places having a good reputation for buildings, as at Joliet. It sometimes occurs more or less saturated with petroleum, as at Chicago, where it indicates the presence of shales immediately below it, and in some localities near its base it contains beds of hematite in small lenticular concretions, as at Iron Ridge, in Dodge County, Wisconsin. The maximum thickness in Illinois is 640 feet, in Wisconsin 800 feet, and in Illinois and Iowa 600 feet. It occurs in south-eastern Canada, in New Brunswick, Newfoundland, and Anticosti, where its maximum thickness is 800 feet. It occurs in nearly all the States to which the Appalachian System extends. In crossing Pennsylvania, where it consists mostly of shales, it has a maximum thickness of 1,600 feet. It occupies extensive areas in Tennessee and Alabama; and in the latter State that part of it which was originally a porous magnesian limestone, subsequently became infiltrated with iron in solution, and now constitutes the celebrated fossiliferous iron ore of Alabama. It forms a sub-circular belt of exposures from 5 to 60 miles in width surrounding the great Lower Silurian area in the middle part of Kentucky, South-western Ohio, and South-eastern Indiana, where it consists of hard, blue and gray limestone, yellowish and whitish-yellow magnesian limestone, and shales, variously alternating and combining, with a maximum thickness of about 600 feet. In some places near the base there is iron-stained chert. At Cedarville, near the top, the porous magnesian limestone is used for the manufacture of lime, and the harder limestone at Dayton, St. Paul, and other places is used for building and other economic purposes. It surrounds the Lower Silurian and Taconic uplift in the southern part of Missouri, and frequently occurs in the Rocky Mountain ranges. It outcrops far to the north, in the Arctic regions north of British America. Fossils have been described from its exposures on Beechy, Cornwallis, Griffiths, Seal, Napoleon, and Offley Islands, from Capes Hilgard, Hotham, Louis, and other points. It is substantially the equivalent of the Wenlock in England, and has its representative in Scandinavia, Russia, Germany, and other European countries. Several species of fossils occurring in the upper part of the Group at Waldron, Indiana, are identical with those occurring at the equally celebrated locality on the Island of Gottland, in the Baltic Sea. It is so constantly present where the rocks from the Lower Silurian to the Devonian are exposed, that it is regarded as a universal Group underlying nearly all the more recent rocks on this continent.

§ 104. It is a deep-sea deposit, as distinguished from all mechanical, littoral, shore-line, and marsh deposits, and, like most other undisturbed marine sediments, is generally limestone. The ocean must have swarmed with invertebrate life during the entire age, as the rocks are almost wholly constituted of their harder parts. It is so thoroughly characterized by its fossils that a palæontologist has little difficulty in recognizing it wherever it exists. It is in this Group the earliest land-plants occur—*Psilophyton* and *Glyptodendron*. The latter was founded upon an impression of uncertain value in a magnesian limestone. *Psilophyton* is supposed to have been a marsh-plant that drifted in the ocean and became imbedded in the mud, which preserved its characters. *Psilophyton princeps* is the oldest fossil land-plant in America. Fucoids are scarce; in striking contrast with their abundance in the Clinton. Sponges were more numerous than in any preceding age. Coral-

reefs were formed, which may now be traced for many miles; single masses were several feet in diameter, and the beauty of their structure is not surpassed by any of the corals which now abound in the ocean. Some of the species, too, were almost world-wide in their distribution, as *Halysites catenulatus*, *Heliolites pyriformis*, and *Favosites forbesi*. It is famous, too, for its Echinoderms. The Cystideans commenced their existence in Taconic times, as evidenced by the plate called *Eocystites*, and reached the climax of their evolution and development in this Group, and almost suddenly disappeared from the face of the earth, a few small species only being found in the Lower Helderberg and Lower Devonian, where the entire order became extinct. Cystideans were marine animals, related to the Crinoidea. Some were sessile; others possessed a column and roots, by which they attached to other objects; and others were free, and possessed a flexible column tapering to a point, which could be used for attaching purposes. The head was globular, oval, pyriform, conical, cylindrical, or of any other shape, but always covered with an external skeleton composed of polygonal calcareous plates, which are sometimes very richly ornamented. The fracture of the plates presents the same crystalline structure as crinoidal plates do. In some species the number of plates and order of arrangement remained constant throughout the life of the animal, the size of the animal increasing by the growth of the original plates, which enlarged throughout, instead of by addition to the edges. In other species the plates are not limited in number, and have no order of arrangement; they increase in size, or new plates are introduced, so as to destroy uniformity in different specimens in the same species. In other species the dorsal side has a definite number of plates and regular order of arrangement without any increase, while the ventral side has no order of arrangement of the plates, and they increase in number to cover the increased growth of the animal. There are usually two principal apertures, and often many smaller ones through which the most important functions of the animal economy were exercised. One of these is called the mouth, and is found on the side near the base or near the apex. It is a curious fact that so important an organ as the mouth occurs almost anywhere on the body of a Cystidean, but, of course, always occupying the same position in each species. Another aperture, called the ambulacral orifice, occurs near the center of the upper part of the body, and between the bases of the arms, when the species possessed such organs. The other apertures are called calycine pores and pectinated rhombs. The calycine pores served in some manner to introduce water into the interior of the animal, but they bear little resemblance to each other in different species, and one can form no adequate idea of the system of circulation. Pectinated rhombs differ in number and position in different species, and sometimes do not occur at all. Their function, too, is an absolute mystery, except they furnished another medium of communication from the exterior to the interior of the body. The Blastoidea commenced existence in this Group by the appearance of *Stephanocrinus*, and became extinct in Carboniferous times. The order Myelodactyloidea, another Echinoderm of very uncertain affinity, seems to have been confined to this age. The development of the Crinoidea was wonderful, no less than 15 genera making their first appearance, eight of which are unknown in later rocks. The Graptolitidæ here became extinct.

§ 105. *Holocystites* occurs in Ohio, Indiana, Illinois, New York, and other States. Twenty-five species have been defined, and none are known from higher

or lower rocks, and it may therefore be considered a characteristic genus. *Eucalyptocrinus* has a wider geographical distribution, and is more abundant, and for the same reason may be called characteristic. *Orthis elegantula*, *O. flabellum*, *O. hybrida*, *Calymene blumenbachi*, and *Illænus barriensis* have almost world-wide distribution, and are characteristic of rocks of this age.

§ 106. The dolomites of this Group in Canada are more or less bituminous. In some parts of Western New York they contain so much solid bitumen that it exudes from the rocks when heated. The escape of carbureted hydrogen from these rocks is of common occurrence. Lyell described in 1841 a "burning spring" on the river just above Niagara Falls, where the light hydro-carbon gas rose from beneath the water out of the limestone rock. The invisible gas makes its way in countless bubbles through the clear, transparent water, and on the application of a lighted candle it plays about with a lambent, flickering flame, which seldom touches the water, the gas being at first too pure to be inflammable, and only obtaining sufficient oxygen after mingling with the atmosphere at the height of several inches above the surface of the river. This gas had its origin in the shale, which forms the lower part of the Falls, and has found its way up through 85 feet or more of quite compact limestone. Petroleum occurs in Niagara limestone at Chicago, which had its origin in some shaly strata beneath, but artesian boring failed to discover it in commercial quantities. Where gas or oil escapes from surface limestone there is little prospect of finding accumulations of commercial importance by artesian boring, because so much has escaped in the ages which have passed away since the elevation of the limestone above the water of the sea. There must be an impervious covering of clay or stone to retain such volatile substances in valuable quantities.

CHAPTER XV.

GUELPH GROUP.

§ 107. THIS Group was named from the town of Guelph in Canada, and defined by Logan in 1863. It appears as a lenticular mass, resting upon the Niagara, and having a maximum thickness of 160 feet. It is a limestone dolomite, particularly distinguished for having no fossil Echinoderms, while it is rich in other fossils closely allied to those in the Niagara, some of the species being identical. It may have been a brackish water-deposit in an arm of the sea. It occurs in the north-western part of Ohio with all the fossils and characteristics pertaining to it in Canada, but is unknown elsewhere. It is doubtless of the same age as the Onondaga Group, and probably should not bear a distinct name, as among the very few fossils found in the latter, *Murchisonia boydi* and *Cyclonema sulcatum* occur in the Guelph. *Megalomus canadensis*, the most common species, and *Trimerella grandis* are found in the Niagara. The characteristic fossils are *Pentamerus occidentalis*, *Murchisonia bivittata*, *M. longispira*, *Subulites ventricosus*, *Pleurotomaria solaroides*, and *Dinobolus galtensis*.

CHAPTER XVI.

ONONDAGA GROUP.

§ 108. THIS Group was named the Onondaga Salt Group, by the New York Geologists, from Onondaga County, New York, in 1839, and re-defined by Vanuxem in 1842, and by Hall in 1843. The Canadian Geologists very properly dropped the word "salt" from the name. It consists, on Oneida Creek and Cayuga Lake, in the lower part, of clayey deposits and red shale, showing green spots, followed by gypseous shales and impure limestones, which at the commencement alternate with the red shale, and this is followed by the gypseous deposit, which embraces the great lenticular masses quarried for plaster, and this by a magnesian rock having groups of needle-form cavities caused by the crystallization of sulphate of magnesia, and the upper member is the Waterlime. It rests upon the Niagara from the western line of New York, east to the middle part of Herkimer County, where the Niagara thins out; it then rests upon the Clinton until it disappears, and then upon older rocks until it reaches the Hudson River. It is therefore unconformable with the underlying rocks in middle and Eastern New York. The red shale loses its color west of the Genesee, becomes a bluish green, and gradually thins out, showing the unconformability in Western New York. The passage from the Niagara to the Onondaga is abrupt, offering no gradation in character of products or in continuation of fossil species. The great mass of gypseous deposits consists of yellowish or drab, and brownish colored argillaceous, and calcareous shale and slate, or of hard and compact slate, which weathers as if hacked by an instrument. The dark color of the gypsum, and brownish color of other rocks, is due to carbonaceous matter. An important member is called the vermicular limerock, which is gray or blue, and perforated with holes and cells, once filled with soluble saline material, which subsequently dissolved, leaving the cavities, some of which are hopper-shaped, and were produced by common salt, as no other common soluble mineral presents similar ones. The sulphate of magnesia cavities are lined with carbon, showing the liquid that held the salt in solution, contained bituminous matter, the salt ejecting its particles in the act of assuming form, as occurs in the purification of acetic acid when obtained from the distillation of wood. This Group is celebrated for its salines, and formerly furnished nearly all the salt consumed in New York; for this reason it has been called the Salina and Saliferous Group. Sulphate of Strontian and sulphurets of lead and zinc occur in small quantities. Sulphuric acid escapes with the water from the earth in many localities, giving rise to acid springs, and sometimes destroying the water in wells for culinary purposes, as the sulphuric acid becomes strong enough to coagulate milk.

§ 109. The Group attains its greatest thickness at about 1,000 feet in Wayne County, and gradually diminishes westerly, so that on Grand River, Canada, it does not exceed 300 feet, which belongs chiefly to the upper portions, from the summit to a little below the gypsum-beds. The beds of gypsum are never continuous for long distances, but appear as detached lenticular or dome-like masses; the strata above them being arched over and often broken, while those below constitute an even, undisturbed floor. The Group is continued through Lake Huron to

the Straits of Mackinac, where it forms the island and the points of the main land. The thickness on the peninsula of Michigan does not exceed 50 feet. It is broken up in a ridge extending west from the west end of Lake Erie near the southern line of Michigan, where it is much thicker, and again at Put-in Bay Island, and at Sandusky and other places in Ottawa County, Ohio, and may be seen on the western and south-west anticlinals, which pass through Wood County, and as far south as Delaware and Pike. The thickness in Ohio has not been accurately ascertained, but including the Waterlime, which is not separable, the thickness is several hundred feet. It has been identified in Missouri, varying from 10 to 75 feet in thickness. It does not occur in Wisconsin or Iowa, and is unknown south of Pennsylvania in the Appalachian system. The composition of the rocks indicates shallow water; but as there is no conglomerate, it does not appear as a shore deposit.

§ 110. It is not very fossiliferous at any locality, and generally fossils are extremely rare. In addition to the two species mentioned as common to the lower part of it and the Guelph, *Orthoceras sublaeve*, *Euomphalus sulcatus*, and *Avicula triquetra* were early described from Wayne County; but the indistinct forms of *Spirifera*, *Atrypa*, and *Cornulites* remain without specific names.

§ 111. The Waterlime takes its name from the earthy, drab-colored limestone used for making hydraulic cement, and is regarded by some as a distinct Group, while the Canadian Geologists regard it as the lower member of the Lower Helderberg. It has its characteristic minerals and fossils; but, following the New York Geologists, it is here treated as the upper member of the Onondaga. In New York and Pennsylvania its thickness is from 30 to 300 feet, and is well-defined and recognized by its mineral nature, its fossils and position. In Eastern New York a brownish limestone, often mottled, containing corals, fragments of crinoids, and small *Orthoceras* forms the base of it. All the species of *Pterygotus* belong to the Waterlime, while *Eurypterus remipes* and *Pterinea rugosa* are characteristic of it in New York. The species which has the greatest geographical distribution in the Onondaga, is that peculiar form called *Pleurodictyum problematicum*.

§ 112. The whole Group contains more or less carbonaceous matter, and the quarries usually smell of petroleum, and the limestone generally gives up the odor when struck with a hammer. This Group is the source of a large part of the gas supplied by the gas-wells of Ohio and Indiana. It is the chief source of the salt manufactured in New York and in Michigan. On the St. Clair River, at Marine City, rock-salt occurs in a mass, extending from 1,633 feet to 1,748 feet below the surface, which is mined by forcing fresh water down into it to take up the salt, and afterward pumping the brine and evaporating it. Thick masses of rock-salt have been formed at various other places in this Group within the salt districts of New York, Michigan, and Ontario.

CHAPTER XVII.

LOWER HELDERBERG GROUP.

§ 113. THIS Group was named from the Helderberg Mountains, and defined by Hall in 1859, in the third volume of the Palæontology of New York. The lower member is a thin-bedded, often thinly laminated, dark-blue limestone, resting on the Waterlime-beds called Tentaculite limestone. The second member is a thin limestone full of *Stromatopora*, followed by a dark-gray concretionary limestone, in irregular layers, charged with *Pentamerus galeatus* and other fossils, which has a maximum thickness in Otsego County of 80 feet, and is called the Pentamerus limestone. The third is a blue, drab-weathering, calcareous shale and blue limestone, full of *Spirifera macropleura* and other fossils, having a maximum thickness in Albany County of 70 feet, called the Delthyris or Catskill Shaly limestone, from Catskill Creek, near Madison, Greene County. The fourth member is a light-gray limestone, full of broken Eocrinites, having a thickness of 25 feet. And above this there is a bluish-gray limestone, charged with Brachiopoda, called the Upper Pentamerus limestone. These local subdivisions are not recognized at any distance from the Helderberg Mountains, nor does the Group occur in Western New York or Western Canada. Strata of this age occur in two or three small outliers in the great basin near Montreal, at the distance of 200 miles from the nearest exposure of the Group in New York. The most important of these is on the Island of St. Helen's, opposite Montreal. The Group, however, is quite largely developed in the Eastern Provinces, where it includes part of the Gaspé limestones. It is exposed on both sides of the Hudson River, and forms the outlier known as Becrafts Mountain, and appears in Maine and New Hampshire. Its maximum thickness in New York is about 400 feet, and nearly as much in Maine, while at Gaspé it is 2,000 feet. It extends southwardly to Tennessee, having a thickness in Pennsylvania of 1,400 feet, in Virginia 1,000 feet, in New Jersey 150 feet, and in Tennessee 100 feet. It has been identified at Cape Frazier in latitude 80°.

§ 114. This is an important Group on the eastern part of the continent, but does not occur west of the Appalachian system, which is in striking contrast with the Onondaga, that spreads out westerly from New York instead of southerly. It abounds in limestone strata, and the evidences of marine life, the latter apparently succeeding that of the Niagara age, by gradual change and development. Crinoids, Corals, Bryozoans, Brachiopods, Gasteropods, Lamellibranchs, and Crustaceans were abundant, but we have no evidence that a vertebrate land or fresh-water animal had yet made its appearance on this continent. The evidence of swamp or air vegetation is on the increase, and here we discover the genus *Annularia*, which subsequently became so abundant in the Coal Measures. The characteristic fossils are: *Tentaculites gyracanthus*, *Spirifera macropleura*, *S. vanuxemi*, *Eatonia singularis*, *E. medialis*, *Pentamerus galeatus*, *P. pseudogaleatus*, *Streptorynchus radiatum*, *Strophonella punctulifera*, *Meristella lævis*, *Rhynchonella semiplicata*, *R. ventricosa*, *Strophodonta varistriata*, *Avicula naviformis*, *A. manticula*, *Beyrichia granulata*, and *B. notata*.

§ 115. Petroleum springs occur on the St. John's River and on Silver Brook,

in the Gaspé series, and in cavities of an amygdaloidal greenstone at Tar Point, which has hardened in some instances to the consistency of pitch, and from its peculiar odor the name Tar Point was given to the locality. The source of this oil is from the fossiliferous rocks or shales beneath, and exudes from an anticlinal. No good well has, however, been discovered by boring in these rocks.

§ 116. With this Group the Upper Silurian closes, because we have another stratigraphical and palæontological chasm, and have arrived at the top of the System as established by Murchison. The absolute want of conformability, with the overlying rocks, is everywhere apparent, and an age of time is therefore unrepresented in the geological column.

CHAPTER XVIII.

DEVONIAN SYSTEM.

§ 117. The Devonian was named in 1837, by Murchison, from Devonshire, in England. It has greater thickness, and is capable of more subdivisions based upon its fossils in this country than in any other part of the world. It is subdivided in ascending order as follows: Oriskany Group, Upper Helderberg Group, Hamilton Group, Portage Group, Chemung Group, and Catskill Group.

§ 118. It commences with a sandstone formation, after which it consists principally of limestone and shales. It is unconformable with the Upper Silurian at all places, except possibly Gaspé, Canada, where the sediment seems to have been regularly deposited from one age to the other. Its greatest development is in New York and Pennsylvania, where mechanical detritus accompanies the marine deposits. During this era land-plants became abundant, and fish swarmed within the seas, while the Archipelago, which had existed in the Silurian era, began to assume somewhat the outlines of a continent, though by no means such as we now behold. Corals, Crinoids, Brachiopods, Gasteropods, Cephalopods, Lamellibranchs, and Crustaceans were abundant, while Cystideans became extinct. It was a long and glorious era, marked by more progress in animal and vegetable organisms than characterized earlier ages. The plants increased in number of genera and species from the Lower to the Upper Devonian, until the flora presented a strong resemblance to that of the Subcarboniferous, especially in the prevalence of Gymnosperms and Cryptogams, though very few species are identical in the two Systems. It is everywhere unconformable with the Subcarboniferous. The masses and dykes of intrusive granite in Nova Scotia, which penetrate all the rocks older than the Subcarboniferous, belong to the close of the Devonian. The carbonaceous shales of this System exceed in thickness those of any other System of rocks, and, as a result, they are the chief oil and gas producing rocks on the continent. Very valuable iron ores and manganese ores occur in this System in different States. In Virginia huge masses of manganese are found imbedded in exposed sandstone ledges, where the supply seems to be practically inexhaustible.

CHAPTER XIX.

ORISKANY GROUP.

§ 119. This Group was defined as the Oriskany sandstone by Vanuxem, in 1839, and named from the white sandstone occurring at the Falls of the Oriskany, in Oneida County, N. Y., where it is about 20 feet in thickness. It forms a narrow belt of rough sandstone from the Hudson to Cayuga Lake, charged with peculiar fossils, and varying from a few inches to 30 feet in thickness. It stretches south in the Appalachian region through Pennsylvania, Maryland, and Virginia, and has a thickness in Pennsylvania of 300 feet. It appears in New Jersey with a thickness of 130 feet. In Maine there is a large exposure between Parlin Pond and Aroostook, and it exists at Gaspé and in Nova Scotia. It is known in Canada at but few places, one of the principal exposures being at North Cayuga, and covering only 230 acres. In Southern Illinois it is underlaid with silicious limestone, called the Clear Creek limestone, which constitutes incomplete passage-beds from the Upper Silurian. It is also known in Missouri.

§ 120. It appears as a belt deposited upon the shores of the islands which then existed, and to mark their outlines in a greater or less degree. Like other arenaceous deposits, it indicates the presence of land and shallow water. It abounds in the casts of Brachiopods and Gasteropods in New York, Maryland, and Virginia, and in some places Crinoids occur. The characteristic species are *Spirifera arenosa*, *S. arrecta*, *S. pyxidata*, *Rensselaeria ovoides*, *Orthis proximus*, *O. muscosa*, *Strophodonta magniventra*, *S. magnifica*, *Cyrtina rostrata*, *Eatonia peculiaris*, *Leptocælia flabellites*, and *Platystoma ventricosum*. In some places in Virginia the shells are silicified and quite free from adhering matter, and the exterior markings and internal structure are well preserved, even the internal coils of Brachiopoda are beautifully represented. Near Cumberland, Md., a few elegant crinoids have been found, and one Cystidean, *Anomalocystites disparilis*, which is the latest known representative of that order, except *Strobilocystites calvini*.

§ 121. The Brachiopods are Devonian in their character rather than Silurian, and there is graduation to the succeeding rocks through the Cauda-galli grit, which is a dark, gritty slate, bearing few fossils. The rocks are not such as to have preserved land-plants very well; but they should have preserved fish-teeth if any then existed, but no trace of them has been discovered.

CHAPTER XX.

UPPER HELDERBERG GROUP.

§ 122. This Group was named from the Helderberg Mountains, where it was divided into the Cauda-galli grit, Schoharie grit, Onondaga limestone, and Corniferous limestone. The Corniferous limestone being the only one which has any great geographical distribution, the Canadian Geologists in 1863 used "Corniferous formation" instead of Upper Helderberg; but as Corniferous is a mineralogical word, Upper Helderberg is to be preferred. The Cauda-galli grit is a dark gritty slate covered with *Taonurus cauda-galli*, and graduates into the Schoharie grit, which is an arenaceous limestone weathering to a brownish color. These occur in the eastern counties of New York, Albany, Greene, and Schoharie, but soon thin out and are not found west as far as the center of the State. The scales and bony plates of fish are first found in the Schoharie grit. The Onondaga is a gray subcrystalline, coralline limestone. It is followed by the Corniferous limestone, which bears dark-colored, cherty beds, that break with a horny fracture, which suggested the name Corniferous; but the cherty beds occur in various places in these two divisions, and there is no real line of separation between them. The chert, or hornstone, is largely composed of microscopic, silicious forms of plants or protophytes, spiculæ of sponges, fragments of the dental apparatus of Gasteropods, and other organisms. The aggregate thickness of the Group in New York is about 300 feet.

§ 123. From New York the Group extends in a belt west across the peninsula of Canada to Mackinac Island, where it is 250 feet thick, and from thence into Michigan where its thickness is 354 feet. It appears at Sandusky and Northwestern Ohio, at Columbus, and on the Ohio a few miles below the mouth of the Scioto, resting upon the Waterlime Group, which has great thickness in this State. It crosses into Northern Indiana, and striking south-westerly, crosses the Ohio River at Louisville. It appears in Illinois, Iowa, Missouri, and Tennessee, resting on the Oriskany, or the Waterlime, or the Niagara, and everywhere preserving the character of the great coral-reef period of the Devonian, but never exceeding a thickness of about 300 feet. In New Jersey, however, the Cauda-galli grit has a thickness of 400 feet, and the Corniferous limestone 500 feet, making a total thickness of 900 feet. It occurs in the western mountain ranges, and is one of the most persistent and generally distributed Groups.

§ 124. It is a marine limestone, distinguished for the remarkable abundance of corals, and coral reefs, the variety in form, number, and size of species, some specimens being several feet in diameter, and larger than any belonging to any earlier period. It is distinguished also for its fish remains, which consist of teeth, or the outer bony covering, sometimes so abundant as to constitute the major part of layers, 3 or 4 inches, or even more, in thickness. Some were very large and singularly constructed. The *Macropetalichthys sullivanii* had a head 15 inches in length composed of hard, bony plates, covered with a thick skin dotted with tubercles. Cephalopods are abundant and quite characteristic, and in a few places drifted land-plants have been found, but they are not of general occurrence. The

most characteristic species among the invertebrates, and those by which the rocks may be readily identified are *Cyathophyllum rugosum*, *Favosites goldfussi*, *Syringopora maclurii*, *Phillipsastrea verneuili*, *Nucleocrinus verneuili*, *Spirifera acuminata*, *S. gregaria*, *Pentamerus knighti*, *P. aratus*, *Stricklandinia elongata*, *Paracyclas occidentalis*, *Conocardium subtrigonale*, *Platyceras dumosum*, *Tentaculites scalariformis*, and *Dalmanites selenurus*. In the vicinity of Davenport, Iowa, it furnishes an abundance of durable and massive building material and contains cavernous openings, as if worn out by the action of water, and filled up subsequently with material derived from higher rocks, and especially those of the Hamilton Group. The quarries at Columbus, Ohio, and North Vernon, Indiana, are in this Group. The strata in the vicinity of the Straits of Mackinac have been eroded and excavated so as to produce the Island of Mackinac, and large masses of the materials have been transported and distributed over Southern Michigan and Ohio.

§ 125. The limestones of this Group in Canada are usually bituminous, and petroleum frequently fills the cells of corals and other fossils. The corals often prevail in distinct bands, some of which will be saturated with the oil, while others will not. Petroleum springs rise from this Group at Tilsonburg, and other places along an anticlinal which runs through the Western Peninsula. The oil being lighter than water, and permeating the strata, naturally rises to the highest part of the anticlinal between the impervious layers of rock, and escapes to the surface. In other localities the bitumen is solid, and takes the form of asphaltum or mineral pitch, as at Kincardine, where slaty beds contain from 10 to 15 per cent of bitumen soluble in benzole. No good well, however, has been discovered in Canada by boring in these rocks, though it has been contended the oil at Enniskillen and on the Thames has its source here. Where the oil has been found in this Group, it has had its source in the Waterline or in the shales below.

CHAPTER XXI.

HAMILTON GROUP.

§ 126. THIS Group was named from Hamilton, Madison County, New York, and defined by Vanuxem in 1842, though he did not include within it the Marcellus Shale, Tully Limestone, and Genesee Slate. The divisions made for it in New York are Marcellus Shale, Ludlowville Shale, Encrinal Limestone, Moscow Shale, Tully Limestone, and Genesee Slate. The rocks are not susceptible of this division, except locally, and they all belong to a single Group. The Marcellus Shale was named from Marcellus, where it is an argillaceous slaty rock, bearing much carbonaceous matter, and sometimes small pieces of coal, and has a thickness of about 200 feet. It contains layers of impure limestone, and abounds in fossils. In many places it contains so much bitumen as to give out flame when thrown into the fire, which led the early settlers to explore it throughout its whole extent for coal, only, of course, to suffer disappointment. It is not separable from the Ludlowville Shale by any well-defined characters. The Ludlowville Shales were named from the town of that name, and separated from the Moscow Shale by a layer of limestone 3 or 4 feet thick, called the Encrinal limestone; but such

division is scarcely worthy of recognition. The three have a thickness varying from 300 to 900 feet, extend from Lake Erie to the Hudson, and abound in fossils. The Tully limestone was named from Tully, where it is burnt for lime, and has a thickness of 14 to 20 feet. The Genesee slate, named from the opening of the gorge of the Genesee River at Mount Morris, where it is a black, argillaceous fissile mass, attains a thickness of 150 feet and closes the era of the Hamilton Group in New York.

§ 127. The Group extends from the Hudson to Lake Erie, occupying a belt of variable width in the central part of the State, and attaining a maximum thickness in the eastern part of 1,200 to 1,400 feet, and diminishing to about 300 feet in the western part. The valleys of Seneca and Cayuga Lakes are excavated for more than half their length in these rocks, and the banks and ravines afford the best facilities for examination. It is an olive shale, with slates and sandstones in the eastern, and calcareous shale and limestone in the western part of the State. The bedded rocks are remarkable for the abundance of ripple-marks, and wave-lines, and the shales abound in carbonaceous material, due to vegetation. Fucoids and marine plants are common, and coniferous trees and ferns grew to a good size, and drifted into the ocean, where they were imbedded and preserved, so as to show much of their form and structure. The New York subdivisions are lost in the extension across the peninsula of Canada from Lake Erie to Lake Huron, and the Group becomes a limestone in Michigan. It occurs at only one place in Wisconsin, which consists of a strip about 10 miles long and 5 or 6 wide, near Milwaukee, where it is an impure limestone, quite fossiliferous, and largely mined for the manufacture of hydraulic cement. It occurs in Ohio, resting on the Upper Helderberg as far south as Columbus, and the upper part of the limestone at the Falls of the Ohio, is referred to it. It occurs at Davenport and New Buffalo, in Iowa, and also in Illinois and Missouri. It appears among the western mountains, on the Mackenzie River, in Alaska, and in the Arctic regions. It has greater thickness in Pennsylvania, New Jersey, Virginia, and other States in the Appalachian chain, than it has in the West, and contains much more mechanical sediment. In the East it is a mud rock supplied with drift materials and marine remains, while more westerly it is exclusively a marine calcareous rock.

§ 128. It is of quite general distribution and usually readily determined by its invertebrate fossils, which exceed in number almost all earlier Groups. *Lepidodendron*, which became so common in the Coal Measures, is found in the shales. The remains of fish are much like those of the Upper Helderberg, though species are distinct. The characteristic fossils, and those by which the Group may usually be determined, are *Heliophyllum halli*, *Spirifera pennata*, *S. granulifera*, *Tropidoleptus carinatus*, *Rhynchonella venustula*, *Athyris spiriferoides*, *Leiorhynchus limitare*, *L. quadricostatum*, *Orthonota undulata*, *Cypricardella bellistriata*, *Cimitaria recurva*, *Pterinea flabellum*, *Modiomorpha concentrica*, *Bellerophon patulus*, *Pleurotomaria sulcomarginata*, *Styliola fissurella*, *Homalonotus dekayi*, and *Phacops bufo*.

§ 129. The oil-springs of Enniskillen and of the Thames, in Canada, were known to the Indians and to the settlers from an early period. The oil floated upon the surface of the waters, and formed by its drying beds of tarry bitumen. On sinking through the clay from 40 to 60 feet, a bed of gravel is reached, from which considerable supplies of petroleum are obtained. Such are called surface-wells,

and are less productive than the deeper ones. Below the gravel thin limestones, shales, and clays occur for a distance of about 230 feet before the Upper Helderberg limestones are reached. One of these wells, when sunk to a depth of 200 feet below the surface, yielded, when first opened, 2,000 barrels of oil in twenty-four hours. In some of the wells bored in this vicinity, both oil and water flowed to the surface, and in some of the deeper ones the water is saline. Wells bored into the Upper Helderberg limestone sometimes reached small quantities of oil, but no valuable wells have thus far been discovered in Canada by boring below the Hamilton Group. The flowing wells soon become intermittent, and within a year cease to flow altogether; they continue, however, to furnish oil by pumping for a limited period, and then appear to be exhausted. The petroleum differs in volatility; the less volatile contains paraffine in solution, and is suited for lubricating machinery, while the more volatile is best suited for light. The alliaceous odor of some of the unrefined oil is due to the presence of a little sulphureted hydrogen. Petroleum is modified on exposure to the air by volatilization and oxidation, and eventually assumes a solid form. Thus near Oil Creek, in Enniskillen, the thickened oil formed two layers, called gum-beds, of a viscid, tarry consistence, covering two or three acres with a thickness from a few inches to two feet. In sinking a well, a bed of this asphaltum, from 2 to 4 inches thick, was met with at a depth of 10 feet, upon a layer of gravel. It contained the remains of leaves and insects, which were imbedded in it during its slow accumulation and solidification. In boring the oil-wells there is always a greater or less disengagement of inflammable carbureted hydrogen-gas, and sometimes it is liberated with explosive violence. The strata almost everywhere in that region hold in a condensed state portions of light carbureted hydrogen, which is discharged wherever a natural fissure or an artificial boring furnishes a vent. The shale on Sulphur Island, at the mouth of Thunder Bay in Lake Huron, is so highly charged with bituminous matter that it has been set on fire and burned for months. The bitumen burns out and leaves the shale with a reddened appearance.

CHAPTER XXII.

PORTAGE GROUP.

§ 130. This Group was named from Portage, New York, and defined by Hall in 1843. It consists of variable shales and sandstones, forming in New York an east and west band, resting upon the Hamilton Group, and dipping south about 25 feet in a mile. The sandstones produce falls in the streams, beautiful cascades, and grand and striking scenery. The highest perpendicular fall of water and deepest canons and gorges in the State exist in this Group. It thickens westerly and thins easterly, and does not extend to the extreme eastern part of the State. Sandstones greatly predominate in the eastern part, while shales increase westerly, until the whole Group becomes a mass of black, bituminous shale. The thickness on the Genesee is 1,000 feet, on Lake Erie 1,400 feet. A considerable part of Lake Erie is excavated out of this Group, which shows a belt on the south side extending nearly to Sandusky; and from here it bends southerly across Ohio, leaving Columbus to the west, and, reaching the Ohio River below the mouth of the Scioto,

it crosses into Kentucky, and is soon broken up in the spurs of the mountain ranges. It crosses Lake Erie, and occupies a small part of the Canadian peninsula, and enters the southern peninsula of Michigan, where Winchell called it the Huron Group. From Michigan it crosses the north-western corner of Ohio, and enters Indiana, forming a belt across that State by way of Indianapolis, and, reaching the Ohio River at New Albany, crosses into Kentucky, and extends far toward Tennessee. It was called the Black Shales in the Geological Survey of Ohio for 1838, and in that of Indiana for 1839, and in later surveys of Kentucky, Indiana, and Tennessee. The thickness in Ohio is from 200 to 1,000 feet or more, in Indiana from 100 to 200, and in Tennessee from 10 to 150 feet. It has never been recognized west of these States, and is therefore classed as a Group belonging to the Appalachian mountain system.

§ 131. Fucoids, wave-lines, and ripple-marks are numerous, and occur throughout its distribution. The paucity of fossils in this Group, when compared with those above and below it, is one of its striking characters. Whole days may be spent in some parts of it without finding a shell, though fucoids are in the greatest abundance. Land-plants occur in profusion in New Brunswick, some of which are of gigantic size. *Goniatites complanatus*, *Panenka speciosa*, and *Spirifera levis* occur in New York and in Ohio, and may therefore be considered characteristic. Fish of large size, covered with thick heavy plates, and having jaws and teeth strong enough to crush a body the size of a man, occur in it. *Cladodus*, a carnivorous fish, became abundant in this period, and flourished until the Permian. It was world-wide in its distribution, and its vertical range exceeds that of any other genus of fishes. The Group seems to have been deposited in internal seas or arms of the ocean, and is the last Group of the Devonian System, having a large geographical distribution, for the Chemung and Catskill are comparatively local in their extension. In Ohio there are large concretionary balls of impure limestone, some of them several feet in diameter, and it was in one of these the monster *Dinichthys* was discovered.

§ 132. The Group is distinguished as the great seat of petroleum, and is supposed to be the source from which the chief supply in this country is derived. In New York, Pennsylvania, and Ohio the wells are bored through the overlying rocks until the Portage is reached, or the saturated sands that overlie it furnish the supply. Ten per cent of the shales is bituminous and carbonaceous matter. The shale yields oil by distillation, and gas and oil springs abound in its sandstones, and in those which overlie it. The great oil-sands in the oil regions of Pennsylvania belong to the Chemung, and have doubtless been fed as well from the shales of this Group as from those of the Chemung, which furnish the same products. The gas at Fredonia, New York, in this Group, was used for lighting houses in 1820. Lyell described it in his travels in 1841, and it has been in constant use, with little variation in the supply, ever since.

CHAPTER XXIII.

CHEMUNG GROUP.

§ 133. This Group was named from the exposure at the Chemung Upper Narrows, at Chemung, New York, and defined by Vanuxem and Hall in 1842 and 1843. The shale and sandstone at Ithaca, having a thickness at Hector's Falls of 400 feet, was called the Ithaca Group, but it is only part of the Chemung. The Chemung consists of a highly fossiliferous series of shales and thin-bedded sandstones and impure limestones, and an infinite variety formed from admixture of these. Except in a few localities there is no marked line between it and the Portage below. The two are distinguished by their fossils. The shales vary in color from a deep black to olive-green, with every grade of intermixture; the sandstones are gray, olive, or green, and almost the whole series weathers to a brownish olive. The Group forms an east and west belt across the southern part of New York, having a thickness in the eastern part of 2,000 feet, dipping southerly at 25 feet or more to the mile, and thinning westwardly, so as not to be determined a short distance from where it crosses the line of Ohio. It is unknown farther west. In its extension from Eastern New York into Pennsylvania the thickness increases until it exceeds 3,000 feet. It occurs at New Brunswick and at Gaspe, Canada, but has not been satisfactorily determined at many other places, though it probably occurs in many other regions of the Appalachian system. The rocks which have been called Chemung in Ohio, Indiana, Illinois, Missouri, Iowa, and Michigan belong to the Waverly, except the thin, tapering belt in North-eastern Ohio, already mentioned.

§ 134. The alternations and interlamination of shales and sandstones show deposition under similar circumstances to those under which the Portage was deposited. The source of the materials was to the east or south-east of New York, as evidenced by the thinning of the deposits and diminution of sandy strata toward the west. The land-plants occur in Eastern New York, and disappear westerly, proving the land existed in that direction. The marine and land plants are abundant in the sandstones, while marine shells increase with the decline of the sandstones and augmentation of the shales westerly, though fucoids continue in abundance wherever the Group exists. The plants foreshadow the approaching Carboniferous System by the presence of *Archæopteris*, *Cyclopteris*, *Sigillaria*, *Lepidodendron*, and *Trigonocarpon*. The fauna has more of a Carboniferous aspect than any which preceded it, and there is a diminution of the types which characterized the earlier Devonian. The species having the greater distribution and most characteristic are *Lepidodendron chemungense*, *Archæopteris laxa*, *Asterophyllites parvulus*, *Orthis impressa*, *Orthis tioga*, *Streptorhynchus chemungense*, *S. pectinaceum*, *Strophodonta cayuta*, *S. mucronata*, *Chonetes muricatus*, *Productella hirsuta*, *Spirifera disjuncta*, *S. mesacostalis*, *Atrypa dumosa*, *A. hystrix*, *Aviculopecten duplicatus*, *A. rugistriatus*, *Leptodesma longispinum*, *L. spinigerum*, *Leiopteria chemungensis*, *Pterinopecten dispanus*, *P. crenicostatus*, *P. suborbicularis*, *Pterinea consimilis*, *Crenipecten crenulatus*, *Mytilarca chemungensis*, and *Phacops nupera*.

§ 135. Springs, evolving carbureted hydrogen-gas, or gas accompanied with petroleum, are common throughout nearly all that part of New York and Pennsyl-

vania covered with the Chemung. The rocks in nearly all localities emit a bituminous odor on percussion, and petroleum often exudes from the crevices. The oil and gas products are the same in the Chemung as in the Portage. The gas and the oil had the same origin. They are both hydrocarbons. They were both derived from vegetable and animal organisms. Wherever shales are found containing carbonaceous matter, evidence of these products may be obtained. It is possible the gas was first produced, and from it the petroleum has been derived, making the latter a secondary product; but the evidence seems to prove they were both formed at the same period of time, and during the decomposition of the organisms, and before the mud had indurated or hardened into rock. And the evidence also seems to prove they were derived almost wholly from marine plants, for the shales bearing the greater number of fucoids are those to which we ascribe the greater supplies of hydrocarbons. The sandstones which overlie these shales are porous and capable of holding from one-eighth to one-tenth their bulk of petroleum, which is sufficient to account for the flowing wells of Pennsylvania which are bored until they penetrate the sandstone. Many of the wells penetrate only the Chemung sandstone, though the oil is derived from the shales of the Portage as well as from the Chemung. The supposed connection of petroleum and gas with anticlinal axes, or synclinal ones, has not been verified by observation, nor supported with reason, neither are they dependent upon faults or crevices, and much less has the depth of the well any connection with the level of the sea. Wells are as valuable when bored below the sea level as they are when the proper rock is struck above that horizon.

CHAPTER XXIV.

CATSKILL GROUP.

§ 136. This Group was named by Emmons from the Catskill Mountains, and quite fully defined by Vanuxem in 1842. It consists of sandstones, shales, slates, conglomerates, and impure limestones. The prevailing color of the arenaceous portion is brick-red, though all of it is more or less colored with iron, and the shales are gray, olive-red, or green. It exists only in a few counties in South-eastern New York, in the Catskill Mountains, where it has a thickness of 3,000 feet, and dips rapidly toward Pennsylvania, where it reaches a thickness of 7,500 feet, and soon disappears. It does not extend west of the Genesee Valley in New York, and is wholly unknown on any part of the continent west of that State. It is conformable with the Chemung, and is distinguished only by the change in lithology, and by the fossils. No Corals, Crinoids, Brachiopods, or Trilobites have been described from it, and only a few Lamellibranchs. The land-plants are generally very poorly preserved. The fish remains are relied upon to really prove the rocks belong to the Devonian rather than to the Subcarboniferous age, and though these are rare and poorly preserved, they show it is the equivalent of the Old Red Sandstone of England, and therefore Devonian. In some places the sand is cemented and forms a grindstone grit, and there are hard concretionary masses, and strata unequally hardened, that weather into picturesque rocks. The Group is

almost wholly a mechanical deposit of very limited distribution and enormous thickness. There are ripple-marks and other evidences of shallow water in different strata. The fossils characteristic of it are *Aneimites obtusus*, *Amnigenia castskillensis*, *Holoptychius americanus*, *H. taylori*, and *Dipterus sherwoodi*.

§ 137. The total maximum thickness of the several Groups belonging to the Devonian as given above is 14,500 feet, though no single section would furnish such a depth. The greatest thickness is in Pennsylvania, and next in New York. The thickness at Gaspé, Canada, is 7,036 feet, and the divisions into Groups are not well defined. In the Western States several Groups are missing, and the thickness of the rest is only a few hundred feet. All the strata are marine; no land or fresh-water shells have been found within them, and the land-plants are fairly supposed to have drifted to the places where they occur. The Devonian is everywhere unconformable with the superimposed Subcarboniferous, which always begins with a conglomerate or sandstone. The great reef-forming Corals so conspicuous in the Upper Helderberg and Hamilton, did not survive the era. Cystideans became extinct. The family *Spiriferidae*, which commenced in the Upper Silurian, became most prosperous in this age, and lived until the Jurassic. The three most notable steps in the progress of development are found in the growth and abundance of land-plants, the appearance of insects, and in the introduction and diversity of fish. The Devonian fish belong to the Selachians or cartilaginous fishes, the Ganoids, or fishes covered with plates or bony scales, and the Placoderms. There is nothing known in connection with plants or animals indicating the temperature of the sea, or climate on land, was different then from what it is now.

CHAPTER XXV.

SUBCARBONIFEROUS SYSTEM.

§ 138. THIS System was named and defined by David Dale Owen in 1838, in the Geological Survey of Indiana. He found it to consist of massive sandstones, limestones, and shales, lying between the Devonian and the Coal Measures, to be characterized by *Pentremites* and other peculiar fossils, and to be capable of subdivision into Groups. The name Subcarboniferous indicates its position is below the Coal Measures. In the great valley of the Mississippi it is divided, in ascending order, into Waverly, Burlington, Keokuk, Warsaw, St. Louis, and Kaskaskia Groups. These Groups have been fully defined in Illinois, Iowa, Missouri, Arkansas, Indiana, Ohio, Kentucky, and Tennessee, and can be determined with more or less satisfaction beneath the Coal Measures in the four larger coal-basins, though not throughout their whole extent. For example, while the Groups are not distinctly marked in Pennsylvania, they can be readily determined on the opposite side of the basin in Kentucky and Tennessee. This is because the rocks consist largely of sandstones and shales in the east, which did not preserve well the fossils, while in the west they are principally limestones, containing fossils in great profusion and perfection. In Pennsylvania the sandstones and shales have a thickness of 5,000 feet, which thin westerly and southerly, and gradually give way to limestones and deep marine deposits.

§ 139. In Nova Scotia the lower part is called Lower Coal Measures, and the upper part Lower Carboniferous Marine Formation, or more generally the whole is called Lower Carboniferous, even where its thickness is 6,000 feet. It consists of sandstones, shales, conglomerates, and limestones, with beds of gypsum. The limestones bear Brachiopods specifically identical with those of corresponding age in the Illinois basin. In Pennsylvania and in Nova Scotia thin seams of coal occur in the strata, which is not the case farther west. On Cape Breton the thickness is 4,600 feet. In the Rocky Mountain region there is a thickness of 4,000 to 7,000 feet or more, and the several Groups may be determined at different places. The System has been divided in the west into the Lodore Group, Tonto Group, Red Wall Group, Lower Aubrey Group, and Upper Aubrey Group. Prof. Dawson found no palæontological or stratigraphical reason for regarding the Subcarboniferous as a System distinct from the Carboniferous, but as it is generally capable of subdivision into Groups, is always unconformable with the Devonian, begins with a sandstone, and is followed by a conglomerate or sandstone unconformable with it, there is good reason for retaining the name, though if the lines were not better defined elsewhere than in Nova Scotia, we might join Prof. Dawson in discarding it.

§ 140. There are some fossils in this System almost world-wide in distribution, and belonging alike to all the Groups into which it has been subdivided; viz., *Spirifera striata*, *Athyris lamellosa*, *A. planosulcata*, *Orthis michelini*, *O. resupinata*, and *Productus semireticulatus*. There are some that occur in the rocks of this age in each of the Coal-basins on this continent; as, *Athyris subtilita* and *Productus cora*. It is in this System at Hillsborough, New Brunswick, the bituminous mineral Albertite is so abundant. The rocks are thin-bedded shales, composed of fine, indurated clay, with much bituminous matter, and are full of fossil fishes in a good state of preservation. The shales have been disturbed and contorted, and contain the vein of asphaltic mineral called Albertite. The theory of its creation is as follows: The argillaceous mud which formed the indurated shales, was charged with finely comminuted vegetable matter, which in its decomposition furnished the petroleum that at some later age escaped into a vein or fissure in the rocks, and by losing its more volatile parts and partial oxidation, it hardened into the coaly or asphaltic substance. No extra heat for such transformation was necessarily required. Springs yielding petroleum flow from these rocks in various places. Peroxide of manganese, used in bleaching and in gas manufacture, occurs in limestone near the base of the System, and wad or black manganese ore is abundant at different places. Alum frequently occurs from the spontaneous weathering of pyritous shales, and is sometimes manufactured from them. Saline springs are not uncommon; indeed, they are numerous from the commencement of the Upper Silurian rocks to the close of this System, and occur occasionally both above and below such range. The conglomerate on the Stewiacke, Musquodoboit, and St. Mary's Rivers, is auriferous. It was formed from auriferous quartz-veins, derived from the Taconic System, and gold occurs in it exactly as in modern auriferous gravels, being found in the lower part of the conglomerate, and in the hollows and crevices of the underlying unconformable rocks. The rocks of the age of this System in Europe are commonly known as the Mountain Limestone.

CHAPTER XXVI.

WAVERLY GROUP.

§ 141. This Group was named in 1838, by Mr. C. Briggs, an assistant geologist on the Ohio Survey, from Waverly, Ohio, where it consists of a fine-grained sandstone, about 300 feet in thickness, superimposed upon a black argillaceous slate 200 or 300 feet thick, and is followed by from 40 to 80 feet of conglomerate. He identified the rocks at Portsmouth, Piketown, and Chillicothe. Mr. J. W. Foster, another assistant, followed them through Licking and Fairfield Counties. In 1839 David Dale Owen, after having examined the rocks in Ohio, found them in Indiana, Illinois, and Kentucky, and described the freestone knobs displayed back of New Albany as the Waverly Sandstone series, and referred them to the base of his Subcarboniferous System. Owen established this Group as a geological subdivision by a fair definition. Owen, Norwood, Pratten, and other Western geologists recognized the Group from that time forward. In 1841 Hubbard recognized the Group in the geological survey of Michigan. Hall and some Eastern geologists erroneously asserted the rocks were of Devonian age. In 1861, Meek and Worthen, having ascertained, upon palæontological evidence, the limestones at Rockford, Indiana, at Choteau, Missouri, and at Kinderhook, in Pike County, Illinois, belong to the base of the Subcarboniferous rocks, proposed to call them the Kinderhook Group. They understood they were making a synonym, but supposed they were including less in their Group than is included in the Waverly. In the same year Alexander Winchell described the Marshall Group of Michigan, and afterward thoroughly defined it, and proved its identity with the Waverly Group, the Kinderhook, the Yellow sandstone series of Iowa, and Choteau limestone, Vermicular sandstone and shale, and Lithographic limestone of Missouri.

§ 142. The Group in Ohio forms a belt from 10 to 20 miles in width, commencing near the mouth of the Scioto, and bearing north and north-east toward Cleveland, but widening as it approaches Lake Erie, until its width exceeds 40 miles. It rests upon the Portage Group, and has been called in its northern extension the Cuyahoga shale, Berea Grit, Bedford and Cleveland Shales. It crosses the Ohio from the Scioto, and entering Kentucky is soon broken up among the mountain ranges. In Indiana it forms a belt extending from New Albany north, by way of Rockford, and south across the Ohio River, by way of Danville and Knob Lick, Kentucky. The fossiliferous, greenish, mottled limestone at Rockford, so famous for its *Goniatites* is at the base of the Group. The maximum thickness in Indiana is 500 feet, in Kentucky 200 feet. In Michigan, at Marshall, Hillsdale, and other places, it consists of reddish, yellowish, and greenish sandstones, having a thickness of 160 feet, and the Napoleon sandstone, 123 feet in thickness. It furnishes large quantities of salt and gypsum. The brine is obtained by boring and pumping, and very large salt-works are established on the Lower Saginaw River. Salt has been largely manufactured from brine obtained from the rocks in Ohio. The celebrated Ohio freestone, so much used for building purposes, is from this Group.

§ 143. In Missouri, the Lithographic limestone has a thickness of 55 feet; is a fine-grained, compact limestone, breaking with a free, conchoidal fracture, and is

especially characterized by *Pentremites roemeri*. The Vermicular sandstone has a thickness of 75 feet, and is ramified with irregular perforations resembling worm-burrows. The Choteau limestone has a thickness of 100 feet, and was named from Choteau Springs, in Cooper County. It has an extensive geographical distribution. At Burlington, Iowa, the Group has a thickness of 77 feet, and consists of shales and sandstones, capped by a four-feet bed of oolitic rock. It thins northerly until it disappears. It has a thickness in Illinois of 200 feet, and at Kinderhook it consists of grit-stones, sandy and argillaceous shales, with thin beds of fine-grained and oolitic limestone. It has been identified in the Wahsatch Range, in Utah, and at other places in the great West.

§ 144. The fauna, on the whole, has assumed a Carboniferous aspect, noticeable in the species which pass to higher Groups, and more strongly in the genera of fish remains. Fossils having a wide distribution and characteristic species are *Productella concentrica*, *Productus cooperensis*, *Spirifera carteri*, *S. extenuata*, *S. peculiaris*, *Syringothyris halli*, *Athyris hannibalensis*, *Rynchonella hubbardi*, *R. missouriensis*, *Centronella allii*, *Bellerophon cyrtolites*, *Grammysia hannibalensis*, *Orthoceras indianense*, *Goniatites oweni*, *G. marshallensis*, and *Phillipsia doris*.

CHAPTER XXVII.

BURLINGTON GROUP.

§ 145. THIS Group was named from Burlington, Iowa, where it was called the Burlington limestone before it was described as a geological subdivision. No single geologist seems to have established the Group, or to have introduced the name to science, though the first full definition is in the geological survey of Iowa for 1858. The limestone at Burlington is subcrystalline, often friable, and largely composed of crinoidal remains, has a thickness of 100 feet, and thins out northwardly. It increases in silicious matter toward the top, until the limestone merges into silicious beds, which, without evidence of unconformability, separate it from the Keokuk Group. Hall referred these cherty layers to the Keokuk, but White, Wachsmuth, and others refer them to the Burlington. In its southern extension, the Group dips below the bed of the Mississippi, and rises again at Quincy, and furnishes a fine exposure at Hannibal, Missouri. It exists in nearly every county on the Mississippi, from St. Louis to Iowa, and west from St. Charles to Howard County, and at Sedalia. The thickness varies from 100 to 500 feet. From a collection of fossils received from Prof. Cope, the author identified the Group in the Lake Valley Mining District of New Mexico; and it doubtless exists at other places in the great West.

§ 146. The separation of the Burlington from the Keokuk could not be maintained were it not for the great change in the specific characters, of the Crinoids, and this resulted probably from the deeper, or clearer, or less disturbed water in the western localities during the Burlington period, than existed in the eastern localities. The detrital material may have prevented the recognition of the Group in the Appalachian system, and rocks of the same age in Ohio, Kentucky, Indiana, and other States may be referred to the Waverly or the Keokuk. In no other

period did the harder parts of Crinoids so completely form the limestone, and hence it is pre-eminently the age of Crinoids. As the *Graptolida* reached the height of development in the Quebec or Upper Taconic, the *Orthoceratidæ* in the Black River, and the *Cystidea* in the Niagara; so did the *Crinoidea* in the Burlington. The bed of the ocean was covered with a dense growth of Crinoids, one generation after another, while the superincumbent water swarmed with fish and invertebrate life. About 400 species of Crinoids, or one-fourth of all known, are from this Group. Among those having the greater distribution and being most characteristic are *Dorycrinus missouriensis*, *D. parvus*, *D. unicornis*, *Batocrinus christyi*, *B. pyriformis*, *B. rotundus*, *Actinocrinus proboscivalis*, *Platycrinus planus*, *Amphorocrinus divergens*, *Belemnocrinus typus*, *Strotocrinus regalis*, *Steganocrinus concinnus*, and *Physetocrinus ventricosus*.

CHAPTER XXVIII.

KEOKUK GROUP.

§ 147. This Group was named from Keokuk, Iowa, where it was extensively quarried, and known as the Keokuk limestone, before it was known as a geological subdivision. It was first defined by Owen in 1852, and afterward by Hall in 1858. As defined by Hall, it consisted of fifty feet of fossiliferous limestone capped by 40 feet of shale, abounding in geodes of quartz, called the geode bed. Others refer the chert layers, which separate it from the Burlington, to this Group. It rapidly thins out to the north, but maintains its thickness southerly to the mouth of the Illinois River, and appears in the south-western part of Missouri, with a thickness of 200 feet, where it is a lead-bearing rock. It crops out in Indiana, 40 or 50 miles north-west of Crawfordsville, and extends southerly, crossing into Kentucky a short distance below New Albany. The thickness does not much exceed 100 feet. It is celebrated at Crawfordsville for the abundance and perfection of the Crinoids; entire specimens—roots, column, head, arms, and pinnules—have been collected. It is well displayed in Southern Kentucky, at King's Mountain tunnel, and in Tennessee, where the thickness is 200 feet. It occurs in Richland County, Ohio, and at other places on the western border of the Appalachian coal basin, but has not been described on the eastern border. It has been identified at numerous places in the western mountain ranges.

§ 148. Ores of lead and zinc occur in South-western Missouri in pockets and fissures associated with limestone and chert, and some of the mines are very rich and have been largely worked. In New Mexico and south of there, in Mexico, silver and lead occur in veins and fissures, some of the mines being very valuable. Some of the fossils having an extensive distribution, and being characteristic, are *Dorycrinus mississippiensis*, *Cyathocrinus multibrachiatus*, *Barycrinus hoveyi*, *Forbesiocrinus wortheni*, *Platycrinus hemisphericus*, *Agaricocrinus americanus*, *A. wortheni*, *Actinocrinus lowei*, *A. pernodosus*, *Batocrinus biturbatus*, *B. indianensis*, *Goniateroideocrinus tuberosus*, *Cyathocrinus subtumidus*, *Palæacis compressus*, *Amplexus fragilis*, *Productus vittatus*, *Orthis keokuk*, *Spirifera keokuk*, *S. suborbicularis*, *Platyceras fissurellum*, *P. equilaterale*, and *Lithophaga illinoisensis*.

CHAPTER XXIX.

WARSAW GROUP.

§ 149. THIS Group was named from Warsaw, Illinois, by Hall, in 1856, and more fully defined in 1858. At the typical locality, near Warsaw, it consists of magnesian, arenaceous, and shaly limestones, abounding in Bryozoa. It is conformable with the Keokuk, only a few feet in thickness, and generally considered as a member of the Keokuk. I have retained it, because so many small fossils have been described from it, which have been the means of identifying it, at great distances from the typical locality. It occurs below the limestone of the cliffs at Alton, Illinois; at Bloomington and Spergen Hill, Indiana; and in St. Genevieve County, Missouri, where it attains its maximum thickness of 100 feet. It should probably be regarded as a mere member of the Keokuk Group. Some of the fossils having great distribution, and therefore characteristic, are *Endothyra baileyi*, *Dichocrinus simplex*, *Alloprosallocrinus conicus*, *Batoerinus icosidactylus*, *Pentremites kovinckanus*, *Productus biseriatus*, *Spiriferina norwoodana*, *Athyris hirsuta*, *Rhynchonella grosvenori*, *R. mutata*, *Terebratula turgida*, *T. formosa*, *Cypriocardinia indianensis*, *Bellerophon sublaevis*, *Naticopsis carleyana*, *Holopea proutana*, *Cyclonema leavenworthanum*, *Pleurtomaria subglobosa*, and *Spirorbis annulatus*.

CHAPTER XXX.

ST. LOUIS GROUP.

§ 150. THIS Group was named and described by Dr. Shumard in the Geological Survey of Missouri, in 1855. In St. Louis County it is celebrated for its splendid quarries, and consists of hard crystalline limestone, sometimes cherty, with thin layers of argillaceous shales, and has a maximum thickness of 250 feet. It forms bluffs below St. Louis as far as Carondelet, where it dips beneath the Mississippi, but soon rises again, and forms bluffs as far as the Meramec, some of which are 175 feet high. It is exposed in the western part of Illinois and eastern part of Missouri and Iowa, thinning out a short distance north of Keokuk. It forms a band of red clay, chert, and limestone bordering the Indiana coal-fields, and crosses Kentucky and Tennessee, south, by way of Clarksville. It borders the Appalachian coal-field in Southern Kentucky, and may be seen at Burnside, on the Cincinnati Southern Railroad and in Eastern Kentucky. In Indiana it consists of limestones, more or less argillaceous, with beds of red clay, sometimes containing geodes, and having a thickness of 200 to 300 feet. It does not lose its thickness in Kentucky or Tennessee, but becomes more cherty and silicious. It is everywhere cavernous, and abounds in sunken rivers, lost or subterranean streams, and in surface, funnel-shaped sink-holes. The Mammoth Cave of Kentucky, and the Wyandotte Cave of Indiana, which has been explored 23 miles, and has a room 240 feet high, are in this Group.

§ 151. These underground avenues have resulted from percolating water, without the intervention of earthquakes or other extraordinary agency. Surface water from ordinary rain-storms, finding its way through the ground as it does, to supply common springs, will take up carbonate of lime in chemical solution in limestone countries, and by so doing the fissures through which it passes will be enlarged. In massive limestones with thin, shaly partings, the constant action for ages of percolating water, aided by disengaged carbonic-acid gas, will enlarge the fissures into rivulets, which will culminate in a subterranean river, finding an outlet in some open stream at a lower level. Such is the process by which the sink-holes, caverns, and subterranean streams in this Group of rocks have been formed. Slight projections on the walls record the different stages of the streams as they were slowly cutting their way to greater depths in the limestone. At the bottom of caverns where little or no water is now flowing, rounded pebbles that have played their part in grinding out the channels occur, as well as sand and clay.

§ 152. When water, holding bicarbonate of lime in solution, slowly drops from the ceiling of a cavern, exposed to the air long enough to allow one equivalent of carbonic-acid gas to escape, the lime is crystallized. If the deposit takes place from above downward, in the form of an icicle, it constitutes stalactite; but if it forms on the floor, from below upward, it is stalagmite. These two sometimes meet and form columns. If the solution which forms the stalactites is free from oxide of iron and other impurities, they will be translucent or milk-white. The presence of iron gives them a dirty yellow, red, or brown color. The chambers in which gypsum occurs are dry, and when rosettes of alabaster or translucent lime are formed the caverns must be dry, as they will not form in a damp atmosphere.

§ 153. The fossils having the greatest distribution, and which are most characteristic of this Group are *Lithostrotion canadense*, *L. proliferum*, *Productus ovatus*, *P. marginicinctus*, *Melonites multiporus*, *Myalina st ludovici*, *Temnocheilus coxanum*, and *Solenocheilus collectum*. Ores of lead and zinc occur in pockets and fissures in Livingston, Crittenden, and Caldwell Counties, Kentucky, and at Rosiclare, Illinois. The ores are associated with fluor spar and calc spar. The principal gangue with which the lead is associated in Hardin County, Illinois, is fluor spar, and it is thoroughly disseminated through it. The fluor spar is used for the manufacture of hydro-fluoric acid, and as a flux for smelting ores, where sulphuret of zinc is associated with galena. Lead occurs associated with different minerals and in many Groups of rocks, but never appears to have had an igneous origin.

CHAPTER XXXI.

KASKASKIA GROUP.

§ 154. DR. GEO. G. AND B. F. SHUMARD were acquainted with this Group, in Kentucky, Indiana, Illinois, Missouri, and Arkansas, in 1852, but did not name it. In 1856 Hall named it, from Kaskaskia, Illinois, and more fully defined it in 1858. In 1866 Prof. Worthen called it the Chester Group, because he had proposed the name in 1853, and had so informed Prof. Hall while acting as his assistant in 1855; but the latter published the information, and instead of using the name Chester used Kaskaskia. Chester is the shortest and best name, but Kaskaskia has priority of publication. At the typical locality it consists of a compact, arenaceous, and coarse-textured limestone, with shaly partings, in the lower part, heavy-bedded sandstone and limestone, with shaly partings, in the central part, followed by a mass of green shale, succeeded by heavy-bedded limestone. The thickness at Chester is 198 feet, at Huntsville, Alabama, 635 feet, on the southern line of Tennessee 720 feet, at the northern line 400 feet, and in Indiana 300 feet. It forms a belt surrounding the Illinois and Indiana Coal-basin, exists upon the western and south-western border of the Appalachian Coal-basin, and upon the eastern border of the Missouri and Arkansas Coal-basin. It consists everywhere of fossiliferous limestones and sandstones, and is followed by rocks unconformable with it.

§ 155. The fossils having the greatest distribution and most characteristic are *Aeroerinus shumardi*, *Agassizocrinus conicus*, *Hydreionocrinus depressus*, *Pentremites godoni*, *P. sulcatus*, *P. cervinus*, *P. obesus*, *P. pyriformis*, *Pterotocrinus capitalis*, *Talarocrinus cornigerus*, *Zeacrinus maniformis*, *Athyris sublamellosa*, *A. subquadrata*, *Spiriferina increbescens*, *Spiriferina spinosa*, *Euomphalus planidorsatus*, and *Temnocheilus spectabile*.

CHAPTER XXXII.

CARBONIFEROUS SYSTEM.

§ 156. THIS system is divided into the Carboniferous Conglomerate, Coal Measures, and Permian Group. The Carboniferous Conglomerate rests unconformably upon the Subcarboniferous rocks, and forms a belt around all the coal-basins. It is a massive sandstone or conglomerate, almost nonfossiliferous, except the occasional presence of *Stigmaria*, *Calamites*, and *Lepidodendron*. In Indiana the thickness is about 200 feet, in Illinois about 300 feet, in Kentucky 500 feet, in Ohio 200 feet, in Michigan 100 feet, in Pennsylvania 1,500 feet, in Virginia 1,000 feet, and in Nova Scotia, where it is called the Millstone grit, 6,000 feet. The pebbles are well rounded, showing the fragments of rock were rolled for a long time on the beaches by the action of the winds and waves, before they were cemented into rock. A similar conglomerate separates the Subcarboniferous and Coal Measures in Europe, where it is called the Millstone Grit. It bears the marks everywhere of a shore-line deposit that surrounded the basins of internal seas. It does not underlie the whole of the Coal Measures—the central parts of the basins are free from it, as is shown by artesian boring.

CHAPTER XXXIII.

COAL MEASURES.

§ 157. THE name "Coal Measures" originated among the miners of England before Geology became a science. It is familiarly used in the earliest text-books on Geology, as a scientific term, which was understood without a definition. It is applied to part of the Carboniferous System, and not to Cretaceous or Tertiary Coal regions. The Coal Measures consist of beds of sandstone, shale, slate, limestone, clay, and coal, which are variable in their geographical distribution. The area covered in North America is estimated at about 210,000 square miles, nearly all of which is included in five fields, four of which are in the United States and one in Nova Scotia. Canada and British America are destitute of this important deposit, as well as many States in the Union, among which are Maine, New Hampshire, Vermont, Connecticut, New York, New Jersey, Delaware, South Carolina, Florida, Mississippi, Louisiana, Minnesota, and Wisconsin.

§ 158. The Coal Measures of Nova Scotia rest upon Subcarboniferous rocks, and are divided into the Millstone Grit, Middle Coal Formation, and Upper Coal Formation. A section of the Millstone Grit is as follows: 1. Reddish shales and red and gray sandstones, having a thickness of 2,082 feet, containing no coal, and poor in fossils, except a few drifted trunks of trees. 2. Sandstones, red shales, and a few dark-colored shales, with nine small or rudimentary coal-beds, with a total thickness of 3,240 feet. The underclays abound in *Sigillaria*, and some strata are quite fossiliferous, containing plants, crustaceans, and fish. 3. Red and gray sandstones, red and chocolate shales, arenaceous conglomerates, and thin beds of concretionary limestones, having a thickness of 700 feet, making a total thickness of 6,000 feet. The Middle Coal Formation includes the productive coal-beds, and contains no marine limestones or conglomerates. It consists of shales and sandstones, and has a thickness of 4,000 feet. The Upper Coal Formation consists of shales, sandstones, conglomerates, limestone, and coal, and has a thickness of 3,000 feet. On Cape Breton, the last two divisions have a thickness of 10,000 feet, making the maximum thickness of the Measures, 16,000 feet. From Nova Scotia the Measures dip south-west, and reappear in the form of a subtriangular basin in New Brunswick. The area in Nova Scotia and New Brunswick is 18,000 square miles. The coal is all bituminous. There are 72 seams and numerous dark bands containing more or less carbonaceous material. A coal-bed at Pictou is $37\frac{1}{2}$ feet thick, and another $22\frac{1}{4}$ feet. A large part of the coal-basin is beneath the waters of the Atlantic and the Gulf of St. Lawrence.

§ 159. The first coal-field in the United States is the Appalachian, which extends over important parts of Pennsylvania, Virginia, West Virginia, Maryland, Ohio, Kentucky, Tennessee, and Alabama. Its length is 875 miles, and width from 30 to 200 miles. The anthracite region is in the north-eastern part of Pennsylvania, and does not cover 500 square miles. The coal-beds form synclinals, anticlinals, or stand highly tilted on their edges, but are never horizontal. All the other parts of this great area, estimated at 60,000 square miles, produce only bituminous coal, and the beds may be horizontal or possessed of a slight dip, to which all the strata

are subjected. The aggregate thickness of the coal-beds in the Pottsville district is 120 feet, in the Wilkesbarre district 62 feet, and in the Pittsburg district 25½ feet. The thickest vein at Wilkesbarre is 29½ feet, and at Pittsburg 8 feet. The best seam in Ohio is from 6 to 12 feet in thickness, and is called the Hocking River Coal-bed.

§ 160. The second coal-field in importance covers nearly two-thirds of Illinois, the western part of Indiana, and the western part of Kentucky, and has an area of 47,000 square miles. The coal is bituminous, and the aggregate thickness of the coal-beds is about 40 feet. Indiana is celebrated for her block coal. There are ten seams of coal in a vertical thickness of 600 feet in Illinois, and six of them are from 2 and one-half to 6 feet each in thickness.

§ 161. The third coal-field in importance is the larger one, and occupies parts of Iowa, Missouri, Kansas, Nebraska, Arkansas, and Texas, and has an area of 80,000 square miles. The coal is all bituminous. The western part of Missouri and eastern part of Kansas bear coal in abundance. The Coal Measures are the lowest Group of rocks exposed in Kansas, and have a thickness of 2,000 feet. There are 22 seams of coal, varying in thickness from a few inches to seven feet. Ten of them are more than a foot each in thickness. The coal in Arkansas is excellent.

§ 162. The fourth coal-field is in Michigan, and occupies about 6,700 square miles, with a thickness of about 125 feet. The coal is bituminous, and consists of one bed from 3 to 5 feet in thickness throughout the whole shallow basin, being thinnest near the border. Toward the central axis of the basin there are 2 or 3 thin seams in close proximity to the main seam. The shales are well stocked with fern-leaves and other terrestrial vegetation. There is a small area in Rhode Island and Massachusetts of about 1,000 square miles, having a thickness of 6,500 feet, but possessing no valuable coal-seam. The basin has suffered by the metamorphism of the rocks and plication of the strata. The coal-seams have been changed to anthracite, and are often somewhat wedge-shaped or of irregular thickness.

§ 163. The Coal Measures were deposited in basins, and must necessarily vary much in thickness, the Group in Nova Scotia being thicker than elsewhere, and the Group in Michigan thinner. The maximum thickness in Pennsylvania is 8,000 feet; Ohio, 2,500 feet; Tennessee, 2,500 feet; Western Kentucky, 3,500 feet; Indiana, 1,000 feet, and Missouri, 2,000 feet. The Group is frequently separated into an upper and lower series by the intervention of a conglomerate, and sometimes more than one conglomerate exists in the Group. Marine vegetation abounds at some localities, and land or marsh plants are distributed throughout the shales, sandstones, and coal. Coal was formed from plants which grew in swamps, marshes, and open seas, and, where valuable, it is quite free from sediment, such as would have accompanied much disturbance of the water. The beds usually rest on clay, bearing *Stigmaria* and stumps of trees, and are followed by rocks bearing the leaves of the vegetation of that era. The clay beneath the coal-beds is usually an argillaceous sediment, almost devoid of alkalies, and represents the ancient soil in which the coal vegetation flourished, and apparently deprived it of the greater part of its potash. This clay is usually excellent fire-clay. From the coal, as from modern peat, the alkalies were almost entirely removed by the action of water. The waters were fresh, brackish, and salt at different times and at different places. The

marshes were subject to overflows, as shown by the remains of fish and beds of sand and shale, while land-shells, air-breathing reptiles, and trees show the presence of land. The bark of the trees was the most durable part, and it is not unusual in sandstone to find only a cast of the tree, covered with a thin film of coal, retaining the original markings of the bark. Some blocks of coal are composed of thin layers formed from the bark of trees and nothing else. Beds vary in purity, from coal with less than one per cent of earthy matter to dark-colored shales, with only a trace of coal.

§ 164. When bituminous coal has lost part of its hydrocarbon gas, it is semi-bituminous, as at Blossburg and Broad Top Mountain coal-fields in Pennsylvania; but if the bitumen is all driven off, it is converted into anthracite. At gas-works bituminous coal is put in a retort, and by the application of heat the gas is driven off, leaving a residue of coke; but if the gas is driven off under great pressure, the residuum is anthracite. When coal melts and runs together in the fire, forming a crust which must be broken to give vent to the draft, it is coking coal. Splint-coal or block-coal does not melt and run together, and is therefore dry-burning coal. Cannel-coal burns with a bright flame like that of a candle, from which circumstance it derived its name. Cannel was the pronunciation of candle in Scotland and England, where this coal received its name. Coal containing sulphur is unfit for smelting iron ores in a blast-furnace, and is not suitable for the manufacture of illuminating gas.

§ 165. Bituminous shales frequently contain iron ore disseminated through them, either as a carbonate or sesquioxide, and sometimes forming black-bands. The same layer of shale which constitutes black-band ore at one place will have the ore gathered in balls, arranged in rows, at another place. By chemical affinity the disseminated particles were brought together, and formed into balls or discs; and hence the iron exists in all stages, from fine distribution through the shales to layers of kidney ores, with whitened shales intervening. The iron ores of the Coal Measures are generally hardened mud, charged with iron, or clay-iron stone, and rarely yield more than 40 per cent of iron, and they are not of much value except as they exist around the margin of the Appalachian coal-field in the Lower Coal Measures. No good iron-mines are found in the other coal-basins. The greater part of iron manufactured from these ores has been obtained in Pennsylvania.

§ 166. The first trace of reptiles observed in the Carboniferous System consisted of foot-prints, found in 1841, in the Lower Coal Measures of Horton Bluff, in Nova Scotia. This was followed in 1844 by the discovery of reptilian bones at Saarbruck, and in 1851 to 1853, bones in Nova Scotia, and the land-snail, *Pupa vetusta*. Since that time the discoveries have been numerous. There is no reason to suppose the atmosphere was charged then with any more carbonic acid than it is now; on the contrary, the air-breathing animals prove it was not. The life of plants and animals is controlled by oxygen, and the adaptation of organs is in accordance with its properties. If there was less oxygen in the atmosphere, the membranous reptile lung could not supply the demands of its system, and analogy proves these animals could not have existed in the coal period with a less proportion of oxygen than is required now.

§ 167. The coal-beds and the vegetation of the coal period are usually suffi-

cient to determine the age of the rocks, but some of the invertebrate characteristic fossils of wide geographical distribution are: *Fusulina cylindrica*, *Lophophyllum proliferum*, *Spirifera camerata*, *Productus rogersi*, *P. nebraskensis*, *P. longispinus*, *Chonetes mesolobus*, *Athyris subtilita*, *Spiriferina kentuckiensis*, *Macrodon carbonarius*, *Allorisma subcuneatum*, *Aviculopecten rectilaterarius*, *Pernopecten aviculatus*, *Pinna peracuta*, *Orenipecten retiferus*, *Myalina subquadrata*, *Bellerophon carbonarius*, *Pleurotomaria tabulata*, *P. sphaerulata*, *Macrochilina gracilis*, *M. primigenia*, *M. kansasensis*, *M. carinata*, *Nautilus missouriensis*, *Phillipsia missouriensis*, and *P. sangamonensis*.

CHAPTER XXXIV.

PERMIAN GROUP.

§ 168. This Group was described by Murchison in 1845, in Russia and the Ural Mountains, and named from Perm, in Russia. It was first ascertained in this country by Swallow in 1858, in Kansas, where it has a thickness of 320 feet. Norwood announced its existence in Illinois, and Shumard described it in the Guadalupe Mountains of New Mexico, where it consists of white limestone, having a thickness of 1,000 feet. In Kansas it consists of magnesian limestone, marls, shales, conglomerates, and gypsum; the magnesian character increases southerly to New Mexico. Fossils are abundant on the Cottonwood, with sun-cracks and ripple marks, and sometimes small piles of fossils and fragments appear, as if washed together. It is conformable with the Coal Measures. In Pennsylvania the Upper Barren Measures, having a thickness of 1,000 feet, are referred to it. It is claimed the reptilian remains in Illinois and Texas have shown its existence in those States. It is always unconformable with the rocks above, in this country and elsewhere. Characteristic species are *Pseudomonotis hawni*, *Myalina permiana*, *Bakevellia parva*, *Monotis halli*, and *Pleurophorus subcuneatus*.

§ 169. This Group closes the Palæozoic series, to which this work is chiefly devoted. All the Groups exist in New York and Pennsylvania, except the subdivisions of the Subcarboniferous can not be distinguished, and the doubtful Quebec Group has no existence there. The maximum thickness in these States is about 38,000 feet. Some of the Groups in the Lower Silurian have greater thickness in other States than they have in these two, and the Coal Measures are much thicker in Nova Scotia than they are in Pennsylvania. The whole Palæozoic series in the western ranges of mountains has an estimated thickness of about 40,000 feet.

CHAPTER XXXV.

TRIASSIC SYSTEM.

§ 170. THE Mesozoic era is divided into three grand ages—Triassic, Jurassic, and Cretaceous. The name Triassic was applied to the rocks in Germany, in allusion to a threefold division which they present in that country; but no such division exists in America. Indeed, notwithstanding the vast thickness of the rocks, they have thus far baffled all attempts to divide them into Groups, and, on account of the similarity of the rocks with the Jurassic, and the barrenness of fossils in the eastern exposures, these Systems have not been satisfactorily defined and separated. On the eastern part of the continent they fill synclinal troughs, and have been very much disturbed by intrusive rocks and volcanic action. They generally rest on Laurentian or Taconic strata, and, of course, the bed is always unconformable. But on the western part of the continent they are frequently undisturbed, and spread over great areas of country, resting on unconformable rocks. The Triassic in the Connecticut Valley extends from Northfield, in the northern part of Massachusetts, across the latter State and Connecticut to New Haven, on Long Island Sound, a distance of 105 miles. It fills a synclinal trough, and has its greatest width at the mouth of the Farmington River, which is about 20 miles. The rocks consist of red sandstones, conglomerates, shales, and occasionally impure limestone. The maximum thickness is about 20,000 feet, but the upper 8,500 feet is referred to the Jurassic, leaving 11,500 feet for the Triassic. A great many reptilian tracks, some fish and a few land-plants and fucoids, have been described from these rocks. Much excellent building-stone has been quarried from the sandstone. About 15 miles west of the exposure, on Long Island Sound, there is another exhibit, about 6 or 7 miles long and 2 miles wide.

§ 171. A long trough and great exposure begins at Stony Point, on the Hudson, and extends across New Jersey, Pennsylvania, and Maryland to Culpeper County, Virginia. It has a length of about 350 miles, and, though frequently narrowing to a breadth of 4 or 5 miles, expands in New Jersey to a width of about 36 miles. The general character of the rocks is like those in the Connecticut Valley, and the total thickness on the Delaware River is 27,000 feet, part of which is probably Jurassic. Another range crosses the Potomac near Washington City, and extends 25 or 30 miles beyond Richmond, and another exists 25 miles west of this one. There is a valuable coal-field in this System in Virginia, which is about 26 miles long and 4 to 12 wide. The James River flows through the middle of it, about 15 miles from the northern extremity, while the Appomattox traverses it near its southern border, and on its eastern side it is distant from Richmond about 13 miles. A great many fossil plants have been described from this locality. There are two basins in North Carolina. One begins at Lakeville, and extends about 30 miles south-west to Germantown, being from 4 to 6 miles wide; and the other commences in Granville County, six miles south of Oxford, and extends south-west about 120 miles, reaching 6 miles into South Carolina. Its width is generally about 6 miles, but at the widest part 18 miles. The thickness in some places exceeds 25,000 feet; the area is about 1,000 square miles, nearly one-third

of which contains coal-beds. Very valuable beds of coal and beds of good argillaceous iron ore are distributed through it. Many fossils have been described from these rocks, and among them *Dromatherium sylvestre*, the earliest fossil mammal yet discovered in America. The rocks occur in Nova Scotia, on the north and south sides of Cobequid Bay, from Moose River to the mouth of North River, and on the south side of the Bay of Fundy. Prince Edward's Island, which stretches for 125 miles along the northern coast of Nova Scotia and New Brunswick, consists of rocks of this age.

§ 172. The red beds of the Triassic, consisting of every texture of sandstone and all varieties of red, are distributed almost throughout the Rocky Mountain system from Mexico to the Arctic regions, covering hundreds of thousands of square miles. Fossils have been collected and described from every territory and from nearly every mountain range throughout this vast extent of country. Over extensive areas of country the Triassic rocks are more than a mile in thickness, and bear internal evidence of having been deposited in the depths of the ocean without any mechanical sediment. Not a single species of any organism found in rocks earlier or later than the Triassic have ever been found within it, and very few genera are common to it and rocks of earlier or more recent date.

§ 173. In Colorado and Utah the lower part of the Triassic has been called the Shinarump Group, and the upper part the Vermilion Cliff Group. The rocks of the Shinarump are persistent in their characters for hundreds of miles, and the coloring is strong and deep. They weather into striking architectural forms and terraced buttes. The rocks of the Vermilion Cliff Group are colored a brilliant red, approximating vermilion, or sometimes inclining to orange, and constitute the great cliff-forming series of the West. The Group consists of massive layers of homogeneous sandstone, from 100 to 300 feet in thickness, with shaly layers intervening; the shales disintegrate, and thereby the sandrock is undermined and breaks off vertically. This process, in time, has presented a series of perpendicular walls and sloping taluses. In the West Humboldt Range of Mountains the lower part has been called the Koipato Group, and the upper part the Star Peak Group. The maximum thickness in this region has been estimated at 16,000 feet. The fantastic columns in the "Garden of the Gods" and in Pleasant Park, Colorado, have been weathered out of the sandstones of this System.

CHAPTER XXXVI.

JURASSIC SYSTEM.

§ 174. The Jurassic System was named from the Jura Mountains, of Switzerland. No *Trigonia*, *Belemnites*, *Ammonites*, or specially characteristic fossils of the Jurassic, have been found on the Atlantic side of the continent, notwithstanding the upper part of the rocks described in the last chapter may be Jurassic. The Jurassic fossils, however, occur in the Rocky Mountain Ranges from Mexico to the Arctic regions. The rocks exist in every State and Territory throughout that vast extent of country, varying in thickness from a few hundred feet to 10,000 feet. They follow the Triassic, and generally rest upon it. Fossils have been described from California, Arizona, New Mexico, Idaho, Colorado, Nevada, Montana, Dakota, British Columbia, Cook's Inlet, Alaska, Point Wilkie on Prince Patrick's Land, and the islands north of Grinnell Land. In some parts of its grand geographical distribution it is composed of sandstones and clays, resembling, in appearance, the Triassic; but in others it consists of limestones, sandstones, shales, and clays, indicating shallow water, and bearing no resemblance to the Triassic. The limestones are frequently fossiliferous, and show the progress animal life had made in the ocean, and vegetation had made on the land. Of 50 genera of vertebrates described from the Jurassic, none of them are Palæozoic, and only two have been doubtfully identified in the Cretaceous. *Ammonites*, *Ceratites*, and *Belemnites* made their first appearance in the Jurassic, and became extinct in the Cretaceous. The genus *Spirifer*, so abundant in the Devonian and Carboniferous, became extinct in the Jurassic. Several genera of mammalian remains have been defined from the Jurassic, but they are all peculiar to it. No single species of plant or animal is common to the Jurassic and any other formation. Ten genera of Carboniferous plants have been identified in the Jurassic, and four genera occurring in the Jurassic have been identified in the Cretaceous. There is a general progress among the invertebrates toward succeeding ages, but the evolution of the vertebrates is very much more marked. There is almost universal unconformability with the overlying Cretaceous, and hence there is an era of time not represented by the rocks. It has been called the Reptilian age, because of the gigantic saurians which then infested the seas. Some of the rocks belonging to this System in California, and, especially about Mariposa, are said to be gold-bearing, but minerals are generally very scarce.

CHAPTER XXXVII.

CRETACEOUS SYSTEM.

§ 175. THE name Cretaceous is from the Latin *Creta*, chalk, and was applied to the rocks in Europe long before its use as a geological term. The existence of the Cretaceous on this continent was first ascertained, in 1827, by Morton and Vanuxem. The Cretaceous is found either exposed upon the surface, or covered by the Tertiary, forming a border of variable width on the Atlantic Coast, from New York to Florida. In like manner it occurs everywhere south of the 33d parallel, with the exception of limited areas in the mountain regions. It covers nearly all Mississippi, extends into Tennessee and Arkansas, and reaches Southern Illinois. West of the 97th Meridian, from the 33d parallel to the Arctic Ocean, the whole country is covered with this formation, with the exception of the areas in the mountain regions, exposing older rocks and inconsiderable extensions of land, where it has been swept away, and an area of some magnitude north and west of Hudson's Bay. This includes, of course, the whole extent covered by the Tertiary and more recent deposits. It is found east of the 97th Meridian, extending into Iowa, Minnesota, and some parts of British America. Or, approximately stated, the Cretaceous forms the surface-rock, or is overlaid with the Tertiary and recent strata over nearly half the North American continent, and from the extensive denudation it has suffered, we may fairly presume, at the commencement of the deposit, the land surface was not half its present dimension. In the east and south the formation is exclusively marine, but in the west the marine is succeeded by a brackish-water deposit.

§ 176. Meek and Hayden divided the marine Cretaceous of Kansas, Nebraska, and the great West, in 1861, in ascending order, into the Dakota Group, Fort Benton Group, Niobrara Group, Fort Pierre Group, and Fox Hills Group. The Dakota Group was named from Dakota County, where it consists of sandstones, with alternations of various colored clays, and beds, and seams of impure lignite, silicified wood, and great numbers of leaves of the higher types of dicotyledonous trees, with casts of *Pharella dakotensis*, *Azinæa siouxensis*, and *Cyrena arenaria*. The thickness in that locality is 400 feet, in North-western Colorado 600 feet, and in the San Juan region 1,000 feet. It is the supposed equivalent of the Eutaw Group of Alabama and Mississippi, which has a thickness of about 400 feet and contains beds of lignite.

§ 177. The Fort Benton Group was named from Fort Benton on the Upper Missouri, where it consists of dark-gray, laminated clays, sometimes alternating with seams of limestone. It abounds in *Inoceramus*, *Ammonites*, *Scaphites*, *Nautilus*, and other fossils, and has a thickness of 800 feet.

§ 178. The Niobrara Group was named from Niobrara, in Nebraska, where it consists of marls and limestones, and abounds in *Inoceramus*, *Ostrea*, and remains of fish, and has a thickness of 200 feet. It has an extensive geographical distribution, but rarely exceeds 500 feet in thickness.

§ 179. The Fort Pierre Group was named from Fort Pierre, in Dakota, where it consists of clays containing carbonaceous matter, seams of gypsum, and masses of sulphuret of iron, and abounds in the shells of Cephalopods, Lamellibranchs,

remains of fish and saurians, and has a thickness of 700 feet. In Northern Colorado it is 800 feet thick, and in Alabama and Mississippi it is known as the Rotten limestone, and reaches a thickness of 1,200 feet.

§ 180. The Fox Hills Group was named from Fox Hills, in Dakota, where it consists of gray, ferruginous, and yellowish sandstones, and arenaceous clays, abounding with shells of Cephalopods, Lamellibranchs, Gasteropods, remains of fish and saurians, and has a thickness of 500 feet. East of the Colorado Range its thickness is 1,500 feet, in the valley of Bitter Creek 3,000 feet, and in that of the North Platte 4,000 feet. It is the same as the Ripley Group of North Carolina, Alabama, and Mississippi, which has a thickness of about 400 feet.

§ 181. The thickness of the marine Cretaceous in New Jersey is about 700 feet. It is valued in that State for its fertile marl, and beds of kaolin in its lower part. In Louisiana its thickness is more than 1,000 feet, in the Uintah Mountain region 7,000 feet, and in New Mexico and British America more than a mile at many places. The cañon of San Carlos, on the Rio Grande, exposes a clear perpendicular height above the river level of 1,500 feet of Cretaceous strata. The Cretaceous is the Coal-bearing formation at Vancouver's Island and other points on the Pacific Coast.

§ 182. There is in the West, superimposed upon the marine Cretaceous strata, rocks which were deposited in brackish water, and form transition-beds from the strictly marine condition of the Cretaceous to the epoch of numerous fresh-water lakes, which were scattered all over the country west of the Mississippi, and north in British America to the Arctic regions. These rocks were named in 1861, by Meek and Hayden, the Fort Union Group. They consist of beds of clay and sand, with numerous seams and local deposits of lignite and beds of coal. The passage from the marine to the brackish-water deposits, and from the latter to the fresh-water deposits, is without abrupt change in the sediment, and with complete conformability. There is no evidence of any important physical or climatic change, beyond the gradual filling up of the basins of the sea and the recession of the salt and brackish water, appearance of fresh-water lakes, and their gradual disappearance. The Fort Union Group has been called the Judith River Group, the Bitter Creek Group, the Bear River Group, the Laramie Group, and by divers other names. It has a thickness, in Bitter Creek Valley, Wyoming, of 6,000 feet, and in Bear River Valley, in Utah, of 7,000 feet. Its geographical distribution extends for a thousand miles in length, and a maximum width of 500 miles or more, with a varying thickness from 100 feet or less, to 7,000 feet or more. It abounds in plants belonging to Eocene genera, which connect the Cretaceous and Tertiary flora by insensible degrees, while the Dinosaurian remains demonstrate its Cretaceous age.

§ 183. Before the discovery of this Group, absolute nonconformability was supposed to exist between Cretaceous and Tertiary rocks, and this is the case where marine Tertiary follows the marine Cretaceous, wherever known in the world. But here, where the marine Cretaceous is as recent as elsewhere, and the continuance of the period is represented by brackish-water deposits, and then fresh-water deposits in lakes cut off from the ocean, the rocks are conformable, and the vegetable and animal kingdoms show the slow progress of advancing ages. About one-third of the genera of plants belonging to that period have become extinct, but the living plants; *Corylus americana*, *C. rostrata*, *Davallia tenuifolia*, and *Onoclea sensibilis*, have

been identified from the Fort Union Group, thus specifically uniting the Cretaceous era with the present time. It is possible, too much confidence in this identification may lead to error, and better specimens may show specific distinctions; but it is an important fact, they so closely resemble the living forms as to be mistaken for them, and show how closely the living are connected with the ancient dead. Among the Cretaceous genera of invertebrates, about one-third survive; three genera of reptiles, *Crocodylus*, *Trionyx*, and *Emys* survive; but no genus of birds or mammals has come down from that age to the present. There is no great break or chasm discoverable in vegetable or animal life in passing back to the Cretaceous era. No sudden physical change has taken place over which some deposit may not furnish a connecting bridge. No evidence of any great climatic change is furnished, either in the animal or vegetable world, but on every hand we are encouraged to look at uniformity in the organisms, subject only to a constant, almost imperceptible evolution. Seams of productive coal occur at different places in this Group.

CHAPTER XXXVIII.

TERTIARY SYSTEM.

§ 184. THE organic remains of the Tertiary are so completely blended with the living, that no Quaternary age or period can be distinguished. The words Primary and Secondary have become quite obsolete in Geology, while Tertiary is so interwoven with the science as to be permanently fastened to the nomenclature, notwithstanding its definition, as the third age, has no application to the period to which it relates. The subdivision of the Tertiary, with reference to the survival of conchological species into Eocene, Miocene, Pliocene, and Post-pliocene, brings us to the living species as gradually as the species change within any of the subdivisions of geological time, or within any division of the strata into Groups. The Tertiary rocks generally consist of marls, clays, sands, or other friable material, filling depressions in the underlying rocks, and, though widely distributed, seldom form hard, continuous strata. This condition of the rocks made it difficult to determine the order of superposition, until a comparison of the shells had been made with living species. This comparison led to the naming of the rocks containing about 3 or 4 per cent of living species, the Eocene, which signifies the dawn of the present state of things; those containing 15 to 20 per cent of living species, the Miocene, which implies less recent; and those containing 90 to 95 per cent of living species, the Pliocene, which means more recent; and those having all the imbedded fossil shells identical with living species, though containing extinct mammalian remains, Post-pliocene. Instead of determining the rocks by the per cent of living species, the contrary course is now adopted, and the age is determined by the extinct species. Certain species are regarded as types of Eocene age, or Miocene, as the case may be, and from the presence of these the rocks are referred to the proper Group. This subdivision of the Tertiary, with reference to the survival of conchological species and the division into geographical Groups, have made a double system of nomenclature.

§ 185. The marine Eocene, commencing in New Jersey with a thickness of 37 feet, and exposing only a narrow surface area, crosses Maryland by way of Fort Washington; Virginia, by way of Fredericksburg, Richmond, and Petersburg; North Carolina, by way of Newbern and Wilmington; South Carolina, by way of Charleston and Shell Bluff, on the Savannah River; Georgia, by way of Milledgeville; Alabama, by way of Claiborne; and Mississippi, by way of Jackson and Vicksburg. In South Carolina it consists of loose sand, clay, gravel, sandstone, limestone, and marl, covers a large area, and has a thickness of 1,100 feet. It is divided into the Buhrstone Group, Santee beds, and Ashley and Cooper beds. It is exposed in Florida, and reaches up into Tennessee, where it is called the Porter's Creek Group. Conrad subdivided it in Alabama and Mississippi, where it has a thickness of about 900 feet, into the Claiborne Group, Jackson Group, St. Stephen's Group, and Vicksburg Group. It crosses Louisiana, appears in Arkansas, and offers numerous exposures in Texas, Mexico, and California. It is extremely fossiliferous at many places, and nowhere conformable with the underlying rocks.

§ 186. The gradual elevation of the western ranges of mountains through Cretaceous and Tertiary time, the formation of bays and arms of the sea, and lakes which have drained themselves in continuing succession, have linked the Tertiary with the Cretaceous, and bound the Eocene, Miocene, Pliocene, and Post-pliocene with the present, almost as one connected age. In these lake regions the Eocene is divided into the Wahsatch Group, Green River Group, Bridger Group, and Brown's Park Group, and there are numerous synonyms for each one of them. The Wahsatch is characterized by its brick-red color, and has a thickness of 8,000 feet; the Green River Group is quite fossiliferous, and has a thickness of 7,500 feet; the Bridger Group rests conformably on the Green River, consists of Bad Land sandstones, limestones, shells, and marls, and has a thickness of 2,000 feet; and the Brown's Park Group has a thickness of 2,500 feet. The combined thickness of the Eocene in the Western Territories is therefore 20,000 feet.

§ 187. The marine Miocene beginning at Martha's Vineyard, though it may exist as far north as Maine, crosses New Jersey through Cumberland County, and forms a border upon the east and south of the Eocene exposure a large part of the way to the Mississippi River, and west across Louisiana, Texas, and Mexico. It is not conformable with the Eocene, and in some parts does not intervene between it and later deposits. It has its greatest thickness in California, where it exceeds 3,000 feet. The Coast Range of mountains is composed in large part of strata of this age, and hence its elevation has been since the Miocene period. It is highly fossiliferous, and the shells generally belong to living genera, and many of the species still survive in the waters bordering the adjacent coast, thus indicating no material change in the climate since that period. The Miocene lake deposits, like the Eocene, cover great extensions of Territory and reach an enormous thickness. In Nebraska it has been divided into the Wind River Group, which has a thickness of 2,000 feet, and the White River Group, which has a thickness of 1,000 feet. On the divide between the Arkansas and South Platte, where the thickness is from 1,500 to 2,000 feet, it is called the Monument Creek Group, and in Oregon it is called the Truckee Group.

§ 188. The marine Pliocene strata are found in Maryland, superimposed upon the Miocene, in South Carolina, upon the Eocene, and generally forming a narrow border at the east of these outcrops on the Atlantic coast, and a wider border on

the south adjoining the Gulf Coast. Fossil shells of species now living on the adjacent coast, abound at every point, and demonstrate beyond reasonable doubt the climate and the waters on the eastern and southern coast of the United States, and in California, were then the same that now prevails. There is no palæontological evidence, so far known, that the Pliocene climate was different from the present on this continent, and as the outlines of the continent were then nearly as they are now, no material difference can be inferred. The Pliocene graduates into the Post-pliocene, so that separation of the strata frequently becomes impracticable, and an arbitrary approximating line for separation is assumed. The Pliocene lake deposits in Nebraska, are called the Loup Fork Group, and have a thickness of 400 feet and cover a great extent of territory, and in North-western Kansas have a thickness of 500 feet. In Wyoming they have a thickness of 1,500 feet, and are called the Niobrara Pliocene. In Bear River Valley they are called the Salt Lake Group and the Cache Valley Group, and the thickness is from 500 to 1,500 feet.

§ 189. The Post-pliocene is represented by marine deposits on the coast, and by drift, sand, and gravel, in the middle part of the continent. In South Carolina it is confined to a belt along the coast 8 or 9 miles wide, and the fossil shells are those of species inhabiting the coast. In Los Angeles Valley, in California, the thickness is 500 feet; but where depressions upon the coast have been filled the thickness may be 1,000 or 1,500 feet, and so at the mouths of rivers where a delta has been formed, as at the mouth of the Mississippi, the Post-pliocene becomes of very great thickness. There are some Lake deposits of this age in the great West, which have a thickness of 500 feet or more. The marine Post-pliocene is usually conformable with the Pliocene, and graduates into the present deposits without disturbance. In South Carolina the bones of horses, hogs, dogs, rabbits, beavers, tapirs, and other mammals occur in the layers of blue mud and sand throughout the period. At some time during this age, man made his appearance on this continent, for none of his work is found preceding it, nor preceding the drift; but his stone implements are associated with the remains of the mastodon and mammoth, and such animals as survived the drift period in such condition as to show they lived at the same time.

§ 190. During the Post-pliocene era, a portion of the country about Hudson's Bay was submerged by the ocean, as shown by the fossiliferous marine sands and clays occurring at 300 or 400 feet above the present level of the ocean. The rocks, too, are striated in all directions, as if done by icebergs or shore-ice holding angular fragments of rock. The New England States and New Brunswick, and that portion of Canada south of the St. Lawrence River and east of the vicinity of Montreal, was submerged, with the exception of the mountain elevations. Several beaches are shown at Murray Bay 90 miles below Quebec, varying from 30 to 326 feet above the bay; like beaches occur at Montreal and at various other places in this part of Canada. All these deposits abound in marine fossils belonging to living species in the Gulf of St. Lawrence and on the near coast of the Atlantic. The surface of the rocks below these deposits is polished and striated in the direction of the St. Lawrence Valley. Like phenomena occur over New Brunswick and the New England States, and extending as far south as the mouth of the Hudson; but they appear on no other part of the continent. These deposits contain no terrestrial or fresh-water fauna, and, so far as the marine life is concerned, connect the lowest of the clays with the present time by an unbroken chain of animal existence.

§ 191. South of the Laurentian Mountains the surface of the rocks beneath the boulder clay is striated in the direction of the valleys, but there is no connection between these and those occurring north of the mountains in the Hudson's Bay region. The force which produced the scratches did not cross the mountains nor exist upon them. Prof. Dawson has proven the bodies which produced them came from the Atlantic Ocean, and following up the St. Lawrence drifted to the south, at various angles, some floating over New Brunswick, and others over Maine, and others through Lake Champlain, and re-entering the Atlantic Ocean by the Hudson River, while others were driven beyond Montreal into the mouth of the Ottawa River. In New Brunswick the striæ are related to the contour of the surface of the land, and conform to the direction of the river valleys. A south-easterly course prevails in the western part of Charlotte County, and a south-western course in the valleys east and north-east of St. John. A map of Maine showing the course of the rivers will show the course of the striæ. The appearance of the surface geology of this State early suggested the fact that a great rush of waters poured over it from a northerly source, and transported by its power the surface *débris* which had accumulated in earlier ages by subaerial forces, and large masses of rock from parent ledges, and deposited them in regions more or less distant from the several sources; and as they passed along they striated and grooved the rocks against which they impinged, or over which they rubbed in the traveled course. The striæ conform to the valleys as a rule, and therefore have their courses in all directions, though some are found deflected at right angles to their original course. The Katahdin Mountains formed an obstruction around which the striating agency operated, but it did not cross the summit. The striæ occur on the north side of the mountains, but not upon the south side. In Vermont, New Hampshire, Massachusetts, and Connecticut, beneath the drift, sand, gravel, boulders, and clay, the surface of the rocks is grooved and furrowed in a general southern direction, though varying with the contour and course of the valleys. At the Island of New York the current swept from the north-west to the south-east, and the furrows are most strongly marked on the north-western slopes of the hills, and least on the south-eastern. In many instances they are very distinct on the western and north-western slopes, extending to the highest point of the rocks; but no traces exist on the eastern and south-eastern slopes, although both slopes are equally exposed. The striæ are most numerous in the middle part of the island, somewhat less in the western, and least in the eastern, showing the current was deflected southward in the middle part of the island. Throughout all this area south of the Gulf of St. Lawrence and the St. Lawrence Valley, we have, in the striæ and furrows and in the distribution of clay, boulders, gravel, sand, and fossils, the evidence of an overflow of the whole country, except the higher hills and mountains, the overflow resulting from subsidence of the coast, and the evidence that the Arctic current, instead of leaving the coast on approaching the mouth of the gulf, as it does now, flowed into the gulf and across the depressed New England area, transporting its fields of ice, which grounded upon the northern slopes of hills and mountains, and rubbed the rocks in the valleys and plains wherever the surface soil and subaerial accumulations were swept off by the grinding weight of a mass, driven by a current through water too shallow to float it. In the Gaspé Peninsula, ocean-terraces and stratified clay, containing marine testacea, occur at the height of 600 feet above the sea. In the Champlain region of Ver-

mont, and the triangular area of 9,000 square miles extending from there to the Ottawa Valley, the marine fossiliferous clays and sand occur at all elevations, as high as 500 feet. They form a coating for New Brunswick, and a continuous belt on the coast of Maine 150 feet above the ocean. The marine species in these clays and sand are such as live at moderate depths, or varying from the littoral zone to 200 fathoms. The submergence must therefore have been much more than 600 feet, because the shells and bones must have had some depth of water, as well as the clay, to protect them, in order to produce the fossilization, and they received a covering of drift materials sufficient to protect them from the ocean currents, which then swept over that region, and the disintegrating and denuding agencies which have prevailed during the long train of centuries that have since elapsed.

§ 192. The fresh-water drift surrounds the great central lakes of the continent, spreads out over a large country in British America, and overspreads part of each of the States in the Valley of the Mississippi. This drift consists of clays, gravel, bowlders, and sand, containing no marine organisms, but bearing land vegetation which now flourishes in the same latitude, and fresh-water shells and the bones of terrestrial animals of the Post-pliocene age. There are beaches surrounding the lakes which show the lakes have occupied much higher levels than they now do, and were stationary for a time at each of these beaches. The terraces and lake deposits of sand and clay in Wisconsin show that Lake Superior stood 600 feet higher than it does now, at one time, in the Post-pliocene age, at which time it could have overflowed nearly the whole country south of it to the Gulf of Mexico. These terraces and lake deposits occur at different elevations surrounding Lakes Michigan, Huron, Erie, and Ontario, showing they were elevated as high as Lake Superior during this period. They have been noticed 750 feet higher than Lake Ontario. Here was then one grand central Post-pliocene lake, several times as large as all of them combined are now. Upon the shores of this lake angular rocks were rolled into bowlders and beaten down to gravel and sand, that formed beaches and terraces, which were subsequently swept south by the overflowing lake, and spread over Western Ohio, Western Kentucky, nearly all of Michigan, Indiana, Illinois, and Mississippi, and the eastern part of the States bordering the Mississippi River on the west. Large bowlders are spread over these States south as far as the Ohio River, though they gradually diminish in size in that direction, and soon the gravel disappears, and only the finer materials are spread over Mississippi and reach to the Gulf. Beneath these clays and sands, where the rocks were denuded of their subaerial *débris*, the surface is frequently scratched and furrowed. This is especially the case where the higher lands were overflowed. The scratches and furrows appear to have been made by shore-ice on the margin of the lake or lakes when occupying different elevations, and by ice carrying angular rocks and bowlders, that were driven against the shores or shallow places. They bear in all directions, and frequently cross each other, which proves they could not have been made by one body, or by any number of bodies moving in the same direction.

§ 193. Commencing in the lower tier of counties in New York, where the hills are from 600 to 800 feet above the level of the narrow valleys, and extending south over all the highlands of Pennsylvania, Virginia, West Virginia, the Carolinas, Georgia, Alabama, Eastern Kentucky, and Tennessee, and south to the Gulf of Mexico, there is an absolutely driftless area, and the surface rocks are free from

scratches and furrows. It was dry land, and much of it high and mountainous, when the marine clays and sands were strewn over the territory adjacent to the Gulf of St. Lawrence and the New England States, and dry land during the period of the drift of the central part of the continent, and for geological ages antecedent thereto. The precipitous ledges and profound valleys of denudation, the overhanging rocks and castellated outliers, furnish incontestable evidence of the ordinary eroding agencies through a period of time commencing anterior to the Tertiary epoch. There are extensive driftless areas in Eastern and Southern Ohio free from scratches and furrows on the surface rocks, and from drift, sand, gravel, and boulders, and they are characterized by outliers, monument rocks, sharp ridges, and rugged scenery. The drift materials extend from the lakes to the sources of the rivers that flow into the Ohio, and over more or less of the land intervening between the head-waters; but below this they occur only in the valleys of the larger rivers. Wherever the valley was large enough to carry off the flow of water from the north, the adjacent land was not overflowed, and the height of the water in the valley is marked by river terraces. In Eastern Ohio, only those rivers having their sources in the central and northern part of the State have river terraces, as the Scioto, Hocking, and Muskingum, while the smaller tributaries, such as Raccoon, Shade, and little Muskingum, have not a vestige of drift, or scratch, or furrow, from their sources to the Ohio. The Ohio River Valley was large enough to carry off the water that flowed across Ohio and Indiana, and hence no drift crossed the valley until it reached the western part of Kentucky. Throughout the drift area of Ohio, Indiana, and Illinois, it is common in excavations below the drift to find an ancient soil of vegetable mold resting upon stratified rocks in place. Beech, sycamore, hickory, and cedar have been found where they grew prior to the drift; but beneath the ancient soil no striated or furrowed rock has ever been discovered.

§ 194. There is a driftless area in the south-western part of Wisconsin, covering about 13,000 square miles, or nearly one-fourth of the State, and which extends into Northern Illinois, North-eastern Iowa, and Eastern Minnesota. There is no drift, sand, clay, or gravel, and, as in all cases where these do not occur, there are no scratches or furrows on the surface of the rocks. This area was not overflowed by the lake, and is a region of narrow, ramifying valleys, narrow, steep-sided, dividing ridges, whose directions are toward every point of the compass, and whose perfectly coinciding horizontal strata prove conclusively their subaerial erosion. The ravines are all in direct proportion to the relative sizes of the streams in them. North and east of this driftless area, from 25 to 75 miles, there is a scantiness of drift and numerous outliers, attesting the ordinary effects of erosion. The "Stand Rock," in the dells of the Wisconsin, the isolated ridges and peaks in the central part of the State, rising from 100 to 300 feet abruptly from the low ground around them, and composed of horizontally stratified sandstone, or of sandstones capped with limestone, prove the regular erosion for ages, and are quite inconsistent with any single mechanical eroding power that must have operated upon the whole country alike. In Dakota County, Minnesota, there is an outlier of the St. Peter's sandstone known as "Lone Rock," whose summit is 100 feet higher than the surrounding country, and from which many other outliers are in view; and yet in the valleys the drift prevails and boulders abound. In Wabasha County, the "Twin Mounds," and in Olmsted County the "Sugar Loaf Mound" and the "Lone Mound," attest in like manner

the continuing erosion since Silurian times. The two lonely towers in the valley of the south branch of Root River, in Fillmore County, known as "Eagle Rocks," rise as high as the rocky walls of the valley, and evidence subaerial erosion, but are inconsistent with the idea that any large body of ice ever passed down the valley or across it.

§ 195. There is no drift in California, nor on the Pacific Coast as far north as British Columbia and Alaska. There are no indications of it in the Rocky Mountain regions, or upon the great plains of the West. There are no such exhibitions of scratched and grooved rocks succeeded by fossiliferous marine clays and sands, with boulders, as occur in the New England States and St. Lawrence region, nor of scratched rocks and ancient soils succeeded by clay, sand, and gravel, with boulders, as occur in the central part of the continent; but, on the contrary, the whole country west of the Mississippi Valley is absolutely driftless, except as to local drift produced upon the shores of Tertiary lakes, and more or less distributed by the rivers that, in the course of time, cut out the cañons which drained them. On the borders of the ancient lakes and rivers there are terraces, marking shore-lines at various places from Mexico to Alaska, but they are standing monuments to disprove the existence of a continental ice-sheet; for no one can conceive of the movement of a heavy body of ice across a valley without disturbing the graveled terraces that border upon both sides at different elevations. The natural towers that stand as evidence of erosion from the Wahsatch times to the present; from the Green River Eocene to the present; from the Bridger Eocene to the present; from the White River Miocene to the present; the columnar masses, irregular pyramids, sandstone towers, and turreted outliers of the Bad Lands of Colorado, Wyoming, Montana, Dakota, and British Columbia; the monuments on Monument Creek; the Garden of the Gods; the buttes in all the mountain chains; the transverse ridges, lone mountains, and exalted peaks; and the whole array of cañons from Texas and Mexico to Alaska,—all alike tell us, in language unmistakable, that no glacial sheet ever moved south upon the western plains or mountain ranges.

§ 196. Indeed, there is no evidence a glacial sheet ever existed on any part of the continent; none that gives any warrant to the hypothesis of a glacial period. On account of the valleys, hills, and mountains, no glacial sheet could move; and if one had ever existed, the waters flowing from it would have cut out channels of such dimensions they could have been not only traced, but their dimensions would have been such they could not be mistaken for any of the valleys now existing. Had there been a glacial period, northern plants and shells would be found occupying their places as far south as Florida, Louisiana, and Texas. But, on the contrary, no such flora or fauna is found farther south than it now exists, while the present flora and fauna occur in the same latitude throughout the Post-pliocene age, and passing back through earlier ages, unmolested by any visible climatic changes. The scratches and furrows so often cited as evidence of the glacial period do not exist upon the mountains, but occur only in the valleys and lower lands that were overflowed by water; and in these valleys there are now standing lone rocks and outliers that a glacier moving in the valleys would necessarily have swept away. The scratches and furrows are readily accounted for without the hypothesis of a glacial period; and on account of their position on the northern side of the higher elevations of land and not upon the southern, and their universal course up the

valleys from the lakes without regard to the direction of the valleys, they can not be accounted for as glacial phenomena, for they are wholly inconsistent with it. The glacial epoch is a theoretical blunder, not supported by scientific facts or intelligent reasoning, and contrary to all geographical, geological, and palæontological information. There is no such geological period, and no gap into which it can possibly be injected.

CHAPTER XXXIX.

NOMENCLATURE.

THE rules of nomenclature are, with few exceptions, firmly established. They have resulted from years of experience and reflection, and tend to secure fixity and convenience in the designation of animals and plants. *Each animal and each plant has a name consisting of two words—the first generic, and the second specific. This is called the binomial system, or Linnæan method of nomenclature. The genera are arranged in families, the families in orders, the orders in classes, and the classes in subkingdoms. These divisions are sometimes further separated into sections or intermediate groups, often distinguished by the prefixes *sub* and *super*.

Linnæus first consistently applied the binomial system of nomenclature to all classes of organisms in 1758, in the 10th edition of *Systema Nature*; but he applied it to botany in *Species Plantarum*, published in 1753. It had been used intermittingly by earlier authors. Naturalists have generally adopted 1753 as the starting-point for the binomial system in botany, and 1758 for zoology, or, without reason, the 12th edition of *Systema Nature*, published in 1766. It can make no difference in palæontology which is regarded as the starting-point, for the last precedes the science. The names in the binomial system assume the Latin form by taking a Latin termination.

DENOMINATION OF HIGHER GROUPS THAN GENERA.

The names of groups higher than genera are usually taken from some of the principal characters. They are expressed by single words of Greek or Latin origin, in which a certain harmony of form and termination is preserved for groups of similar nature; as, Phanerogamæ, Cryptogamæ; Cephalopoda, Gasteropoda.

Compounds of Greek and Latin words are not allowable. In cryptogamic botany, ancient names of families, such as *Musci* and *Filices*, have been employed as names of classes or sub-classes. Botanical cohorts or sub-cohorts are designated by the name of one of their principal families, with the termination *ales*.

The families in botany are designated by the name of one of their principal genera, with the termination *aceæ*, as *Rosa*, *Rosaceæ*; *Ranunculus*, *Ranunculaceæ*. To which there are the following exceptions: 1. When the genus from which the

*NOTE.—See Report of the 12th Meeting of the British Association for the advancement of Science, held at Manchester in June, 1842, Reprinted Cin. Quar. Jour. Sci., Vol. I, p. 351; Report of the British Association at Birmingham, in 1865, and Report of the Committee (W. H. Dall) on Zoological Nomenclature, to section B. of the American Association for the Advancement of Science, at the Nashville Meeting in 1877. The authorities are quite fully cited in the latter report.

name of the family is taken ends in Latin with *ix* or *is* (genitive *icis*, *idis*, or *iscis*), the termination *iceæ*, *ideæ*, or *ineæ* is permitted; as, *Salix*, *Salicineæ*; *Berberis*, *Berberideæ*; *Tamarix*, *Tamariscineæ*. 2. When the genus from whence the name of the family is derived has a name of inconvenient length, and there is not a tribal name in the family formed from the same generic name, the termination *ææ* is admitted; as, *Dipterocarpeæ*, from *Dipterocarpus*. 3. For some very large families universally known under their exceptional names, the ancient designation is preserved; as, *Crucifereæ*, *Compositæ*, and *Gramineæ*. 4. An old generic name no longer preserving that rank, but applied only to a section, or even a species, may be maintained as the base of a family name; as, *Hippocastaneæ*, from *Aesculus hippocastanum*.

Botanical sub-families are formed from the name of one of the genera contained in them, with the termination *ææ* or *ineæ*, and also the names of tribes and sub-tribes which take the termination *ææ*; as, *Roseæ*, from *Rosa*.

The names of zoological families are formed by adding the termination *idæ* to the earliest known, or most characteristic genus contained in them; and of sub-families by adding the termination *inæ*; as, *Terbebratula*, *Terebratulidæ*; *Strix*, *Strigidæ*, not *Strixidæ*; *Buceros*, *Bucerotidæ*, not *Bucerosidæ* or *Buceridæ*. The *i* in *idæ* is short; but in *inæ* it is long.

Names of higher rank than genera are not rigidly subject to the law of priority, because their limits fluctuate with the advancement of science, and changes are therefore allowable when newly discovered facts have made the name erroneous. And when a genus from whose name a family name has been taken, is removed to another family, the family name may be dropped, and a new one may be coined for the remaining genera.

ORTHOGRAPHY.

The rules of Latin orthography must be adhered to. Greek names are Latinized by substituting for the Greek letters their Latin equivalents, according to the following table:

α	=	a;	($\beta\eta\tau\alpha$)	Beta.
β	=	b;	($\beta\rho\alpha\chi\acute{\iota}\omega\nu$)	Brachium.
γ	=	g;	($\gamma\lambda\omega\sigma\sigma\alpha$)	Glossa.
δ	=	d;	($\delta\iota\psi\acute{\alpha}\varsigma$)	Dipsas.
ϵ	=	e;	($\delta\alpha\lambda\acute{\epsilon}\nu\varsigma$)	Hyalæa, not Hyalæa.
ζ	=	z;	($\zeta\acute{\iota}\zeta\upsilon\phi\omicron\nu$)	Zizyphus, Zizyphinus.
η	=	e;	($\pi\epsilon\iota\rho\acute{\eta}\nu\eta$)	Pirena, not Pirina.
η final	=	a;	($\pi\epsilon\iota\rho\acute{\eta}\nu\eta$)	Pirena, not Pirene.
θ, θ	=	th;	($\tau\eta\theta\acute{\upsilon}\varsigma$)	Tethys; ($\theta\acute{\epsilon}\tau\iota\varsigma$) Thetis.
ι	=	i;	($\beta\alpha\lambda\acute{\iota}\upsilon\varsigma$)	Balia, not Balea.
κ	=	c;	($\iota\pi\omicron\kappa\rho\acute{\rho}\eta\nu\eta$)	Hippocrena, not Hippochrenes.
λ	=	l;	($\phi\upsilon\lambda\lambda\acute{\iota}\varsigma$)	Phyllis.
μ	=	m;	($\mu\acute{\epsilon}\lambda\alpha\varsigma$)	Melas.
ν	=	n;	($\pi\epsilon\iota\rho\acute{\eta}\nu\eta$)	Pirena.
ξ	=	x;	($\xi\acute{\epsilon}\nu\omicron\varsigma$)	Xenus, Xenophora.
\omicron, ω	=	o;	($\phi\omicron\rho\acute{\omicron}\varsigma$)	Phorus; ($\pi\tilde{\omega}\mu\alpha$) Poma.
π	=	p;	($\pi\omicron\tau\alpha\mu\acute{\omicron}\varsigma$)	Potamus.

ρ	=	r;	(πτερόν)	Pterum.
ρρ	=	rrh;	(φυλλίρ-βοή)	Phyllirrhoa, not Phyllirhoe.
σ, ς	=	s;	(γλωσσός)	Glossus.
τ	=	t;	(πτερόν)	Pterum.
υ	=	y;	(ύβός)	Hybolithus, not Hibolites.
φ	=	ph;	(φορός)	Phorus.
χ	=	ch;	(χοχλίας)	Cochlias.
ψ	=	ps;	(ψάμμος)	Psammus.
αι	=	æ;	(λιμναῖος)	Limnaea, not Limnea.
αυ	=	au;	(γλαυκός)	Glaucus.
ει	=	e;	(τείνω)	Exotenobranchia.
ἔι	=	i;	(χεῖλος)	Chilostoma, not Cheilostoma.
ευ	=	eu;	(εὐρος)	Eurus.
φι, οι	=	oe;	(δίς, οίξω)	Dioeca, not Dioica.
ον final	=	um;	(εφίπκιον)	Ephippium, not Ephippion.
ος final	=	us;	(ομφαλος)	Euomphalus, not Euomphalos.
ου	=	u;	(λουτήριον)	Luterium, not Lotorium.
γγ	=	ng;	(αγγαρεία)	Angaria.
γχ	=	nch;	(ἀγχωστόμα)	Anchistoma, not Angistoma.
γξ	=	nc;	(ἀγκιστρον)	Ancistrodon, not Agkistrodon.
ῥ	=	rh;	(ρέα)	Rhea.
ῥ	=	h;	(ερμαία)	Hermæa, not Ermæa.

It follows therefore, that *Buthotrephis* must, according to the laws of etymology, be spelt *Bythotrephis*; *Xenophasia*, instead of *Zenophasia*; *Pæocephala*, instead of *Poiocephala*. In Latinizing modern words where the rules of classic usage do not apply, the etymology must be preserved, even though it includes letters and combinations unknown in Latin; thus, *woodwardi*, instead of *vudvardi*; *knighti*, instead of *cnichti*; *bullocki*, instead of *bullocci*; *eschscholtzi*, instead of *essolzi*; *nebraskensis*, instead of *nebrascensis*. But words of barbarous origin should be rendered as classical in appearance as is consistent with the preservation of their original sound; as, *tocous*, instead of *tockus*; *ansure*, instead of *ansuree*; *argunda*, instead of *argoondat*.

In Latinizing proper names and converting them into specific ones, they assume a distinctive character, which they did not before possess. The rule is to use the termination *us*, genitive *i*, when the name ends with a consonant; as, *Miller*, *milleri*. But when it ends in a vowel, *ius*, genitive *ii*; as, *Moore*, *moorii*. This rule is often violated, but it would be much better strictly to adhere to it.

PRIORITY.

It is of the highest importance that we retain the first defined and illustrated names of genera and species. The British Association said:

“It being admitted on all hands that words are only the conventional signs of ideas, it is evident that language can only attain its end effectually by being permanently established and generally recognized. This consideration ought, it would seem, to have checked those who are continually attempting to subvert the established language of Zoology, by substituting terms of their own coinage. But, forgetting the true value of language, they persist in confounding the *name* of a species or

group with its *definition*; and because the former always falls short of the fullness of expression found in the latter, they cancel it without hesitation, and introduce some new term which appears to them more characteristic, but which is utterly unknown to the science, and is therefore devoid of all authority. If those persons were to object to such names of men as *Long, Little, Armstrong, Golightly*, etc., in cases where they fail to apply to the individuals who bear them, or should complain of the names of *Gough, Lawrence, or Harvey*, that they were devoid of meaning, and should hence propose to change them for more characteristic appellations, they would not act more unphilosophically or inconsiderately than they do in the case before us; for, in truth, it matters not, in the least, by what conventional sound we agree to designate an individual object, provided the sign to be employed be stamped with such an authority as will suffice to make it pass current. Now, in Zoology, no one person can subsequently claim an authority equal to that possessed by the person who is the first to define a new genus or describe a new species; and hence it is that the name originally given, even though it may be inferior in point of elegance or expressiveness to those subsequently proposed, ought as a general principle to be permanently retained. To this consideration we ought to add, the injustice of erasing the name originally selected by the person to whose labors we owe our first knowledge of the object; and we should reflect how much the permission of such a practice opens a door to obscure pretenders for dragging themselves into notice at the expense of original observers."

"The name originally given by the founder of a group, or the describer of a species, should be permanently retained to the exclusion of all subsequent synonyms."

"As the number of known species which form the ground-work of zoological science is always increasing, and our knowledge of their structure becomes more complete, fresh generalizations continually occur to the naturalist, and the number of genera and other groups requiring appellations is ever becoming more extensive. It thus becomes necessary to subdivide the contents of old groups, and to make their definitions continually more restricted. In carrying out this process, it is an act of justice to the original author that his generic name should never be lost sight of, and it is no less essential to the welfare of the science, that all which is sound in its nomenclature should remain unaltered amid the additions which are continually being made to it."

"A generic name, when once established, should never be canceled in any subsequent subdivision of the group, but retained in a restricted sense for one of the constituent portions."

"When a genus is subdivided into other genera, the original name should be retained for that portion of it which exhibits in the greatest degree its essential characters as at first defined. Authors frequently indicate this by selecting some one species as a fixed point of reference, which they term the 'type of the genus.' When they omit doing so, it may still in many cases be correctly inferred that the *first* species mentioned on their list, if found accurately to agree with their definition, was regarded by them as the type. A specific name or its synonyms will also often serve to point out the particular species, which by implication must be regarded as the original type of a genus. In such cases we are justified in restoring the name of the old genus to its typical signification, even when later authors have done otherwise."

“The generic name should always be retained for that portion of the original genus which was considered typical by the author.”

“*Example.*—The genus *Picumnus* was established by Temminck, and included two groups, one with four toes, the other with three, the *former* of which was regarded by the author as typical. Swainson, however, in raising these groups at a later period to the rank of genera, gave a new name, *Asthenurus*, to the *former* group, and retained *Picumnus* for the *latter*. In this case we have no choice but to restore the name *Picumnus* Tem., to its correct sense, canceling the name *Asthenurus* Sw., and imposing a new name on the three-toed group which Swainson had called *Picumnus*.”

“When no type is indicated, then the original name is to be kept for that subsequent subdivision which first received it.”

“When the evidence as to the original type of a genus is not perfectly clear and indisputable, then the person who first subdivides the genus may affix the original name to any portion of it at his discretion, and no later author has a right to transfer that name to any part of the original genus.”

“When an author infringes the law of priority by giving a new name to a genus, which has already been properly defined and named, the only penalty which can be attached to this act of negligence or injustice, is to expel the name so introduced from the pale of science.”

“When two authors define and name the same genus, both making it exactly of the same extent, the later name should be canceled *in toto*, and not retained in a modified sense.”

“No special rule is required for the cases in which the later of two generic names is so defined as to be *less extensive* in signification than the earlier; for if the later includes the type of the earlier genus, it would be canceled by the operation of the rule that the generic name should always be retained for that portion of the original genus which was considered typical by the author.”

“If the later name be so defined as to be equal in extent to two or more previously published genera, it must be canceled, *in toto*.”

“A genus compounded of two or more previously proposed genera, whose characters are now deemed insufficient, should retain the name of one of them. If these original generic names differ in date, the oldest one should be the one adopted.”

The committee on zoological nomenclature, appointed by the American Association for the Advancement of Science, said:

“A change in the diagnostic characters, or a revision which carries with it the exclusion of certain elements of a group, or the inclusion of new elements, does not authorize the change of the name or names of a group.”

“When a group or genus is divided into two or more groups, the original name must be preserved and given to one of the principal divisions. The division including the typical species of the primitive genus, if any type had been specified, or the oldest, best known, or most characteristic of the species originally included when the primitive genus was first described by its author, is the portion for which the original name is to be preserved. If there is no section specially so distinguished, that which retains the larger number of species should retain the old name, but the latter can not be applied to a restricted group containing none of the

species referred to the primitive group by its author at the time when it was described, or when he enumerated the species contained in it."

The rule that a subsequent author can not revise a genus and substitute as its type a species different from that relied upon by the founder of the genus seems to be well settled in England and America. The instances of strictly adhering to it under circumstances where it would have seemed to accommodate the author to violate it, are numerous. For instance, Professor Hall, mistaking the type of the genus *Retzia*, proposed and defined the genus *Rhynchospira*; afterward ascertaining that *Rhynchospira* was a synonym for *Retzia*, he abandoned it and proposed *Rhynchotreta* for the form which he had originally mistaken for *Retzia*. Had it not been for this rule he might have abandoned *Retzia evax* as the type of his genus *Rhynchospira*, and substituted *Rhynchonella cuneata*, which became the type of *Rhynchotreta*. If you can substitute another than the original species as the type of a genus, I can substitute another, and so we destroy all *fixity* in the type and designated characters, throw the science into confusion, and seriously impair the value and reliability of generic characters.

When an author has specified no type, the first species defined is to be taken as the type, or if the genus is to be divided, no type having yet been selected, a species may be chosen from among those originally specified as belonging to the genus, due regard being paid to the necessity of retaining as many of the original species as possible in the division which is to retain the old name.

In dividing a genus of which there are already synonyms, if the synonyms are typified by the same species or group of species selected as types of the primitive genus, they should not be again used. When, however, the so-called synonyms are founded on species belonging to different sections of the genus, although the names may have been considered coextensive in their application, and the genus is to be divided accordingly, the so-called synonyms become the proper designations for which other names can not be applied.

In case of the consolidation of two or more groups of the same nature, the oldest name must be retained for the whole. If both, or all, are of the same date, the reviser may select the one to be retained. If a name be so defined as to be equal in extent to two or more previously described, it must be canceled. When it is necessary to divide a species, the form which received the old specific name must retain it.

A generic name must have a single meaning, and therefore two genera can not bear the same name, even though belonging to distinct subkingdoms.

AS TO PUBLICATION.

Publication consists of the insertion of a distinct exposition of essential characters in a printed book which is kept for sale, or which has been generally distributed among those conversant with the subject. Where figures are necessary to an understanding of the character of the organism, they must accompany the definition or it will be invalid. The tendency of the science of palæontology is to demand in all cases both definition and illustration before the publication is to be recognized. There are many species whose characters are so complicated and parts so minute, that an exposition of the essential ones, so they may be understood by those conversant with the fossils in the class, can only be made by illustration

accompanied by proper definition; the science therefore demands the rule shall be co-extensive with its necessities, and good authors refuse to recognize names unless the publication is such that their meaning may be readily comprehended.

A communication in a public assembly or learned society, or the reading of a paper containing new names at such meeting, printing of the names in a catalogue, labeling the fossils in a collection, printing the names and description in a newspaper, either one or all these attempts to introduce the names, does not constitute a publication within the rule, and hence give the names no place in science. Nor does the printing of the names with brief definitions in an obscure pamphlet, or even in the Journal of a learned society, where the definition will not enable an ordinary palæontologist to identify or distinguish the species at another locality than the typical one, give them any right to claim recognition. Occasional pamphlets independently issued, and insufficiently advertised and distributed, or very small editions that can not reach the students of the science generally, are not publications within the rule.

The date borne by a publication will be presumed to be accurate, though this presumption is only *prima facie*, and may always be contested, and the true date shown, from which time alone do names have any validity.

A species is not to be considered as named unless both generic and specific names are simultaneously applied to it.

Where a genus or species is announced in a publication, and subsequently described in another publication, the latter only is entitled to recognition. It is essential in establishing a genus that some species be referred to it.

NAMES TO BE REJECTED, CHANGED, OR MODIFIED.

A generic name should be rejected when it has been previously applied to another valid genus of organisms, even if it has received general currency. It should also be rejected when it expresses a positively false character in the genus, and is therefore liable to propagate error, and especially is this the case where the definition is so erroneous as not to entitle it to recognition; but where the name has received general circulation, and the error is not such as to seriously mislead, the name is retained; as, *Athyris* and *Atrypa*. So a specific name should be rejected when it is already applied to another species or subdivision in the same genus, or when a geographical name of a country entirely removed from the habitat of the species is used.

A name should be rejected when it is formed of two words belonging to different languages, as *en* put before a Latin name, *sub* before a Greek name, *oides*, *opsis* suffixed to a Latin name; or when it is identical if properly spelled, according to its true derivation, with a prior valid name, as *Platystoma* of Conrad, being preoccupied, can not be retained simply because he misspelled it *Platyostoma*.

A name should always be rejected when it outrages decency.

It is inelegant and tautological to derive a generic name from the specific name of its typical species. For example, *Corvus pyrrhocorax*, Linn., was afterward advanced to a genus under the name of *Pyrrhocorax*. The name therefore became *Pyrrhocorax pyrrhocorax*. The rule is now to reject all such generic names, except those which, from long usage, have imbedded themselves into science; none of which, however, can claim a place in palæontology.

When a species is transferred from one genus to another in which there is a species of the same name, the older specific name is retained, and the oldest tenable synonym is adopted for the other form, if there be one; and if not, a new specific name is proposed. But if the form bearing the prior specific name is transferred to another genus, the original specific name of the later species must be restored, and the new specific name must fall into synonymy. This is the necessary result of the law of priority.

When a name is published, the author has no more control over it than any other one. He has the same rights, no more and no less, than other naturalists.

SELECTION OF NAMES AND MODIFICATION.

The best names are derived from Latin and Greek, and express some distinguishing characteristic of the object to which they are applied. In palæontology it is more consistent with practice and uniformity to derive the generic names from Greek and the specific names from Latin; and if the name as proposed exhibits a faulty construction, any naturalist is authorized to correct it. When a wrong gender is given to a species by its termination, not agreeing with a genus, it is the duty of a naturalist to correct it.

When a name derived from a person has not been written according to the real orthography of his name, it may be changed, provided it does not involve the first syllable and thereby disturb the arrangement of indices, tables, catalogues, and dictionaries, in alphabetical order, or interfere with long-established usage. The botanical congress at London, in 1866, refused to change the name *Cinchona*, named after the Countess Chincon, because of established usage. In 1866 Hall described *Glyptocrinus nealli* in honor of O'Neill; but the name must stand as described, not only because its change would interfere with indices, tables, catalogues, and dictionaries, but Hall had the right to construct the specific name *nealli* as he did, and the fixity of nomenclature will not allow another to change it. *Scalaria turtoni*, named after Miss Turton, may be changed to *S. turtonæ*; and *Viviparus* being inconsistent with itself may be changed to *Vivipara*, because the change is in the end of the name to conform to the rules of grammar.

Names of persons are Latinized and not adopted in Greek form, but where *en* is prefixed or *oides* or *opsis* suffixed, one may not be authorized to change it, because the name is not of Latin origin, though it is in very bad taste. Buffoonery has no place in science; hence Latin puns on names, as *faba* after Mr. Bean, should be rejected in all cases as a poor joke.

The name of a person must have the termination Latinized, but the specific name can not be composed of the Christian and surname, because it would not be binomial, and can not be made to conform to the rules. Geographical names are eminently fit and suitable when they indicate the locality from which the type was collected. Barbarous names are not in good taste in Palæontology, though they have been defended in other departments of Natural History. Names expressive of trades and professions are not in good taste. Mythological and historical names are generally in bad taste for specific names, though they have been largely used; but mythological names for genera have usually been defended. The right to use both is conceded. Names expressive of something else than a character of the fossil, as *centennialis* for a *Hyolithes* are in very bad taste, and sometimes even absurd. Com-

parative names are often appropriate; but those expressive of size, as *maximus*, *minor*, and *minimus*, are too frequently rendered inaccurate by after discoveries, and are therefore objectionable.

Both generic and specific names derived from persons engaged in palæontological pursuits are very appropriate. Names of harsh and inelegant pronunciation ought to be avoided, as also words of too great length or having more than five syllables.

Generic names may be compounded from other genera to express the position of the genus as intermediate to or allied with two other genera, care being taken not to adopt such as are of too great length, and not to corrupt them in trying to render them shorter. *Aviculopecten* and *Aviculopinna* are examples of the appropriate use of compound words, notwithstanding their length, while *Tellinomya* is more fanciful than real, and yet not to be discarded.

In compounding words all the radical or essential parts of the constituent members must be retained, and no change made except in the variable terminations. Words coined at random, or without any derivation or meaning, will not be recognized.

The names of genera are in all cases essentially substantive, and hence adjective terms can not be employed for them without doing violence to grammar; for instance, *Anomaloides* proposed as a generic name must be disregarded. The same may be said of names in the genitive case, which are wholly inadmissible, without reformation.

FORMATION OF NAMES.

The generic name always begins with a capital letter, the specific name with a small initial letter, even when derived from person or place. The generic name is a noun, while the specific name has the force of an adjective. The specific name is in no instance a proper noun, but all species are equal, and should therefore be written alike. It is a violation of a plain rule of grammar to write a specific name with a capital letter; beside, there is an advantage in obeying the rule, for by so doing the eye at a glance distinguishes specific from generic names.

The generic name retains the gender which belongs to it in the language from which it is taken. Where no change is made in the termination of the last word in a generic name, the gender of that word determines the gender of the genus. Thus *ceras*, *nema*, *stoma*, and *desma* are in the Greek of the neuter gender, and consequently all genera ending with these words, such as *Orthoceras*, *Loxonema*, *Phragmostoma*, *Lyrodesma*, are neuter.

In defining a new genus the etymology should be given, and a species should be selected as the type. There is no excuse for neglecting these rules, except that the author is incapable of giving the etymology of his proposed generic name, and is not sufficiently confident of his definition to dare venture to rely upon one of his species as the type.

When a generic name is derived from the name of a person, it is stripped of all titles and preliminary particles, reduced to the genitive case, and the letter *a* is appended, thus taking on a feminine form. The following examples illustrate the method, viz.: *Names*, Brun, Bruni, Bruno, Brunus, Bruna, Brune, Bruny. Generic form, Brunia, Bruniia, Brunoia, Brunusia, Brunæa, Brunia, Brunyia. Y at the end of a word of one syllable is treated as a consonant, as Quoy, Quoyia; Gay, Gayia; and mute *e* final becomes *i*, or is dropped entirely, as Pouse, Pousia.

Every specific name agrees in gender with the genus to which it belongs, and if an adjective, its termination must show it. If the specific name is a substantive, the termination is not necessarily changed. The rule is not to change the ending of a common noun or mythological name, but to make an adjective, and the name of a person or place, indicate the gender of the genus to which it belongs.

The following rules govern the use of these terminations:

—*alis*. This Latin termination, implying resemblance, is seldom used, except in words already compounded in Greek and Latin; and when otherwise, it must be annexed to the stem of the word, as *rectilateralis*, *quadrilateralis*.

—*anus*. This Latin termination implies resemblance or association, and may be added to proper names, personal or local; though in science its use is almost confined to the former. If the word is capable of taking a classic form, the termination should be simply annexed to the stem as *Linneus*, *linneanus*; *Lesquer-eux* (*lescuria*), *lescurianus*; in conformity with classic usage; *pagus*, *paganus*; *Claudius*, *claudianus*; *Neapolis*, *neapolitanus*. In other cases, the addition of this termination must follow the same rule as those for *ensis*, as *America*, *americanus*; *Geinitz*, *geinitzianus*; *Meek*, *meekanus*; *Erie*, *erianus*; *Italy* (*ia*), *italianus*.

—*atus*. This Latin termination strictly implies the possession of the thing to the name of which it is added. It is therefore affixed to the stem of common names only; as, *costa*, *costatus*; *galea*, *galeatus*; *fornix*, *fornicatus*; *sinus*, *sinuatus*; *stria*, *striatus*; *lobus*, *lobatus*; *rostrum*, *rostratus*. It is worthy of remark here that this termination sometimes loses its *at*, to shorten the word. The practice is not commendable from a linguistic stand-point, but some of the terms so made have become fixed in the nomenclature; as, *Orthis biloba*.

—*formis*. This Latin termination implies resemblance of shape, and should be confined to Latin words, to the stem of which it is joined by the connecting vowel *i*; as, *laterna*, *laterniformis*; *pistillum*, *pistilliformis*. In forming terms, such as the first given above from Latin words ending in *a*, the error of using *æ* as the connecting vowel should be avoided; being inconsistent with classic usage, as well as more awkward and lengthy, thus we have from *terra*, *terricola*; *gemma*, *gemmifer*; *squama*, *squamiger*; *tuba*, *tubiformis*; etc.

—*ensis*. This is a Latin termination, expressive of locality, and can not therefore be correctly employed, except as an affix to the name of a place. This rule has been traversed in few real, but in many apparent instances. *Lingula morsensis* is an illustration of the former. In accordance with law, this has been changed to *L. morsii*, being given in honor of Mr. Morse. *Zygospira cincinnatiensis*, *Pupa vermilionensis*, *Cardium napoleonense*, *Athyris hannibalensis* are apparent exceptions; but these terms are formed from words which, though originally personal or trivial, have now become local names, and consequently no valid objection can be raised against them. In using this termination the following rules have been generally followed: 1st. If the name of the place ends in a consonant, the termination is annexed to the word; as, *Clinton clintonensis*. 2d. If the name ends in *a* or *e*, these letters are dropped, and the termination then annexed; as, *Canada*, *canadensis*; *Minnesota*, *minnesotensis*; *Iowa*, *iowensis*; *Indiana*, *indianensis*; *Lasalle*, *lasallensis*; *Erie*, *erianensis*. 3d. If the name ends in *i*, *o*, or *u*, that vowel is retained; as, *Mississippi*, *mississippiensis*; *Missouri*, *missouriensis*; *Chicago*, *chicagoensis*; *Colorado*, *coloradoensis*; *Chouteau*, *chouteauensis*. 4th. If the name ends in *y*, that letter becomes *i* upon the addition

of the termination; as, *Kentucky, kentuckiensis*; *Alleghany, alleghaniensis*; in accordance with classic usage, as *Sicily, siciliensis*.

—*i*. The termination *i* is to be considered a mere indication of the Latin genitive case, and custom rather than correctness has, in some sense, legalized its addition to any name. In practice, however, it is almost restricted to proper names. Thus we have *knighti, littoni, flemingi, ivesi*.

—*icus*. This Greek termination implies resemblance, and may be added to common names under the same rules as those given for —*ensis*, except that, in forming the word, a vowel is suppressed if it would precede the termination; thus, *Macedon, macedonicus*; *Italy (ia), italicus*. It is little used, except as an affix to the name of a river or country; as, *euphraticus, anglicus*, or in such words as *ellipticus*.

—*eus*. This Latin termination has been occasionally employed; but as it implies "made of," it is evidently seldom, if ever, admissible in palæontology. The term *eboraceus*, from *eboracum*, the Latin name for York, is a misnomer and should have been *eboracensis*.

—*inus*. This termination is applied to both common and proper names. Latin usage restricted its application more than modern scientific practice has done, and applied it mainly to proper names, local terms, and living beings; as, *caninus, alpinus*; but did not sanction such words as *rugatinus, sulcatinus, secalinus, taxinus*, and *velutinus*. The termination is used subject to the same laws as —*ensis*.

—*ites*. This termination expresses the fossil nature of the specimen. It is a contraction of the Greek word *lithos*, a stone. In most instances it coalesces with the last vowel of the root. This and long usage in many words, such as *Ammonites, Belemnites, Pyrites*, have completely established the long *i*, while the gender is determined by that of the Greek word to be masculine. All specific terms in the genus must, therefore, be of this gender.

—*oides*. This Greek termination, signifying "like," should be added only to the stems of words of Greek origin. No connecting vowel is necessary. Thus we have *dactylos, dactyloides*; *discos, discoides*. The Latin form —*oides* obeys the same laws, except the Greek termination is alike in all genders, while the Latin is inflected as Latin adjectives of similar termination.

Compound terms. In forming compound terms care should be taken to connect them rightly. If an adjective of three terminations, or a noun of the second Latin declension, composes the first part of the word, either *i* or *o* may be employed as a connecting vowel, the choice being largely determined by the ear. Thus *sulcomarginatus* is better than *sulcimarginatus*, and *crassicaulis* than *crassocaulis*. If the adjective has but one or two terminations, or the noun be of the first, third, or fourth Latin declension, the connecting vowel *i* should always be employed; as, *tenuistriatus, pinniformis, ilicifolius, retiformis, cornifer*. The connecting vowel *o* is admissible by Greek usage in all declensions; as, *Ulodendron, Cycloconcha, Syringodendron, Alethopteris, Dictyonema, Dictyopteris*, except that where the first part of the word is an adjective ending in —*ys*, it is shorter, and at the same time consonant with classic usage to employ no connecting vowel at all; thus, *pachyderma, euryteines, Platystoma*, etc., are better than *pachyderma, euryteines, Platystoma*, etc.

NORTH AMERICAN PALÆOZOIC FOSSILS.

By the little words plants and animals we include all the organisms in the world. But science, demanding technical words and controlling characteristics, has added the word "Kingdom" to these common names; and hence all organisms and all which have existed in the past are divided between the "Vegetable Kingdom" and the "Animal Kingdom."

VEGETABLE KINGDOM.

THE Palæozoic Fossil plants are divided into seven classes; viz., Fucoides, Fungi, Equisetaceæ, Filicaceæ, Lycopodiaceæ, Cordaitæ, and Coniferæ. The Fucoides are also called Sargassites and Thalassophites. They are supposed to have some affinity with the leathery marine vegetation called Fucus or the Sargassum. The fossils are merely casts, showing, as a rule, no structure whatever. Lesquereux says marine vegetation readily disintegrates and passes into a gelatinous, half-fluid matter, which penetrates the sand, so that the lowest strata of the great heaps thrown up by the waves and exposed to atmospheric action, do not generally preserve traces of their organisms for more than a year. The fossil forms may have been harder, and contained less gelatinous matter in their cells, and probably had only a remote resemblance to the living Fucus or Sargassum, though there can be no reasonable doubt they are representatives of extinct marine cryptogamous plants.

The fossils referred to this Class have never been distributed into Orders and Families. The genera are as follows: Archæophyton, Arthraria, Arthrophyceus, Asterophycus, Astropolithon (Graptolite?), Blastophycus, Bythotrephis, Calamophycus, Chondrites, Conostichus, Cruziana, Dactylophycus, Dendrophycus, Discophycus, Dystactophycus, Eophyton, Heliophycus, Hippodophycus, Ichnophycus, Licrophycus, Palæophycus, Phytopsis, Protostigma, Rusophycus, Sphenothallus, Taonurus, Trichophycus.

The Fungi are cellular cryptogamous plants (*kruptos*, hidden; *gamos*, marriage). They are flowerless plants, in which the fructifying organs are so minute as to escape detection without a microscope. The spores are sometimes naked, and in other cases inclosed in a theca. The evidence of the existence of this Class in Palæozoic rocks is extremely meager, though Lesquereux refers a species of Rhizomorpha to it.

The vascular cryptogamous plants flourished to such an extent in the Carboniferous era, that it has been called the "Age of Acrogens," and the "Age of Coal-

plants." The Classes and Orders have been named as Latin adjectives in the feminine plural, to agree with *plantæ* (plants), which is said to be always understood. Thus from *Equisetum*, by prolonging the termination into *acæ*, we have *Equisetacæ*; from *Filices*, *Filicacæ*, etc.

The *Equisetacæ* are either cellular or vascular flowerless plants, producing spores instead of seeds. The Palæozoic fossils are all referred to one Order, the *Calamariæ*. The genera are as follows: *Anarthrocanna*, *Annularia*, *Arthrostroma*, *Asterophyllites*, *Bechera*, *Bornia*, *Calamites*, *Calamodendron*, *Calamostachys*, *Equisetites*, *Macrostachya*, *Nematophyllum*, *Sphenophyllum*, *Volkmanuia*.

The *Filicacæ*, or ferns, are too common among existing plants to have escaped the notice of any one. The Palæozoic ferns are divided into Orders as follows:

1. ORDER, NEUROPTERIDEÆ.

Cyclopteris, *Dictyopteris*, *Lesleya*, *Neuropteris*, *Odontopteris*.

UNCERTAIN RELATION TO THE ORDER.

Baiera, *Cardiopteris*, *Danæites*, *Idiophyllum*, *Megalopteris*, *Neriopteris*, *Orthogoniopteris*, *Tæniopteris*.

2. ORDER ALETHOPTERIDEÆ.

Alethopteris, *Callipteridium*, *Callipteris*, *Lescuropteris*, *Protoblechnum*.

3. ORDER, PSEUDOPECOPTERIDEÆ.

Pseudopecopteris.

4. ORDER, PECOPTERIDEÆ.

Beinertia, *Cymoglossa*, *Lonchopteris*, *Oligocarpia*, *Pecopteris*, *Phyllopteris*.

5. ORDER, SPHENOPTERIDEÆ.

Eremopteris, *Hymenophyllites*, *Sphenopteris*.

6. ORDER, ADIANTITES.

Aneimites, *Archæopteris*, *Triphyllopteris*.

FERNS OF UNCERTAIN AFFINITY.

Asteropteris, *Crematopteris*, *Pachypteris*, *Rhacophyllum*.

SEPARATE FRUCTIFICATION OF FERNS.

Sorocladus.

RACHIS OF FERNS.

Rhachiopteris.

RHIZOMA OF FERNS.

Stigmarioides.

STEMS OR TRUNKS OF FERNS.

Caulopteris, *Megaphyllum*, *Psaronius*, *Stemmatopteris*.

The existing Lycopodiaceæ inhabit the deep shade of the forests, the surface of bogs, or the slopes of mountains, where there is a high degree of humidity, except a few species, which have the power of closing the leaves under the heat of the sun and opening them to receive the rain or fog. Some of them, like the "Ground Pine," are evergreens, and none of them grow beyond a few feet in length. Many Carboniferous plants of this Class, however, were grand and stately trees, two feet or more in diameter, and fifty feet or more in length. Lesquereux says, in speaking of Carboniferous plants :

"The leaves of the Lycopodiaceæ are generally in a spiral order, modified sometimes in their relative disposition, even in the same species. They are narrow, linear-lanceolate, of various length, according to species, all with a strong midrib. Their point of attachment upon the stems is marked by scars of divers forms, which greatly vary in size, according to the age of the fragments, or rather of the part of the tree from which the fragments of bark are derived. It is essentially from the characters of these leaf-scars that species of the Lepidodendræ have been established."

"The fructifications, rarely found attached to their support, are in cylindrical or ovate spikes, sessile or pedicellate, composed of sporanges attached to the anterior base of leaves or blades of various forms, which, curved upward and imbricated, cover the outside of the cones. The sporanges contain organisms of two kinds, either very small ones (microspores), which are like powder, or agglutinated globules of matter, distinct only with microscopes of great power. They may represent the male fertilizing pollen. Or, and more generally, they contain macrospores, large, true globular seeds, angular on one side, and rounded on the other."

The class may be divided into three orders, as follows :

1. ORDER, LEPIDODENDRÆ.

Acanthophyton (?), Cyclostigma, Dechenia, Diplostegium, Glyptodendron, Halonia, Knorria, Lepidocystis, Lepidodendron, Lepidophlœum, Lepidophloios, Lepidophyllum, Lepidostrobis, Leptophlœum, Lycopodites, Plumalina, Psilophyton, Sporangites, Sporocystis, Ulodendron.

2. ORDER, TÆNIOPHYLLÆ.

Tæniophyllum.

3. ORDER, SIGILLARIÆ.

Didymophyllum, Pinnularia, Sigillaria, Sigillarioides, Sigillariostrobis, Spirangium, Stigmara, Syringodendron.

4. ORDER, NOEGGERATHIÆ.

Noeggerathia, Whittleseya.

The Cordaitæ, an extinct class, are represented in the Coal Measures, generally by fragments of ribbon-like leaves, and most rarely by stems bearing leaves and flowers. They belong to the Gymnosperms, and occupy a position somewhat intermediate between the Noeggerathiæ and Coniferæ. The genera are as follows :

Antholithes, Asterocarpus, Cardiocarpon, Carpolithes, Cordaianthus, Cordaicarpus, Cordaistrobus, Cordaites, Desmiophyllum, Dieranophyllum, Lepidoxylon, Rhabdocarpus, Trigonocarpum.

FRUIT OF UNCERTAIN AFFINITY.

Gulielmites.

The Coniferæ are exogenous evergreen trees and shrubs, with branching trunks containing a resinous juice. They have a strobile cone or solitary seed. Three Palæozoic genera have been referred to the Coniferæ: viz., Dadoxylon, Saportæa, and Walchia, but there must be doubt about the reference of Dadoxylon to this Class.

WOOD OF UNCERTAIN AFFINITY.

Celluloxylon, Nematoxylon, Ormoxyton, Prototaxites, Sternbergia, Syringoxylon.

ACANTHOPHYTON, Dawson, 1862, Quar. Jour. Geo. Soc., vol. 18. p. 324. [Ety. *akantha*, thorn; *phyton*, plant.] Cylindrical branches, ramifying in alternate manner, striated, with scattered tubercles, on which are borne short spines. Type A. spinosum.

spinosum, Dawson, 1862, Quar. Jour. Geo. Soc., vol. 18. p. 324, Chemung Gr.

ALETHOPTERIS, Sternberg, 1825, Vers. Darst. Flora der Vorwelt. p. 21. [Ety. *alethos*, true; *ptēris*, fern.] Fronds poly-pinnate; pinnules coriaceous, simple, mostly entire, enlarged at the base, connate or free, borders reflexed; midrib distinct, immersed into the epidermis, marked by a groove on the upper surface; prominent on the lower; lateral veins simple or forking once, open, often in right angle to the rachis; fructifications marginal. Type A. lonchitica.

acuta, see Pecopteris *acuta*.

ambigua, Lesquereux, 1880, Coal Flora of Pa., p. 182, Coal Meas.

aquilina, Schlotheim, 1820, (Filicites *aquilinus*.) Petrefaktenkunde, p. 405, and Coal Flora of Pa., p. 181, Coal Meas.

bunburyi, Andrews, 1875, Ohio Pal., vol. 2, p. 421, Coal Meas.

coxana, Lesquereux, 1861, Geo. Sur. Ky., vol. 4, p. 433, Coal Meas.

crassa, Lesquereux, 1884, Coal Flora of Pa., p. 748, Coal Meas.

crenulata, Brongniart, as identified by Lesquereux, in Geo. Sur. Ill., vol. 2, p. 439, is Pseudopcopteris *suberenu-lata*.

cristata, see Pecopteris *cristata*.

discrepans, Dawson, 1862, Jour. Geo. Soc., vol. 18, p. 222, Devonian.

distans, Lesquereux, 1858, Geo. Sur. Pa., vol. 2, p. 865, is a variety of A. *lonchitica*.

emarginata, see Pecopteris *emarginata*.

erosa, see Pecopteris *erosa*.

evansi, Lesquereux, 1884, Coal Flora of Pa., p. 834, Coal Meas.

falcata, Lesquereux, 1870, Geo. Sur. Ill., vol. 4, p. 396, Coal Meas.

gibsoni, Lesquereux, 1880, Coal Flora of Pa., p. 183, Coal Meas.

grandifolia, Newberry, 1873, Ohio Pal., vol. 1, p. 384, Coal Meas.

grandis, Dawson, 1863, Can. Nat. & Geol., vol. 8, and Acad. Geol. p. 484, Coal Meas.

halleri, see Pecopteris *halleri*.

helenæ, Lesquereux, 1880, Coal Flora of Pa. p. 179, Coal Meas.

heterophylla, Lindley & Hutton, 1833, (Pecopteris *heterophylla*.) Foss. Flora, vol. 1, p. 113, Coal Meas.

holdeni, see Protoblechnum *holdeni*.

hymenophylloides, see Pseudopcopteris *hymenophylloides*.

inflata, see Callipteridium *inflatum*.

ingens, Dawson, 1868, Acad. Geol. p. 553, Devonian.

lævis, Lesquereux, 1858, Geo. Sur. Pa., vol. 2, p. 865, Coal Meas.

lanceolata, see Pecopteris *lancoolata*.

lonchitica, Schlotheim, 1820, (Filicites *lonchiticus*.) Nachtrage zur Petrefaktenkunde, p. 411, and Coal Flora of Pa., p. 177, Coal Meas.

longifolia, see Pecopteris *longifolia*.

macrophylla, see Danæites *Macrophyllum*.

massillionis, see Callipteridium *massilloneum*.



FIG. 5.—Alethopteris lonchitica.

maxima, Andrews, 1875, Ohio Pal., vol. 2, p. 421, Coal Meas.
mazonana, see *Pseudopecopteris mazonana*.
muricata, see *Pseudopecopteris muricata*.
nervosa, see *Pseudopecopteris nervosa*.
obscura, Lesquereux, 1858, Geo. Sur. Pa., vol. 2, p. 865, syn. for *Callipteridium rugosum*.
oweni, see *Callipteridium oweni*.
pectinata, Lesquereux, 1866, Geo. Sur. Ill., vol. 2, p. 469, Coal Meas.
pennsylvanica, Lesquereux, 1858, Geo. Sur. Pa., vol. 2, p. 864, Coal Meas.
perleyi, Hart, 1868, Acad. Geol. p. 554, Devonian.
pluckeneti, see *Pseudopecopteris pluckeneti*.
preciosa, see *Pecopteris preciosa*.
pteroides, see *Pecopteris pteroides*.
robusta, Lesquereux, 1884, Coal Flora of Pa., p. 835, Coal Meas.
rugosa, see *Callipteridium rugosum*.
serlii, Brongniart, 1828, (*Pecopteris serlii*.) Hist. d. Veg. Foss. p. 292, and Coal Flora of Pa., p. 176, Coal Meas.
serrula, see *Pecopteris serrula*.
serrulata, see *Pecopteris serrulata*.
sheaferi, see *Pseudopecopteris sheaferi*.
solida, see *Pecopteris solida*.
spinulosa, see *Pseudopecopteris spinulosa*.
stellata, see *Pecopteris stellata*.
tæniopteroides, see *Pecopteris tæniopteroides*.
urophylla, Brongniart, 1828, (*Pecopteris urophylla*.) Hist. d. Veg. Foss. Coal Meas.
virginiana, Fontaine & White, 1880, Perm. or Up. Carb. Flora, p. 88, Coal Meas. or Permian.

ANARTHROCANNA, Gœppert, 1845, in Tchih. Voy. [Ety. *an*, without; *arthron* joint; *canna*, a plant.] Cylindrical stems, more or less swelling at the nodes, with ribs flattened and continuous instead of forming joints as in *Calamites*.
perryana, Dawson, 1863, Quar. Jour. Geo. Soc. vol. 19, p. 461, and Foss. plants of Dev. and Up. Sil. formations, p. 27, Catskill Gr.

ANEIMITES, Dawson, 1861, Quar. Jour. Geo. Soc. vol. 17, p. 5. [Ety. from *Anæmia*, a genus.] Pinnules clustered, petiolate or attached by a narrow base, with flabellate venation. Type *A. acadicus*, closely related to *Cyclopteris*.
acadicus, Dawson, 1861, Quar. Jour. Geo. Soc., vol. 17, p. 5, and vol. 21, p. 153, Low. Coal Meas.
bockshii, Gœppert, 1836, (*Adiantites bockshii*.) Syst. Filic. Foss. p. 384, and Foss. plants of Dev. and Up. Sil. of Can. p. 46, Chemung Gr.
obtusus, Lesquereux, 1858, (*Noeggerathia obtusa*.) Geo. Sur. Pa., vol. 2, p. 854, and Foss. plants of Dev. and Up. Sil. of Can., p. 46, Catskill Gr.
validus, Dawson, 1862, (*Cyclopteris valida*),

Quar. Jour. Geo. Soc., vol. 18, p. 319, and Foss. plants of Dev. and Up. Sil. of Can., p. 46, Ham. Gr.



FIG. 6.—*Anelmities obtusus*.

ANNULARIA, Sternberg, 1820, Essai d'un exposé Geognostico-botanique d. l. Flore. du monde primitif. 2d Cahier, p. 36. [Ety. *annulus*, a ring.] Stem articulate, striate, with a strong diaphragm traversing it at the articulations; branches opposite, nearly in right angles from the articulations; leaves verticillate, lanceolate, spatulate, or lingulate, abruptly or gradually acuminate, or obtuse, even emarginate at the apex; fructifications in long cylindrical spikes, with close articulations, and narrowly lanceolate bracts, bearing round sporanges in the axils of the leaves, or double, oval ones, pedicellate and attached in the middle of the internodes. Type *A. spinulosa*. This name is preoccupied in the subkingdom Mollusca, and Wood in 1860 proposed to substitute *Trochophyllum*; but *Trochophyllum* was preoccupied for a genus of corals in 1851, by Edwards and Haine.
acuminata, see *Sporangites acuminatus*.
antiqua, Dawson, 1861, Can. Nat. and Geol. vol. 6, p. 170, Devonian.
calamitoidea, Schimper, 1869, Pal. Veget., vol. 1, p. 349, and Coal Flora of Pa., p. 48, Coal Meas.
clavata, Lesquereux, 1880, (*Trochophyllum clavatum*.) Coal Flora of Pa., p. 65, Coal Meas.
cuspidata, Lesquereux, 1884, Coal Flora of Pa., p. 725, Subcarboniferous.
dawsoni, Schimper, 1869, Palæontologie Vegetale, vol. 1, p. 350, and Coal Flora of Pa., p. 51, Devonian. Proposed for *Asterophyllites latifolius*, of Dawson, because that name was preoccupied; but I have retained *Asterophyllites latifolius* because it is doubtful whether it is an *Annularia*.

emersoni, Lesquereux, 1880, Coal Flora of Pa., p. 50, Coal Meas.
 fertilis, Sternb., 1824, Vers. Darst. Flora der Vorwelt, p. 31, Coal Meas.
 inflata, Lesquereux, 1870, Geo. Sur. Ill., vol. 4, p. 423, Coal Meas.
 laxa, Dawson, 1871, Foss. Plants Canada, p. 31, Devonian.
 longifolia, Brongniart, 1828, Prodrôme Hist. Veg. Foss., p. 156, and Coal Flora of Pa., p. 45, Coal Meas.
 minuta, Brongniart, 1828, Prodr. Hist. Veg. Foss., p. 155, and Coal Flora of Pa., p. 49, Coal Meas.
 radiata, Brongniart, 1822, Class. d. Veg. Foss., p. 35 in Mus. d. Hist. Nat., vol. 8, pl. 13, fig. 7, and Coal Flora of Pa., p. 50, Subconglomerate.
 romingeri, Lesquereux, 1877, Trans. Am. Phil. Soc., p. 166, Low. Held. Gr.



FIG. 7.—*Anularia Sphenophylloides*.

sphenophylloides, Zenker, 1833, (Galium sphenophylloides,) in Leonh. v. Bronn's Jahrb., p. 398, and Coal Flora of Pa., p. 48, Coal Meas.
 tuberculata, Sternberg, 1823, (Bruckmannia tuberculata) Vers. Darst. Flor. d. Vorwelt. Fasc. 4, p. 29, and Coral Flora of Pa., p. 723, Coal Meas.

ANTHOLITHES, Brongniart, 1822, Mem. du Mus. d'Hist. Nat., vol. 8, p. 203. [Ety. *anthos*, flower; *lithos*, stone.] Supposed to be the flowers of Cordaites or other trees. The characters are not very definite. Type *A. liliacea*.
devonicus, Dawson, 1868,

Acad. Geol., p. 566, Devonian.
floridus, Dawson, 1871, Foss. Plants Can., p. 63, Devonian.

piteairniæ, Lindley and Hutton, 1835, Foss. Flora of Great Britain, vol. 2, p. 82, Coal Measure.

priscus, Newberry, 1873, Ohio Pal. vol. 1, p. 363, Coal Meas.

pygmeus, Dawson, 1863, Can. Nat., vol. 8, and Acad. Geol., p. 477, Coal Meas.

rhabdocarpus, Dawson, 1863, Can. Nat., vol. 8, and Acad. Geol., p. 477, Coal Meas.

squamosus, Dawson, 1863, Can. Nat., vol. 8, and Acad. Geol., p. 477, Coal Meas.

spinosus, Dawson, 1868, Acad. Geol., p. 477, Coal Meas.

Aphlebia adnascens, see *Rhacophyllum adnascens*.



FIG. 8. *Antholithes priscus*.

flabellata, see *Rhacophyllum flabellatum*.
irregularis, see *Rhacophyllum irregulare*.

Araucarioxylon gracilis, see *Walchia gracilis*.
ARCHÆOPTERYX, Britton, 1888, Ann. N. Y. Acad. Sci. vol. 4, p. 123. [Ety. *archaios*, ancient; *phyton*, plant.] Founded upon black films of graphite in crystalline limestone. Type *A. newberryanum*. Probably a Graptolite.

newberryanum, Britton, 1888, Ann. N. Y. Acad. Sci. vol. 4, p. 123, Taconic.

ARCHÆOPTERIS, Dawson, 1863, Can. Nat. vol. 8, and Foss. plants of Dev. and Up. Sil. Can. pp. 48, 98. [Ety. *archaios*, ancient; *ptēris*, fern.] Frond bipinnate; pinnules obovate, inequilateral, narrowing to the base and decurrent on the partial petioles, the main petiole often having accessory pinnules, at the bases of the pinnae. Veins spreading from the base, curved or straight, dividing dichotomously into fine veinlets; fertile pinnae bearing groups of oval spore-cases instead of pinnules. Type *A. hibernica*.

acadica, see *Aneimites acadicus*.

alleghaniensis, syn. for *A. rogersi*.

bockschiana, see *Aneimites bockschii*.

brownii, see *Cyclopteris brownii*.

denticulata, Lesquereux, 1884, Coal Flora of Pa., p. 774, Subcarboniferous.

gaspensis, Dawson, 1881, Can. Nat. and Geol., vol. 10, p. 8, Devonian.

hallana, Goepfert, 1852, (*Cyclopteris hallana*) Die fossil Flora des Uebergangsgebirges, p. 145. Proposed as a substitute for *Sphenopteris laxa*, which latter name was preoccupied in that genus; but when referred to this genus, *laxa* must be restored.

hartii, Dawson, 1863, (*Paleopteris hartii*) Can. Nat., vol. 8, and Acad. Geol., p. 485, Coal Meas.
hibernica, Forbes, 1852, (*Cyclopteris hibernica*) Proc. Brit. Ass'n, and Coal Flora of Pa., p. 305, Chemung Gr.

jacksoni, Dawson, 1861, (*Cyclopteris jacksoni*) Can. Nat. and Geo., vol. 6, p. 173, Catskill Gr.

laxa, Hall, 1843, (*Sphenopteris laxa*) Geo. Rep. 4th Dist. N. Y., p. 275, Chemung Gr. This species has also been named *A. hallana*.

macilenta, Lesquereux, 1884, Coal Flora of Pa., p. 775, Catskill Gr.

minor, Lesquereux, 1858, (*Noeggerathia minor*) Geo. Sur. Pa., vol. 2, p. 854, Catskill Gr.

obliqua, Lesquereux, 1880, Coal Flora of Pa., pp. 300, 774, Catskill Gr.

obtusa, see *Aneimites obtusus*.

rogersi, Dawson, 1863, (*Cyclopteris rog-*



FIG. 9. *Archæopteris hibernica*.

ersi,) Quar. Jour. Geo. Soc., vol. 19, p. 463, and Coal Flora of Pa., pp. 307, 776, Catskill Gr.
 sphenophyllifolia Lesquereux, 1884, Coal Flora of Pa., p. 775, Catskill Gr.
 stricta, Andrews, 1875, Ohio Pal. vol. 2, p. 418, Coal Meas.



FIG. 10.—Archæopteris stricta.

ramosum var *germanum*, Miller and Dyer, 1878, Cont. to Pal. No. 2, p. 4, Hud. Riv. Gr. Probably inorganic.
 ARTHRARIA, Billings, 1874, Pal. Foss., vol. 2, p. 66. [Ety. *arthron*, a joint.] Cylindrical stems with an expansion at each end in the form of a dumb-bell. Type A. antiquata.
 antiquata, Billings, 1874, Pal. Foss., vol. 2, p. 66, Upper Taconic.
 biclavata, S. A. Miller, 1875, Cin. Quar. Jour. Sci., vol. 2, p. 354, Hud. Riv. Gr.
 ARTHROPHYCUS, Hall, 1852, Pal. N. Y., vol. 2, p. 4. [Ety. *arthron*, joint; *phykos*, sea-plant.] Simple or branching, rounded or subangular, flexuous, transversely ridged or furrowed. Type A. harlani.

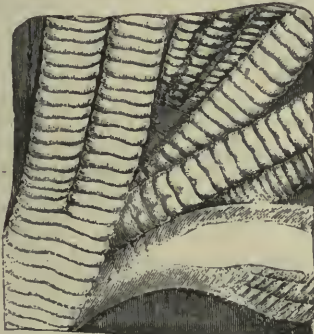


FIG. 12.—Arthropycus harlani.

harlani, Conrad, 1838, (Fucoides harlani,) Ann. Rep. N. Y., p. 113, and Pal. N. Y., vol. 2, p. 5, Medina sandstone.
 montalto, Simpson, 1888, Dict. Foss., found in Pa. Medina (?) Gr.
 ARTHROSTIGMA, Dawson, 1871, Foss. Plants Canada, p. 41. [Ety. *arthron*, joint;

stigma, a dot or puncture.] Stems elongated, cylindrical, bifurcating, and giving off lateral branches; irregularly furrowed longitudinally, with circular leaf scars arranged in whorls, and bearing linear rigid leaves with circular bases, structure apparently cellular, with a slender vascular axis. Type A. gracile.

gracile, Dawson, 1871, Foss. Plants Can., p. 41, Devonian.
 Artisia, Sternberg, syn. for Sternbergia.
transversa, see Sternbergia transversa.
 Asolanus, Wood, 1860, syn. for Sigillaria.
camptotenaria, syn. for Sigillaria monostigma.
manephleus, a doubtful species of Sigillaria.
ornithicoides, see Sigillaria ornithicoides.
 Asplenites, Gœppert, 1836, Systema Filicum Fossilium. [Ety. *Asplenium*, a genus of ferns.]
elegans, see Eremopteris elegans.
ruber, Lesquereux, 1858, Geo. Sur. Pa., vol. 2, p. 864, Coal Meas. This species does not seem to be recognized by Lesquereux in his later work.
 ASTEROCARPUS, Gœppert, 1836, Syst. Fil. Foss., p. 188. [Ety. *aster*, star; *karpos*, fruit.] Fructification on lanceolate pinnales, marked by large star-like sori. Type A. sternbergi.
 grandis, Lesquereux, 1870, Geo. Sur. Ill., vol. 4, p. 469, Coal Meas.
 sternbergi, Gœppert, 1836, Syst. Filic. Foss., p. 188, Coal Meas.



FIG. 11. Arthrarium antiquata.



FIG. 13.—Asterophycus Simplex.

ASTEROPHYCUS, Lesquereux, 1876, 7th Ann. Rep. Geol. Sur. Ind., p. 139. [Ety. *aster*, star; *phykos*, a sea-weed.] Stem short, cylindrical; frond expanded and divided star-like from the top of the central axis; segments flattened or inflated. Type A. coxi.
 coxi, Lesquereux, 1876, 7th Ann. Rep. Geol. Sur. Ind., p. 139, Low. and Up. Coal Meas.
 simplex, Lesquereux, 1880, Coal Flora of Pa., p. 13, Coal Meas.
 ASTEROPHYLLITES, Brongniart, 1822, Mem. du Mus. t. 8, p. 203. [Ety. *aster*, star;

phyllon, leaf; *lithos*, stone.] Stems articulate; branches opposite; central axis hollow or solid; leaves verticillate, free to the base, linear, acuminate, simple nerved; fructifications in elongated ears, bearing round sporanges in the axils of the leaves. Type A. *equisetiformis*.

acicularis, Dawson, 1862, Quar. Jour. Geol. Soc., vol. 18, p. 310, Devonian. *anthracinus*, Heer, 1877, Fl. Foss. Helv., vol. 4, p. 50, and Coal Flora of Pa., p. 36, Coal Meas.

apertus, see *Macrostachya aperta*. *brardi*, Brongniart, 1828, Prodr. Hist. Veg. Foss., p. 159, Coal Meas.

crassicaulis, Lesquereux, 1858, Geo. Sur. Pa., vol. 2, p. 851, Coal Meas.

curtus, see *Bechera curta*. *equisetiformis*, Schlotheim, 1804, (Casuarinites *equisetiformis*.) Beitrag Zur. Flora der Vorwelt, tab. 1, fig. 1, and Coal Flora of Pa., p. 35, Coal Meas.

erectifolius, Andrews, 1875, Ohio Pal., vol. 2, p. 425, Coal Meas.

fasciculatus, Lesquereux, 1880, Coal Flora of Pa., p. 41, Coal Meas.



FIG. 14.—*Asterophyllites foliosus*.

foliosus, Lindley & Hutton, 1833, Foss. Flora, vol. 1, p. 77, and Coal Flora of Pa., p. 38, Coal Meas.

gracilis, Lesquereux, 1860, Geo. Sur. Ark., vol. 2, p. 310, Coal Meas.

grandis, see *Bechera grandis*.

lanceolatus, see *Macrostachya lanceolata*.

latifolius, Dawson, 1862, Quar. Jour. Geol. Soc., vol. 18, p. 311, Devonian. The same form was called by Schimper *Annularia dawsoni*.

laxus, Dawson, 1868, Acad. Geol., p. 539, Devonian.

lentus, Dawson, 1871, Foss. Plants Can., p. 29, Devonian.

longifolius, Sternberg, 1823, (Bruckmannia *longifolia*.) Vers. Darst. Flora der Vorwelt fasc. 4, p. 58, Coal Meas.

minutus, Andrews, 1875, Ohio Pal., vol. 2, p. 424, Coal Meas.

ovalis, see *Calamostachys ovalis*.

parvulus, Dawson, 1861, Can. Nat. and Geo., vol. 6, p. 168, and Acad. Geol. p. 539, Chemung Gr.

radiatus, see *Annularia radiata*.

rigidus, Sternberg, 1824, (Bruckmannia *rigida*.) Vers. Darst. Flor. der Vorwelt, p. 29, and Coal Flora of Pa., p. 37, Coal Meas.

scutigerus, Dawson, 1862, Quar. Jour. Geol. Soc., vol. 18, p. 311, Devonian.

stachioides, Wood, 1860, (Lepidostrobus *stachioides*.) Proc. Acad. Nat. Sci. Phil., vol. 12, p. 240, Coal Meas.

sublævis, Lesquereux, 1858, Geo. Sur. Pa., vol. 2, p. 851, Coal Meas.

trinervis, Dawson, 1863, Can. Nat., vol. 8, and Acad. Geol. p. 479, Coal Meas.

tuberculatus, see *Annularia tuberculata*.

ASTEROPTERIS, Dawson, 1881, Quar. Jour. Geol. Soc., vol. 37, p. 299.

[Ety. *aster*, star; *pterus*, fern.] Stems of ferns having the axial portion composed of vertical radiating plates of scalariform tissue imbedded in parenchyma, and having the outer cylinder composed of elongated cells traversed by leaf-bundles similar to those of *Zygopteris*. Type A. *novoboracensis*.

novoboracensis, Dawson, 1881, Quar. Jour. Geol. Soc., vol. 37, p. 299, Portage Gr.

ASTROPOLITHON, Dawson, 1888, Geo. Hist. Plants, p. 31. A peculiar impression, supposed by Prof. Dawson to be fucoïdal. Judging from the illustration, I would refer it to the Graptolida. Type A. *hindii*.

hindii, Dawson, 1888, Geo. Hist. plants, p. 31, Up. Taconic.

BAIERA, Fr. Braun, 1840, Die Petrefakten d. Naturalien Samml.

[Ety. proper name.] Leaves petiolate, flabelliform, dichotomous, many parted; nerves in each lacinia, several, dichotomous, and proceeding parallel with each other; leaf substance leathery.

Type B. *teniata*.

virginiana, Fontaine & White, 1880, Perm or Up. Carb. Flora, p. 103, Coal Meas. or Permian.

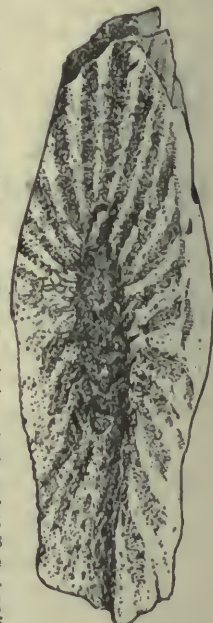


FIG. 15.—*Astropolithon hindii*.

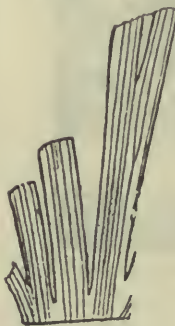


FIG. 16.—*Baiera virginiana*.

BECHERA, Sternberg, 1824, Vers. Darst. Flora der Vorwelt, p. 30. [Ety. proper name.] Like Asterophyllites in its verticillate leaves, but distinguished by its tumid joints and deeply and widely furrowed stems. Type *B. grandis*.
grandis, Sternberg, 1824, Vers. Darst. Flora der Vorwelt, fasc. 4, p. 30, and Coal Flora of Pa., p. 41. Coal Meas.
tenuis, Bunbury, 1846, Am. Jour. Sci., 2d series, vol. 2, p. 232, Coal Meas.

BEINERTIA, Gœppert, 1836, Syst. Filic. Foss. p. 273. [Ety. proper name.] Distinguished from Pecopteris by the treble flexuous nerves; sometimes anastomosing, and may have its actual representative in the Gymnogramme. Type *B. gymnogrammoides*.
gœpperti, Dawson, 1863, Can. Nat., vol. 8, and Acad. Geol. p. 485, Coal Meas.

Bergeria marginata, see *Lepidodendron marginatum*.

Bergeria rhombica, see *Lepidodendron rhombicum*.

BLASTOPHYCUS, Miller & Dyer, 1878, Jour. Cin. Soc. Nat. Hist., vol. 1, p. 24. [Ety. *blastos*, bud; *phukos*, sea-weed.] Plant bilobate with a button-like protuberance at the junction. Type *B. diadematum*.



FIG. 17. Blastophycus diadematum.

diadematum, Miller & Dyer, 1878, Jour. Cin. Soc. Nat. Hist., vol. 1, p. 24, Utica Slate Gr.

BORNIA, F. A. Roemer, 1854, Palæontographica, vol. 3. [Ety. proper name.] Stems cylindrical, articulate and furrowed as in Calamites; articulations scarcely contracted; ribs cut square or obtuse at the articulations, continuous, not alternating, thinly striate; cortical cylinder thick; leaves verticillate, free, linear-lanceolate. Type *B. radiata*.

inornata, Dawson, 1862, (Calamites inornatus,) Quar. Jour. Geo. Soc., vol. 18, p. 310, Genessee Slate.
radiata, Brongniart, 1828, (Calamites radiatus,) Hist. d. Veg. Foss., p. 122, and Coal Flora of Pa., p. 30, Subconglomerate.



FIG. 18.—Borna transitionis.

transitionis, Gœppert, 1852, (Calamites transitionis,) Foss. Fl. d. Uebergsg., p. 116, and Quar. Jour. Geo. Soc., vol. 18, p. 309, Ham. Gr.

Bothrodendron punctatum, see *Ulodendron punctatum*.

Brachyphyllum obtusum, see *Lepidocystis obtusum*.

Bruckmannia longifolia, see *Asterophyllites longifolius*.

rigida, see *Asterophyllites rigidus*.

tuberculata, see *Annularia tuberculata*.

BYTHOTREPHIS, Hall, 1847, Pal. N. Y., vol. 1, p. 8. [Ety. *buthos*, depth of the sea; *trephos*, to grow.] Stems subcylindrical or compressed; branches numerous, divaricating, sometimes leaf-like. Type *B. antiquata*.

antiquata, Hall, 1847, Pal. N. Y., vol. 1, p. 8, Calcif. Gr.

asteroides, Fitch, 1849, Trans. Ag. Soc., and Emmons Am. Geol., p. 101, Upper Taconic.

cæspitosa, Hall, 1850, 3d Rep. N. Y. St., Mus. Nat. Hist., p. 178, Trenton Gr.

flexuosa, Emmons, 1844, (Fucoides flexuosa,) Taconic system, p. 69, Upper Taconic.

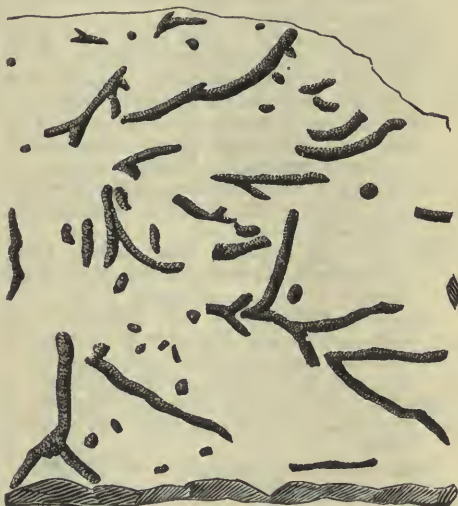


FIG. 19.—Bythotrephis ramulosa, showing the ends, and branches as they appear on a nodule.

gracilis, Hall, 1843, Geo. Rep., 4th Dist., N. Y., p. 69, and Pal. N. Y., vol. 1, p. 62, Trenton to Clinton Gr.

gracilis var. crassa, Hall, 1852, Pal. N. Y., vol. 2, p. 19, Clinton Gr.

gracilis var. intermedia, Hall, 1852, Pal. N. Y., vol. 2, p. 19, Trenton to Clinton Gr.

granti, Dawson, 1888, Geo. Hist. of Plants, p. 37, Clinton Gr.

gregaria, Ringueberg, 1888, Proc. Acad. Nat. Sci. Phil., p. 131, Niagara Gr.

impudica, Hall, 1852, Pal. N. Y., vol. 2, p. 20, Clinton Gr.

lesquereuxi, Grote & Pitt, 1876, Bull. Buff. Soc. Nat. Hist., vol. 3, p. 88, Waterlime Gr.
palmata, Hall, 1852, Pal. N. Y., vol. 2, p. 20, Clinton Gr.

- ramosa*, Hall, 1852, Pal. N. Y., vol. 2, p. 21, Clinton Gr.
- ramulosa*, S. A. Miller, 1874, Cin. Quar. Jour. Sci., vol. 1, p. 235, Utica Slate Gr.
- rigida*, Emmons, 1844, (Fucoides rigidus,) Taconic System, p. 69, Upper Taconic.
- subnodosa*, Hall, 1847, Pal. N. Y., vol. 1, p. 262, Hud. Riv. Gr.
- succulens*, Hall, 1847, Pal. N. Y., vol. 1, p. 62, Trenton Gr.
- tenuis*, Hall, 1852, Pal. N. Y., vol. 2, p. 18, Trenton Gr. The Trenton form of *B. gracilis*.
- CALAMITES**, Guettard, 1751, Mem. Ac. Sci., Paris. [Ety. *calamus*, a reed.] Plants arborescent; trunks cylindrical, articulate; articulations variable in distance, rapidly closer toward the narrowed ob-conical base; surface narrowly ribbed lengthwise; ribs equal, simple, parallel, contracted or rounded at the articulations; branches nearly at right angles, verticillate like the leaves, which are lanceolate, acuminate, simple nerved. Type C. *suckovi*.
- approximatus*, Sternberg, 1820, Essai d'un exposé Geognostico-botanique d. l. Fl. d. Monde primitif 2d Cahier, p. 36, and Coal Flora of Pa. p. 26, Coal Meas.
- distriatus*, Lesquereux, 1858, Geo. Sur. Pa., vol. 2, p. 850, Coal Meas. This name was preoccupied by Sternberg.
- canniformis*, Schlothheim, 1820, Petrefactenkunde, p. 398, and Coal Flora of Pa., p. 24, Coal Meas.
- cisti*, Brongniart, 1828, Hist. d. Veg. Foss. p. 129, and Coal Flora of Pa., p. 27, Coal Meas.
- cruciatius*, Brongniart, 1828, Hist. d. Veg. Foss. t. 1. p. 128, Coal Meas.
- disjunctus*, Lesquereux, 1858, Geo. Sur. Pa., vol. 2, p. 850, Coal Meas.
- dubius*, Artis, 1825, Antedil. Phytology, pl. 13, and Coal Flora of Pa., p. 27, Coal Meas.
- gigas*, Brongniart, 1828, Hist. d. Veg. Foss., 1, p. 136, and Coal Flora of Pa., p. 25, Coal Meas.
- gracilis*, Lesquereux, 1861, Geo. Sur. Ky., vol. 4, p. 436, Coal Meas.
- inornatus*, see *Bornia inornata*.
- major*, Weiss, 1872, Fossil Flora d. jungsten Steinkolen formation, p. 119, and Coal Flora of Pa., p. 21, Coal Meas.
- nodosus*, Sternberg, 1820, Essai d'un Exp. Geog.-Botan. d. l. Fl. d. Monde primitif 2d Cahier, p. 36, Coal Meas.
- nova-scoticus*, Dawson, 1863, Can. Nat. & Geol., vol. 8, and Acad. Geol. p. 479, Coal Meas.
- pachyderma*, Brongniart, 1828, Hist. d. Veg. Foss., 1, p. 132, and Coal Flora of Pa., p. 28, Coal Meas.
- radiatus*, see *Bornia radiata*.
- ramifer*, Stur, 1875, Culm Flora d. Mährisch-Schlesischen Dachschiefers, p. 82, and Coal Flora of Pa., pp. 23, 703, Coal Meas.
- ramosus*, Artis, 1825, Antedil. Phytology, pl. 2, and Coal Flora of Pa., pp. 22, 702, Coal Meas.
- suckovi*, Brongniart, 1828, Hist. d. Veg. Foss., t. 1, p. 124, and Coal Flor. of Pa., p. 20, Coal Meas.
- transitionis*, see *Bornia transitionis*.
- undulatus*, Brongniart, 1828, Hist. d. Veg. Foss. 1. p. 127, Coal Meas.
- voltzi*, Brongniart, 1828, Hist. d. Veg. Foss. 1, p. 135, and Acad. Geol. p. 194, Coal Meas.
- Calamocladus*, Schimper, 1869, Pal. Veget., vol. 1, p. 423. Not clearly distinguished from *Asterophyllites* and founded upon *A. longifolius* as the type, and including *A. equisetiformis*, *A. foliosus*, *A. rigidus*, and *Bechera grandis*.
- CALAMODENDRON**, Brongniart, 1828, Hist. d. Veg. Foss. vol. 1, p. 133. [Ety. *calamus*, reed; *dendron* tree.] Central cylinder striate lengthwise and articulate, surrounded by a thick, woody cylinder or bark, with outside surface smooth. The structure is allied to *Sigillaria*, but the appearance is like *Calamites*. Type C. *approximatum*.
- antiquum*, Dawson, 1871, Foss. Plants Canada, p. 24, Devonian.
- approximatum*, Brongniart, 1828, Hist. d. Veg. Foss., vol. 1, p. 133, Coal Meas.
- obscurum*, Dawson, 1863, Can. Nat., vol. 8, and Acad. Geol. p. 476, Coal Meas.
- tenuistriatum*, Dawson, 1871, Foss. Plants Canada, p. 25, Devonian.
- CALAMOPHYCUS**, Lesquereux, 1877; Proc. Am. Phil. Soc., p. 165. [Ety. *calamus*, reed; *phukos*, sea-plant.] Fronds simple, elongated, gradually tapering to a point; cavity divided by transverse membranes, either passing through the whole diameter, or connected in the middle to vertical subdivisions. Type C. *septum*.
- septum*, Lesquereux, 1877, Proc. Am. Phil. Soc. p. 165, Low. Held. Gr.
- CALAMOSTACHYS**, Schimper, 1869, Traité de Paleontologie Vegetale, vol. 1, p. 328. [Ety. *calamus*, reed; *stachys*, plant.] Spikes doubtfully considered as fructifications of *Asterophyllites*. Type C. *typicus*.
- brevifolius*, Lesquereux, 1884, Coal Flora of Pa., p. 718, Coal Meas.
- lanceolatus*, Lesquereux, 1884, Coal Flora of Pa., p. 715, Subconglomerate.

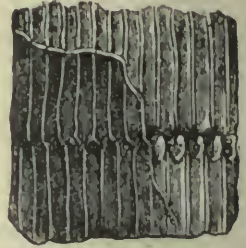


FIG. 20.—*Calamites Suckovi*.



FIG. 21.—*Calamodendron approximatum*.

ovalis, Lesquereux, 1858, (*Asterophyllites ovalis*), *Geo. of Pa.*, p. 851, and *Coal Flora of Pa.*, p. 717, *Coal Meas.*

prælongus, see *Volkmania prælonga*.

CALLIPTERIDIUM, Weiss, 1872, *Foss. Flora d. jungsten Steinkohlen formation.* [Ety. from the genus *Callipteris*.] Fronds large, polypinnate; pinnules attached to the rachis by the whole base, often decurrent, and the lower descending to the main rachis, connate or disjointed at the base; primary nerve strong, dissolved below the apex; lateral veins oblique, curved in passing to the borders, dichotomous, the basilar attached to the rachis. Type *C. sullivanti*.

aldrichi, Lesquereux, 1880, *Coal Flora of Pa.*, p. 171, *Coal Meas.*

dournaisi, Brongniart, 1828, (*Pecopteris dournaisii*), *Hist. d. Veg. Foss.*, p. 282, and *Coal Flora of Pa.*, p. 747, *Coal Meas.*

dawsonianum, Fontaine & White, 1880, *Perm. or Up. Carb. Flora.*, p. 56, *Coal Meas. or Permian.*

grandifolium, Fontaine & White, 1880, *Perm. or Up. Carb. Flora.*, p. 58, *Coal Meas. or Permian.*



FIG. 22.—*Callipteridium sullivanti*.

grandini, Brongniart, 1828, (*Pecopteris grandini*), *Hist. d. Veg. Foss.*, p. 286, and *Coal Flora of Pa.*, p. 748, *Coal Meas.*
 inflatum, Lesquereux, 1870, (*Alethopteris inflata*), *Geo. Sur. Ill.*, vol. 4, p. 393, *Coal Meas.*

inæquale, Lesquereux, 1880, *Coal Flora of Pa.*, p. 168, *Coal Meas.*

mansfieldi, Lesquereux, 1880, *Coal Flora of Pa.*, p. 166, *Coal Meas.*

massillonum, Lesquereux, 1866, (*Alethopteris massillonis*), *Geo. Sur. Ill.*, vol. 2, p. 438, *Low. Coal Meas.*

membranaceum, Lesquereux, 1880, *Coal Flora of Pa.*, p. 172, *Coal Meas.*

neuropteroides, Lesquereux, 1880, *Coal Flora of Pa.*, p. 166, *Coal Meas.*

oblongifolium, Fontaine & White, 1880, *Perm. or Up. Carb. Flora.*, p. 56, *Coal Meas. or Permian.*

odontopteroides, Fontaine & White, 1880, *Perm. or Up. Carb. Flora.*, p. 59, *Coal Meas. or Permian.*

oweni, Lesquereux, 1860, (*Alethopteris oweni*), *Geo. Rep. of Arkansas*, vol. 2, p. 309, *Coal Meas.*

pardeei, Lesquereux, 1880, *Coal Flora of Pa.*, p. 169, *Coal Meas.*

rigidum, Lesquereux, 1884, *Coal Flora of Pa.*, p. 746, *Coal Meas.*

rugosum, Lesquereux, 1858, (*Alethopteris rugosa*), *Catal. Potts. Ass'n*, p. 11, and *Coal Flora of Pa.*, p. 169, *Coal Meas.*

sinuatum, Brongniart, 1828, (*Pecopteris sinuata*), *Hist. d. Veg. Foss.*, p. 296, and *Coal Flora of Pa.*, p. 745, *Coal Meas.*

sullivanti, Lesquereux, 1854, (*Callipteris sullivanti*), *Bost. Jour. Nat. Hist.*, vol. 6, p. 423, and *Geo. Sur. Pa.*, vol. 2, p. 866, *Coal Meas.*

unitum, Fontaine & White, 1880, *Perm. or Up. Carb. Flora.*, p. 60, *Coal Meas.*

CALLIPTERIS, Brongniart, 1828, *Hist. d. Veg. Foss.*, p. 249. [Ety. *kallos*, beautiful;

pterus, fern.] Fronds polypinnate; pinnules sessile and sometimes occurring on the principal rachis, thick; parenchyma dense, nerves immersed, showing creases in the leaf-substance, simple or forking once. Type *C. conferta*.

conferta, Sternberg, 1824, (*Sphenopteris conferta*), *Vers. Darst. Flor. d. Vorwelt* and *Perm. or Up. Carb. Flora of Pa.*, p. 54, *Coal Meas. or Permian.*

sullivanti, see *Callipteridium sullivanti*.

CARDIACARPON, Brongniart, 1828, *Prodr. Hist. Veg. Foss.*, p. 87. [Ety. *kardia*, heart; *karpos*, fruit.] Seeds of various forms, composed of a compressed, generally cordiform or oval nucleus, surrounded by a flattened, fibrous border, or a membranaceous wing. Type *C. majum*.

affine, Lesquereux, 1860, *Geo. of Ark.*, vol. 2, p. 311, *Coal Meas.*

annulare, Sternberg, 1824, (*Carpolithes annularis*), *Vers. Darst. Flor. d. Vorwelt* and *Coal Flora of Pa.*, p. 814, *Subconglomerate.*

annulatum, Newberry, 1873, *Ohio Pal.*, vol. 1, p. 374, *Coal Meas.*

apiculatum, Göppert & Berger, 1848, *De fructibus et seminibus*, p. 23, and *Coal Flora of Pa.*, p. 571, *Subconglomerate.*

baileyi, Dawson, 1868, *Acad. Geol.*, p. 554, *Devonian.*

bicornutum, Lesquereux, 1870, (*Ptilocarpus bicornutus*), *Geo. Sur. Ill.*, vol. 4, p. 443, *Coal Meas.*

bicuspidatum, Sternberg, 1820, (*Carpolithes bicuspidatus*), *Flora der Vorwelt*, and *Coal Flora of Pa.*, p. 573, *Coal Meas.*

bisectum, Dawson, 1863, *Can. Nat. and Geol.*, vol. 8, and *Acad. Geol.*, p. 491, *Coal Meas.*

circulare, Lesquereux, 1884, *Coal Flora of Pa.*, p. 812, *Coal Meas.*

conglobatum, Lesquereux, 1884, *Coal Flora of Pa.*, p. 810, *Coal Meas.*

congruens, Grand Eury, 1877, *Flore Carbonifere*, p. 236, and *Coal Flora of Pa.*, p. 573, *Coal Meas.*

cornutum, Dawson, 1862, Quar. Jour. Geo. Soc., vol. 18, p. 324, Devonian.
 crampi, Hartt, 1868, Acad. Geol., p. 554, Devonian.
 crassum, Lesquereux, 1884, Coal Flora of Pa., p. 812, Coal Meas.
 dilatatum, Lesquereux, 1884, Coal Flora of Pa., p. 806, Subcarboniferous.
 diminutivum, Lesquereux, 1880, Coal Flora of Pa., p. 570, Coal Meas.
 diplotesta, Lesquereux, 1884, Coal Flora of Pa., p. 812, Coal Meas.
 divergens, Lesquereux, 1884, Coal Flora of Pa., p. 811, Coal Meas.
 ellipticum, Sternberg, 1820, (Carpolithes ellipticus,) Flor. d. Vorw., p. 40, and Coal Flora of Pa., p. 814, Coal Meas.
 elongatum, Newberry, 1873, Ohio Pal., vol. 1, p. 324, Coal Meas.
 fasciculatum, Lesquereux, 1880, Coal Flora of Pa., p. 570, Coal Meas.
 fluitans, Dawson, 1863, Can. Nat. and Geol., vol. 8, and Acad. Geol., p. 491, Coal Meas.
 harveyi, Lesquereux, 1884, 13th Rep. Ind. Geol., p. 102, and Coal Flora of Pa., p. 808, Coal Meas.
 ingens, Lesquereux, 1860, Geo. of Ark., vol. 2, p. 311, Coal Meas.
 late-alatum, Lesquereux, 1880, Coal Flora of Pa., p. 568, Coal Meas.
 latior, Lesquereux, 1884, Coal Meas. of Pa., p. 811, Coal Meas.
 latum, Newberry, 1873, Ohio Pal., vol. 1, p. 372, Coal Meas.
 lescurianum, n. sp. Coal Meas. Proposed instead of *C. ovale* Lesquereux, in Coal Flora of Pa., p. 810, which name was preoccupied.
 longicollis, Lesquereux, 1884, Coal Flora of Pa., p. 808, Coal Meas.
 mamillatum, see *Rhabdocarpus mamillatus*.
 marginatum, Artis, 1828, Antedil. Phytol., pl. 22, Coal Meas.
 minus, Newberry, 1873, Ohio Pal., vol. 1, p. 372, Coal Meas.
 newberryi, Andrews, 1875, Ohio Pal., vol. 2, p. 425, Coal Meas.
 obliquum, Dawson, 1862, Quar. Jour. Geo. Soc., vol. 18, p. 324, Devonian.
 orbiculare, Newberry, 1853, Ann. of Sci., vol. 1, p. 374, Coal Meas.
 ovale, Dawson, 1871, Foss. Plants Can., p. 60, Devonian.
 ovale, Lesquereux, 1884, Coal Flora of Pa., p. 810, Coal Meas. The name was preoccupied. See *C. lescurianum*.
 ovatum, Grand'Eury, 1877, Flore Carbonifere, p. 236, Coal Meas.
 pachyteta, Lesquereux, 1880, Coal Flora of Pa., p. 565, Coal Meas.
 patens, Lesquereux, 1884, Coal Flora of Pa., p. 807, Coal Meas.
 plicatum, Lesquereux, 1858, Geo. Sur. Pa., vol. 2, p. 876, Coal Meas.
 punctatum, Gœppert, 1836, Syst. Filic. Foss., p. 24, and Coal Flora of Pa., 597, Coal Meas.
 pusillum, Lesquereux, 1884, Coal Flora of Pa., p. 815, Coal Meas.

regulare, Sternberg, 1820, (Carpolithes regularis,) Flor. d. Vorw., and Coal Flora of Pa., p. 572, Coal Meas.

retusum, Sternberg, 1820, (Carpolithes retusum,) Flora der Vorwelt, and Ohio Pal., vol. 1, p. 374, Coal Meas.

samariforme, Newberry, 1873, Ohio Pal., vol. 1, p. 375, Coal Meas.

simplex, Lesquereux, 1880, Coal Flora of Pa., p. 569, Coal Meas.

speciosus, Lesquereux, 1884, Coal Flora of Pa., p. 807, Coal Meas.

tenellum, Dawson, 1873, Rep. Foss. Plants, p. 28, Subcarboniferous.

trevortoni, Lesquereux, 1858, Geo. Sur. Pa., vol. 2, p. 876, Coal Meas.

zonulatum, Lesquereux, 1880, Coal Flora of Pa., p. 568, Coal Meas.

CARDIOPTERIS, Schimper, 1869, *Traité de Paléontologie Végétale*, vol. 1, p. 457.

[Ety. *kardia*, heart; *pteris*, fern.] Leaves simple, pinnate; stipe striated, rounded, base spoon-like, dilated; pinnae perpendicular, opposite close, imbricated, cordato-ovate, leathery, margins reflexed; primary nerves numerous, equal, dichotomous. Type *C. polymorpha*.

eriana, Dawson, 1881, Quar. Jour. Geo. Soc. Lond., vol. 37, p. 305, Devonian.

CARPOLITHES, Schlotheim, 1820, *Petrefactenkunde*. [Ety. *karpos*, fruit; *lithos*, stone.]

Seeds of uncertain relation not referable by their characters to other genera.

acuminatus, Sternberg, 1821, Flor. d. Vorw. and Coal Flora of Pa., p. 596, Coal Meas.

bicarpus, Fontaine & White, 1880, Perm. or Up. Carb. Flora, p. 98, Coal Meas. or Permian.

bicuspidatus, see *Cardiocarpus bicuspidatum*.

bifidus, Lesquereux, 1858, Geo. Sur. Pa., vol. 2, p. 877, Coal Meas.

bullatus, see *Lepidocystis bullatus*.

butleranus, Lesquereux, 1884, Coal Flora of Pa., p. 824, Coal Meas.

cerasiformis, Sternberg, Flor. d. Vorw., vol. 2, p. 208, and Coal Flora of Pa., p. 824, Coal Meas.

cistula, Lesquereux, 1866, Geo. Sur. Ill., vol. 2, p. 451, Coal Meas.

clavatus, see *Rhabdocarpus clavatus*.

compactus, Dawson, 1871, Foss. Plants Canada, p. 63, Devonian.

conicus, Lesquereux, 1884, Coal Flora of Pa., p. 824, Coal Meas.

corticosus, Lesquereux, 1870, Geo. Sur. Ill., vol. 4, p. 462, Coal Meas.



FIG. 23.—*Cardiocarpus samariforme*.

disjunctus, Lesquereux, 1858, Geo. Sur. Pa., vol. 2, p. 877, syn. for *Trigonocarpon dawesi*.

fasciculatus, Lesquereux, 1866, Geo. Sur. Ill., vol. 2, p. 457, Coal Meas.

fragarioides, Newberry, 1873, Ohio Pal., vol. 1, p. 370, Coal Meas.

granularis, Sternberg, 1820, Flora der Vorwelt, and Coal Flora of Pa. p. 825, Coal Meas.

jacksonensis, see *Rhabdocarpus jacksonensis*.

laticus, Lesquereux, 1884, Coal Flora of Pa., p. 826, Coal Meas.

lunatus, Dawson, 1863, Quar. Jour. Geo. Soc., vol. 19, p. 464, Devonian.

marginatus, Fontaine & White, 1880, Perm. or Up. Carb. Flora, p. 98. The name was preoccupied by Artis in 1825. See *C. whittianus*.

minus, Sternberg, 1820, Flora der Vorwelt and Coal Flora of Pa., p. 825, Coal Meas.

multistriatus, see *Rhabdocarpus multistriatus*.

perpusillus, Lesquereux, 1884, Coal Flora of Pa., p. 825, Coal Meas.

persicaria, Lesquereux, 1870, Geo. Sur. Ill., vol. 4, p. 462, Coal Meas.

platimarginatus, see *Rhabdocarpus platimarginatus*.

retusus, see *Cardiocarpon retusum*.

siliqua, Dawson, 1863, Quar. Jour. Geo. Soc. Lond., vol. 19, p. 465, Devonian.

spicatus, Dawson, 1863, Quar. Jour. Geo. Soc. Lond., vol. 19, p. 461, Devonian.

transectus, Lesquereux, 1884, Coal Flora of Pa., p. 826, Coal Meas.

trilocularis, see *Trigonocarpon triloculare*.

umbonatus, Sternberg, 1820, Vers. Darst. Flora der Vorwelt, Coal Meas.

venosus, see *Rhabdocarpus venosus*.

vesicularis, see *Lepidocystis vesicularis*.

whittianus n. sp. Coal Meas. or Perm. Proposed instead of *C. marginatus*, Fontaine & White, 1880, in Perm. or Up. Carb. Flora, p. 98, which name was preoccupied.

Casuarinites equisetiformis, see *Asterophyllites equisetiformis*.

Cauleripites, Brongniart, 1828, Prodr. d. Hist. d. Veg. Foss., p. 21. [Ety. *kaulos*, stem; *erpo*, creep.] Stem simple or ramose, covered with short branches, in form of leaves doubled or imbricated. Type *C. lycopodioides*.

marginatus, see *Taonurus marginatus*.

CAULOPTERIS, Lindley & Hutton, 1833, Foss. Flora, vol. 1, p. 121. [Ety. *kaulos*, stem; *pterus*, a fern.] Scars with the inside disk either marked by linear bands, remains of vessels passing from the trunk to the base of the rachis, or covered by impressions of rootlets obliterating its shape, or merely ovate or elliptical, without traces of horseshoe-shaped vascular lines. These lines may have been, in some cases, effaced by abrasion of the surface or covered by rootlets. Type *C. primæva*.

acanthophora, Lesquereux, 1870, Geo. Sur. Ill., vol. 4, p. 458, Coal Meas. It may be a synonym for

Ulodendron punctatum.

antiqua, Newberry, 1871, Quar. Jour. Geo. Soc., vol. 27, p. 271, Up. Held. Gr.

cisti, Brongniart, 1828, (*Sigillaria cisti*), Hist. Veg. Foss. p. 418, and Coal Flora of Pa., p. 345, Coal Meas.

elliptica, Fontaine &

White, 1880, Perm. or Up. Carb. Flora, p. 95, Coal Meas. or Permian.

giffordi, Lesquereux, 1880, Coal Flora of Pa., p. 343, Coal Meas.

gigantea, see *Stemmatopteris gigantea*.

gigantea, Fontaine & White, 1880, Perm. or Up. Carb. Flora, p. 95, Coal Meas. or Permian.

insignis, see *Stemmatopteris insignis*.

intermedia, Lesquereux, 1870, Geo. Sur. Ill., vol. 4, p. 459, Coal Meas.

laccæ, Lesquereux, 1880, Coal Flora of Pa., p. 344, Coal Meas.

lockwoodi, Dawson, 1871, Quar. Jour. Geo. Soc., vol. 27, p. 270, Chemung Gr.

mansfieldi, Lesquereux, 1880, Coal Flora of Pa., p. 346, Coal Meas.

obtecta, Lesquereux, 1870, Geo. Sur. Ill., vol. 4, p. 457, Coal Meas.

peregrina, Newberry, 1871, Quar. Jour. Geo. Soc., vol. 27, p. 272, Up. Held. Gr.

punctata, see *Stemmatopteris punctata*.

wortheni, see *Stemmatopteris wortheni*.

CELULOXYLON, Dawson, 1881, Lond. Quar. Jour. Geo. Soc., vol. 37, p. 302.

cellula, a small apartment; *xylon*, wood.] Trunk showing in cross section, large

and somewhat unequal cells disposed in narrow concentric bands, between wider bands of fine fibrous tissue; no medullary rays; longitudinal section shows either cells superimposed in vertical rows, or a sort of banded prosenchymatous tissue. The structure appears to have been of exogenous growth. Type *C. primævum*.

primævum, Dawson, 1881, Quar. Jour. Geo. Soc., vol. 37, p. 302, Ham. Gr.

Penhallow says this is an Algæ, and belongs to the genus *Nematophycus*.

Chloephyucus, Miller & Dyer, 1878, Cont. to Pal., No. 2, p. 3. Probably inorganic.

plumosum, Miller & Dyer, Cont. to Pal., No. 2, p. 3, Hud. Riv. Gr. Probably inorganic.



FIG. 24.—*Caulopteris primæva*.

- CHONDRITES, Sternberg, 1833, Vers. Darst. Flora der Vorwelt, p. 25. [Ety. from its resemblance to *Chondrus crispus*, or Irish moss.] Fronds cartilaginous, filiform or robust stems, dichotomous, branchy; rounded or compressed. Type *C. antiquus*.
- antiquus*, Brongniart, 1828, (*Fucoides antiquus*.) Hist. d. Veg. Foss., vol. 1, p. 63, Devonian.
- colletti*, see *Taonurus colletti*.
- targioni*, Brongniart, 1828, (*Fucoides targioni*.) Hist. d. Veg. Voss., t. 1, p. 56, Coal Meas.
- CONOSTICHUS, Lesquereux, 1876, 7th Ann. Rep. Geo. Sur. Ind., p. 142. [Ety. *konos*, cone; *stichos*, row.] Stipe cylindrical, continuous; frond enlarging from the base upward in the shape of a plate, or of a cup, or increasing by successive superposed layers or concentric laminae; top concave, cup-shaped. Type *C. ornatus*.
- broadheadi*, Lesquereux, 1880, Coal Flora of Pa., p. 15. Coal Meas.

FIG. 25.—*Conostichus ornatus*.

- ornatus*, Lesquereux, 1876, 7th Ann. Rep. Geo. Sur. Ind., p. 142, Coal Meas.
- prolifer*, Lesquereux, 1880, Coal Flora of Pa., p. 16, Coal Meas.
- CORDAIANTHUS, Grand'Eury, 1877, Flore Carbonifere, p. 228. [Ety. *Cordaites*, a genus; *anthos*, flower.] Flowers and fruits of *Cordaites*, found isolated or in fragments where their relation to stem-bearing leaves is unknown. A provisional name only. Type *C. gemmifer*.
- bracteatus*, Lesquereux, 1870, (*Schultzia bracteata*.) Geo. Sur. Ill., vol. 4, p. 427, Coal Meas.
- dichotomus*, Lesquereux, 1880, Coal Flora of Pa., p. 546, Coal Meas.
- ebracteatus*, Lesquereux, 1884, Coal Flora of Pa., p. 844, Coal Meas.
- flexuosus*, Lesquereux, 1884, Coal Flora of Pa., p. 802, Coal Meas.
- gemmifer*, Grand'Eury, 1877, Flore Carbonifere, p. 228, and Coal Flora of Pa., p. 545, Coal Meas.
- ovatus*, Lesquereux, 1880, Coal Flora of Pa., p. 545, Coal Meas.
- rugosus*, Lesquereux, 1884, Coal Flora of Pa., p. 803, Coal Meas.
- scaber*, Lesquereux, 1884, Coal Flora of Pa., p. 844, Coal Meas.
- simplex*, Lesquereux, 1880, Coal Flora of Pa., p. 538, Coal Meas.

- spicatus*, Lesquereux, 1884, Coal Flora of Pa., p. 802, Coal Meas.
- CORDAICARPUS, Grand'Eury, 1877, Flore Carbonifere, p. 236. [Ety. *Cordaites*, a genus; *karpos*, fruit.] Seeds of variable size and shape. Type *C. ovatus*.
- apiculatus*, Lesquereux, 1880, Coal Flora of Pa., p. 551, Coal Meas.
- cinctus*, Lesquereux, 1884, Coal Flora of Pa., p. 804, Coal Meas.
- costatus*, Lesquereux, 1880, (*Cordaites costatus*.) Coal Flora of Pa., p. 540, Coal Meas.
- gutbieri*, Grand'Eury, 1877, Flore Carbonifere, p. 236, Coal Meas.
- lineatus*, Lesquereux, 1884, Coal Flora of Pa., p. 805, Coal Meas.
- ovatus*, Grand'Eury, 1877, Flore Carbonifere, p. 236, and Coal Flora of Pa., p. 550, Coal Meas.
- stabilis*, Lesquereux, 1884, Coal Flora of Pa., p. 805, Coal Meas.
- CORDAISTROBUS, Lesquereux, 1880, Coal Flora of Pa., p. 551. [Ety. *Cordaites*, a genus; *strobilus*, cone.] Strobile cylindrical, tapering to a blunt acumen, covered by transversely rhomboidal scars placed in spiral, bearing narrow, linear leaves, with the characters, form, and nervation of leaves of *Cordaites*. Type *C. grandeuryi*.
- grandeuryi*, Lesquereux, 1880, Coal Flora of Pa., p. 552, Coal Meas.
- CORDAITES, Unger, 1850, Gen. et sp., p. 277. [Ety. proper name.] Trunks of large size, irregularly branching, formed of a large medullar canal or pith; marked on the outer surface by transverse, narrow, parallel, simple ribs, rarely joined by divisions, covered by double or triple layers of wood and bark, converted by fossilization into thin layers of coal; leaves in spiral order, more or less distant, ribbon-like, of various length and width, linear, or more generally gradually enlarging upward, obtuse, entire or undulate, and split at the apex; borders curving to the sessile, or semi-embracing, somewhat inflated base; surface marked lengthwise by primary and secondary parallel simple nerves, generally more distant in the middle of the leaves, and slightly inflated toward the base; flowers in racemes from the axils of the leaves; fruits generally oval, sessile, of various size. Type *C. borassifolius*.
- angustifolius*, Dawson, 1861, Can. Nat., vol. 6, p. 10, Ham. Gr.
- angustifolius*, Lesquereux, see *C. diversifolius*.
- borassifolius*, Sternberg, 1820, (*Flabellaria borassifolia*.) Essai d. Exp. Geogn.-botan. d. l. Flora d. monde primitif, 2d Cabier., p. 36, and Coal Flora of Pa., p. 532, Coal Meas.

FIG. 26.
Cordaicarpus
apiculatus.

communis, Lesquereux, 1878, Proc. Am. Phil. Soc., p. 320, and Coal Flora of Pa., p. 534, Coal Meas.

costatus, Lesquereux, 1878, Proc. Am.

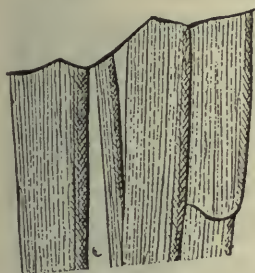


FIG. 27.—*Cordaites costatus*.

Phil. Soc., p. 323, and Coal Flora of Pa., p. 540, Coal Meas.

crassinervis, Fontaine & White, 1880, Perm. or Up. Carb. Flora, p. 97, Coal Meas. or Perm.

crassus, Lesquereux, 1880, Coal Flora of Pa., p. 530, Coal Meas.

diversifolius, Lesquereux, 1880, Coal Flora of Pa., p. 535, Coal Meas. Proposed instead of *C. angustifolius* Lesquereux, which was preoccupied.

flexuosus, Dawson, 1863, Quar. Jour. Geo. Soc., vol. 19, p. 462, Catskill Gr.

gracilis, Lesquereux, 1878, Proc. Am. Phil. Soc., p. 322, and Coal Flora of Pa., p. 539, Coal Meas.

grandifolius, Lesquereux, 1878, Proc. Am. Phil. Soc., p. 318, and Coal Flora of Pa., p. 530, Coal Meas.

lacoel, Lesquereux, 1880, Coal Flora of Pa., p. 535, Coal Meas.

lingulatus, Grand'Eury., 1877, Flore Carbonifere, p. 218, and Coal Flora of Pa., p. 533, Coal Meas.

mansfieldi, Lesquereux, 1878, Proc. Am. Phil. Soc., p. 321, and Coal Flora of Pa., p. 537, Coal Meas.

radiatus, Lesquereux, 1880, Coal Flora of Pa., p. 540, Coal Meas.

robbi, Dawson, 1861, Can. Nat., vol. 6, p. 8, Ham. Gr.

serpens, Lesquereux, 1880, Coal Flora of Pa., p. 324, Coal Meas.

simplex, Dawson, 1863, Can. Nat., vol. 8, and Acad. Geol., p. 490, Coal Meas.

validus, Lesquereux, 1878, Proc. Am. Phil. Soc., p. 317, and Coal Flora of Pa., p. 529, Coal Meas.

CREMATOPTERIS, Schimper, 1869, Traité de Paleontologie Vegetale, vol. 1, p. 596. [Ety. *krematos*, hanging; *pterus*, fern.] Rachis thick; pinnules sessile, ovate-oblong, contracted at the base, and subauriculate. Type *C. typica*.

pennsylvanica, Lesquereux, 1880, Coal Flora of Pa., p. 307, Coal Meas.

CRUZIANA, D'Orbigny, 1842, Voy. dans l'Amer. Merid. t. 3, pt. 2, p. 30. [Ety. proper name.] A transversely wrinkled fucoid, much like *Rusophycus*. Type *C. rugosa*.

linnarsoni, White, 1874, Rep. Invert. Foss., p. 5, and Geo. Sur. W. 100th Merid., vol. 4, p. 32, Upper Taconic.

rustica, White, 1874, Rep. Invert. Foss., p. 5, and Geo. Sur. W. 100th Merid., vol. 4, p. 32, Up. Taconic.

similis, Billings, 1874, Pal. Foss., vol. 2, p. 68, Up. Taconic.

CYCLOPTERIS, Brongniart, 1828, Prodr. Hist. Veg. Foss., p. 51. [Ety. *kuklos*, circle; *pterus*, fern.] Leaflets orbicular or reniform, large, veins numerous, and not positively referable to other genera. Type *C. orbicularis*.

acadica, see *Aneimites acadicus*.

alleganiensis, Meek, 1876, Desc. Foss. Plants Va. Syn. for *Archæopteris rogersi*.

antiqua, Dawson, 1863, Can. Nat. and Geo., vol. 8, and Acad. Geol., p. 481, Coal Meas.

bockshii, see *Aneimites bockshii*.

brownii, see *Rhacophyllum brownii*.

crispa, Germ. & Kaulf, 1831, (*Filicites crispus*) Nova. Acta. Acad., vol. 15, p. 229, Coal Meas.

elegans, Lesquereux, 1858, Bost. Jour. Nat. Hist., vol. 6, p. 416, and Geo. Sur. Pa., vol. 2, p. 856, Coal Meas.

fimbriata, see *Neuropteris fimbriata*.

flabellata, Brongniart, 1828, Prodr. Hist. Veg. Foss., p. 52, Coal Meas.

germari, see *Neuropteris germari*.

hallana, see *Archæopteris hallana*.

hispida, Dawson, 1863, Can. Nat. and Geo., vol. 8, and Acad. Geol., p. 481, Coal Meas.

hirsuta, Lesquereux, 1858, Geo. Sur. Pa., vol. 2, p. 856, Coal Meas.

incerta, Dawson, 1862, Quar. Jour. Geo. Soc., vol. 18, p. 320, Ham. Gr.

jacksoni, see *Archæopteris jacksoni*.

laciniata, see *Neuropteris laciniata*.

lescuriana, see *Triphyllopteris lescuriana*.

oblata, Lindley & Hutton, 1837, Foss. Flora, vol. 3, pl. 217, Coal Meas.

obliqua, Brongniart, 1828, Prodr. Hist. Veg. Foss., p. 52, Coal Meas.

orbicularis, Brongniart, 1828, Prodr. Hist. Veg. Foss., p. 52, Coal Meas.

problematica, Dawson, 1871, Foss. Plants Dev. and Up. Sil., p. 47, Devonian.

rogersi, see *Archæopteris rogersi*.

trichomanoides, see *Neuropteris trichomanoides*.

undans, Lesquereux, 1858, Geo. Sur. Pa., vol. 2, p. 855, Coal Meas.



FIG. 28.—*Cyclopteris elegans*.

valida, see *Aneimites validus*.
varia, Dawson, 1862, Quar. Jour. Geo. Soc., vol. 18, p. 319, Devonian.
virginiana, see *Pseudopectopteris virginiana*.
wilsoni, Wood, 1860, Proc. Acad. Nat. Sci., p. 519, Coal Meas.

CYCLOSTIGMA, Houghton, 1860, Ann. and Mag. Nat. Hist., 3d ser., vol. 5, p. 444.

[Ety. *kuklos*, circle; *stigma*, a dot or puncture.] Stems arborescent, surface tuberculate, rugose lengthwise; tubercles in regular spiral order, small, subglobose, more generally conical, acute, topped with a vascular terminal and prominent point, or more rarely flattened at the top into small, round areoles, with the vascular point in the middle; decorticated surfaces smooth or obscurely striate lengthwise by the series of tubercles, which are oval, elevated or prominent, and gradually effaced downward or decurring, preserving the impressions of the central vascular scars. Type *C. kiltorkense*.

affine, Dawson, 1881, Quar. Jour. Geo. Soc., vol. 37, p. 301, Chemung Gr.

densifolium, Dawson, 1871, Foss. Plants Can., p. 43, Devonian.

kiltorkense, Houghton, 1860, Ann. and Mag. Nat. Hist., 3d ser., vol. 5, p. 444, Subcarboniferous.

CYMOGLOSSA, Schimper, 1869, Traité de Paleontologie Vegetale, vol. 1, p. 553.

[Ety. *kumo*, wavy; *glossa*, tongue.] Fronds pinnate, or bipinnate; pinnae oblong, sessile, alternate, margin lobed; nerves simple or branching, reaching the margin and leaving triangular spaces without nerves. Type *C. goeppertana*.

breviloba, Fontaine & White, 1880, Perm. and Up. Carb. Flora, p. 86, Coal Meas. or Permian.

formosa, Fontaine & White, 1880, Perm. and Up. Carb. Flora, p. 86, Coal Meas. or Permian.

lobata, Fontaine & White, 1880, Perm. and Up. Carb. Flora, p. 87, Coal Meas. or Permian.

obtusifolia, Fontaine & White, 1880, Perm. and Up. Carb. Flora, p. 85, Coal Meas. or Permian.

DACTYLOPHYCUS, Miller & Dyer, 1878, Cont. to Pal., No. 2, p. 1.

[Ety. *dactylos*, finger; *phukos*, sea-plant.] Stem divided at one or both ends into three or more short subequal branches, and closely related to *Ichnophycus*. Type *D. tridigitatum*.

quadripartitum, Miller & Dyer, 1878, Cont. to Pal., No. 2, p. 2,

Utica Slate Gr.

tridigitatum, Miller & Dyer, 1878, Cont. to Pal., No. 2, p. 1, Utica Slate Gr.



FIG. 29.—*Dactylophycus tridigitatum*.

DADOXYLON, Endlicher, 1840, Syn. Con. [Sig. pine or torch-wood.] Branching trunks, with distinct zones of growth and a pith of *Sternbergia* type; wood-cells, with rows of areoles with oval pores; medullary rays with series of cells.

acadianum, Dawson, 1863, Can. Nat., vol. 8, and Acad. Geol., p. 473, Coal Meas.

annulatum, Dawson, 1863, Can. Nat., vol. 8, and Acad. Geol., p. 473, Coal Meas.

antiquum, Dawson, 1863, Can. Nat., vol. 8, and Acad. Geol., p. 473, Coal Meas.

clarkii, Dawson, 1882, Foss. Plants Erian and Up. Sil. Formations, pt. 2, p. 124, Genesee shales.

halli, Dawson, 1862, Quar. Jour. Geo. Soc., vol. 18, p. 306, Ham. Gr.

materiarium, Dawson, 1863, Can. Nat., vol. 8, and Acad. Geol., p. 473, Up. Coal Meas.

newberryi, Dawson, 1871, Foss. Plants Can., p. 14, Portage Gr.

ouangondianum, Dawson, 1861, Can. Nat., vol. 6, and Acad. Geol., p. 534, Up. Devonian.

DANEITES, Gœppert, 1836, Syst. Filic. Foss., p. 380. [Ety. from the genus *Danæa*.]

Fronds pinnate; secondary veins coming out in right angles from the primary straight nerve, simple or dichotomous; sporanges, on the lower side of the lamina, placed in rows from the medial nerve to near the borders along the lateral veins, oval or linear exannulate. Type *D. asplenioides*.

asplenioides, var. *major*, Bunbury, 1846, Quar. Jour. Geol. Soc., vol. 2, p. 85, Coal Meas.

emersoni, Lesquereux, 1880, Coal Flora of Pa., p. 157, Coal Meas.

macrophyllus, Newberry, 1873, (*Alethopteris macrophylla*) Ohio Pal., vol. 1, p. 383, Low. Coal Meas.

DECHENIA, Gœppert, 1841, Die Gattungen der fossilen Pflanzen, p. 43. [Ety. proper name.] Stems arborescent;

leaf-scars in continuous spiral lines; bolsters oblong, rounded, marked by obscure concentric striae, on the middle



FIG. 30.—*Dadoxylon*. a, bark; b, woody zone or fiber (pleurenychyma); c, medulla or pith; d, cast of hollow pith or sternbergia.



FIG. 31.—*Danæites macrophyllus*.

of which were attached leaves, probably cylindrical. Type *D. euphorboides*.

striata, Lesquereux, 1880, Coal Flora of Pa., p. 431, Coal Meas.

DENDROPHYCUS, Lesquereux, 1884, Coal Flora of Pa., vol. 3, p. 699. [Ety. *dendron*, tree; *phukos*, sea-weed.] Root composed of tubulose flattened filaments, irregularly branching and widely spreading from the base of the rhizoma; rhizoma cylindrical, simple, long and thick; fronds at first top-shaped, very large, tree-like, and many times divided when opened; primary and secondary branches thick and somewhat flat on one side, dichotomous; ultimate divisions cylindrical, narrow and pointed. Type *D. desori*.

desori, Lesquereux 1884, Coal Flora of Pa., vol. 3, p. 699, Devonian.

DESMIOPHYLLUM, Lesquereux, 1880, Coal Flora of Pa., p. 556. [Ety. *desmos*, band; *phyllon*, leaf.] Stems slender; leaves narrow, sublinear, gradually enlarged from the base, single and sparse or joined 3 or 4 together and fasciculate at the base; surface of stem and leaves irregularly ribbed lengthwise by prominent large bundles of nerves buried under the epidermis, which is thick, irregularly granulose, by splitting of the coaly layer. Type *D. gracile*.

gracile, Lesquereux, 1880, Coal Flora of Pa., p. 557, Coal Meas.

DICRANOPHYLLUM, Grand'Eury, 1877, Flore Carbonifere, pl. 30. [Ety. *dikranos*, two-pointed; *phyllon*, leaf.] Stems slender, leaves narrow, linear, subcoriaceous, of various length, forking, or dividing in filaments in the upper part, marked with a few thick primary nerves, and intermediate nervilles, more or less immersed into the epidermis.

dichotomum, Lesquereux, 1880, Coal Flora of Pa., p. 553, Coal Meas.

dimorphum, Lesquereux, 1878, Proc. Am. Phil. Soc., p. 329, and Coal Flora of Pa., p. 554, Coal Meas.

Dictyolites, see *Dictyophyton* in the class Protozoa.

becki see *Dictyophyton becki*.

DICTYOPTERIS, Gutbier, 1835, Verst. Zwick. Schwarzfz., p. 63. [Ety. *dictyon*, net; *pteris*, fern.] Frond bipinnate; pinules cordate, truncate or rounded at the base, sessile or short pedicelled, oblong, obtuse or lanceolate, entire; veins flexuous, connected by flexures and intersections, forming a more or less distinct and close reticulation of polygonal meshes. Type *D. brongniarti*.

cordata, Roemer, in Pflanzen d. prod. Steinkohlegeb. am Harz und Piesberg in Palæontographica, vol. 9, p. 186,

and Coal Flora of Pa., p. 833, Coal Meas.

neuropteroidea, Gutbier, 1852, Verst. Stein Sachs., p. 23, and Coal Flora of Pa., p. 833, Coal Meas.

obliqua, Bunbury, 1847, Quar. Jour. Geo. Soc., vol. 3, p. 427, and Coal Flora of Pa., p. 146, Coal Meas.

rubella, Lesquereux, 1870, Geo. Sur. Ill., vol. 4, p. 388, Coal Meas.

scheuchziri, Hoffman, in Roem. Pflanz. d. Kohlengeb. am Harz in Paleont. IX, p. 186, and Coal Flora of Pa., p. 832, Coal Meas.



FIG. 32.—*Dictyopteris obliqua*.

DIDYMOPHYLLUM, Gœppert, 1841, Gatt. der Foss. Pflanzen, p. 35. [Ety. *didymos*, double; *phyllon*, a leaf.] Trunk arborescent, cylindrical; leaves double, united at the base, disposed in spiral order, appressed; areoles prominent, reniform, each resembling a pair of small areoles attached to each other. Type *D. schottini*.

oweni, Lesquereux, 1870, (Sigillaria oweni,) Geo. Sur. Ill., vol. 4, p. 498, Coal Meas.

reniforme, Dawson, 1862, Quar. Jour. Geo. Soc., vol. 18, p. 309, Ham. Gr.

Diplazites emarginatus, see *Pecopteris emarginata*.

DIPLOSTEGIUM, Corda, 1845, Beitrage zur Flora der Vorwelt, p. 112. [Ety. *diplos*, double; *steges*, a covering; but spelled by Corda *Diplostegium*.] Thick trunks of trees longitudinally furrowed; bark thick, and imbricated in short cylindrical overlaps. Type *D. brownanum*.



FIG. 33.
Diplostegium retusum.

retusum, Dawson, 1863, Can. Nat., vol. 8, and Acad. Geol., p. 490, Coal Meas.

truncatum, Lesquereux, 1860, Geo. Sur. Ark., vol. 2. Syn. for *Knorria imbricata*.

DISCOPHYCUS, Walcott, 1879, Trans. Alb. Inst., vol. 10, p. 19. [Ety. *diskos*, disk; *phukos*, sea-plant.] Frond discoid, slightly convex, and substance coriaceous. Type *D. typicale*.

typicale, Walcott, 1879, Trans. Alb. Inst., vol. 10, p. 19, Utica slate.

DYSTACTOPHYCUS, Miller & Dyer, 1878, Cont. to Pal., No. 2, p. 2. [Ety. *dustaktos*, hard to arrange; *phukos*, sea-plant.] Frond mammiform, expanded and concentrically wrinkled. Type *D. mammillanum*.

mammillanum, Miller & Dyer, 1878, Cont. to Pal., No. 2, p. 2, Hud. Riv. Gr.

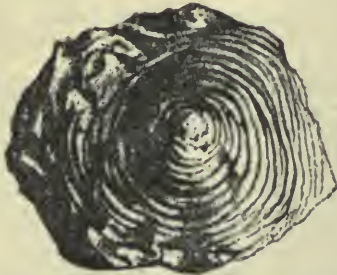


FIG. 34.—*Dystactophycus mammillanum*.

EOPHYTON, Torell, 1868, Bidr. t. Sparagm. geogn. och. paleont., p. 36. [Ety. *eos*, dawn; *phyton*, a plant.] Slender, cylindrical, reed-like fucoids, longitudinally striated. Type *E. linnæanum*.

explanatum, Dawson, 1870, Can. Nat. and Geol., Low. Arenig rocks.

jukesi, Billings, 1874, Pal. Foss., vol. 2, p. 65, Up. Taconic.

linnæanum (?), Torell, 1868, Bidr. t. Sparagm. geogn. och. paleont., p. 36, Up. Taconic.

EQUISETITES, Sternberg, 1833, Vers. Darst. Flora der Vorwelt, vol. 2, p. 43. [Ety. *equus*, a horse; *seta*, a hair or bristle; in allusion to the resemblance to a horse-tail.] Arborescent; stems articulate; articulations surrounded with costate sheaths, dentate on the border. Type *E. gigantea*.

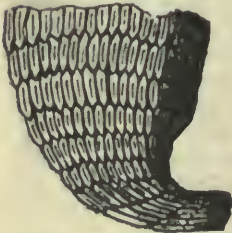


FIG. 35.—*Equisetites curtus*.

columnaris, Brongniart, 1828, (*Equisetum columnare*,) Hist. Veg. Foss., t. 1, p. 115, Coal Meas.

curtus, Dawson, 1863, Syn. Carb. Flora in Can. Nat., vol. 8, and Acad. Geol., p. 443, Coal Meas.

elongatus, Fontaine & White, 1880, Perm. or Up. Carb. Flora, p. 33, Coal Meas. or Permian.

gracilis, Lesquereux, 1884, Coal Flora of Pa., p. 729, Coal Meas.

macrodontus, Wood, 1860, Proc. Acad. Nat. Sci. Not satisfactorily defined.

occidentalis, Lesquereux, 1870, Geo. Sur. Ill., vol. 4, p. 425, Coal Meas.

stellifolius, Harlan, 1835, (*Equisetum stellifolium*,) Trans. Geo. Soc. Pa., vol. 1, p. 261, Coal Meas. Syn. for *Annularia longifolia*?

striatus, Fontaine & White, 1880, Perm. or Up. Carb. Flora, p. 34, Coal Meas. or Permian.

wrightianus, see *Echinocaris wrightiana*.

Equisetum, see *Equisetites*.

columnare, see *Equisetites columnaris*.

stellifolium, see *Equisetites stellifolius*.

EREMOPTERIS, Schimper, 1869, Traité de Paléontologie Vegetale, vol. 1, p. 416.

[Ety. *eremos*, isolated; *pterus*, fern.]

Upper part of fronds dichotomous; pinnae open or oblique, irregularly pinnatifid; laciniae long, obovate or wedge-form, the lower ones deeply cut; the lateral veins enter the lobes in acute angles of divergence from the midrib, and passing up to the borders are flabellate, dichotomous, parallel, and close. Type *E. artemisiifolia*.

artemisiifolia, Sternberg, 1824, (*Sphenopteris artemisiifolia*,) Vers. Darst. Flora der Vorwelt, p. 44, and Coal Flora of Pa., p. 293, Coal Meas.

cheathamii, Lesquereux, 1884, Coal Flora of Pa., p. 770, Coal Meas.

crenulata, Lesquereux, 1876, Geo. Rep. of Alabama, p. 75, and Coal Flora of Pa., p. 292, Coal Meas.

dissecta, Lesquereux, 1876, Geo. Rep. of Alabama, p. 75, and Coal Flora of Pa., p. 293, Coal Meas.

elegans, Ettingshausen, 1852, (*Asplenites elegans*,) Die Steinkohlen flora v. Stradonitz in Bohmen, p. 15, and Coal Flora of Pa., p. 294, Coal Meas.

flexuosa, Lesquereux, 1876, Geo. Rep. of Alabama, p. 75, and Coal Flora of Pa., p. 293, Coal Meas.

marginata, Andrews, 1875, Ohio Pal., vol. 2, p. 422, Coal Meas.

microphylla, Lesquereux, 1880, Coal Flora of Pa., p. 296, Coal Meas.

missouriensis, Lesquereux, 1880, Coal Flora of Pa., p. 295, Coal Meas.

Ficoidites scabrosus, Hildreth, 1837, Am. Jour. Sci. and Arts, vol. 31, p. 30, Low. Coal Meas. Not recognized, but probably a *Sigillaria*.

Filicites, Schlotheim, 1820, Nachtr. zur Petref. It was used for all fossil ferns, and hence is not of generic value.

acuminatus, see *Neuropteris acuminata*.

aquilinus, see *Alethopteris aquilina*.

arborescens, see *Pecopteris arborescens*.

crispus, see *Cyclopteris crispata*.

gracilis, see *Plumalina gracilis*.

lonchiticus, see *Alethopteris lonchitica*.

miltoni, see *Pecopteris miltoni*.

penniformis, see *Pecopteris penniformis*.

pluckeneti, see *Pseudopecopteris pluckeneti*.

plumosus, see *Pecopteris plumosa*.

oreopteridis, see *Pecopteris oreopteridis*.

trifoliatus, see *Pseudopecopteris trifoliata*.

Flabellaria borassifolia, see *Cordaites borassifolius*.

Fucoides, Brongniart, 1822, in Mem. d. Hist.



FIG. 36.
Eremopteris marginata.

Nat. and Hist. d. Veg. Foss., t. 1., p. 50. It was used to comprehend the *Sargasites* or *Thalassophytes*, and hence is of more than generic value.

alleganiensis, see *Arthropycus harlani*.

auriformis, Hall, 1843. Not organic.

bilobatus, see *Rusophycus bilobatum*.

caudagalli, see *Taonurus caudagalli*.

demissa, Conrad probably *phytopsis tubulosa*.

dentatus, Brongniart probably *Diplograptus pristiniiformis*.

filiciformis, see *Rhacophyllum filiciforme*.

flexuosus, see *Bythotrephis flexuosa*.

gracilis, see *Bythotrephis gracilis*.

graphica. Not defined so as to be determined.

harlani, see *Arthropycus harlani*.

heterophyllum, Hall. Not defined so as to be determined.

retort, see *Taonurus retortus*.

rigidus, see *Bythotrephis rigida*.

secalinus, Hall syn. for *Diplograptus simplex*.

serra, Brongniart, see *Graptolithus bryonoides*.

simplex, see *Diplograptus simplex*.

velum, see *Taonurus velum*.

verticalis, see *Scolithus verticalis*.

Galium sphenophylloides, see *Annularia sphenophylloides*.

GLYPTODENDRON, Claypole, 1878, Am. Jour. Sci. and Arts, 3d ser., vol. 15, p. 302. [Ety. *glyptos* sculptured; *dendron*, tree.] Stem thick, covered with rhomboidal areoles, the lower portions of which are depressed. Type *G. eatonense*.



FIG. 37.—*Glyptodendron eatonense*.

eatonense, Claypole, 1878, Am. Jour. Sci. and Arts, 3d. ser., vol. 15, p. 302, Niagara Gr.

Goniopteris newberryana, see *Pecopteris newberryana*.

oblonga, see *Pecopteris oblonga*.

Gordia marina, see *Palæochorda marina*.

GULIELMITES, Geinitz, 1858, Leithpflanzen d. Rothleig. u. d. Zechstein, Sachsen, p. 19. [Ety. from the genus *Gulielma*.] A kind of fruit, of uncertain affinity.

orbicularis, Fontaine & White, 1880, Perm. and Up. Carb. Flora, p. 99, Coal Meas. or Permian.

permanianus, Geinitz, 1858, Leithpflanzen d. Rothleig. u. d. Zechstein, Sachsen, p. 19, Permian.

HALONIA, Lindley & Hutton, 1835, Foss. Flora, vol. 2, p. 11. [Ety. from its close affinity with *Halonina*.] Stems of medium size, dichotomous; cortex tuberculate; spaces intermediate to the tubercles marked with rhomboidal scars; decorticated surface, covered with punctiform round or oval papillæ, obtuse or perforated in the center, placed in spiral order. Type *H. tortuosa*.

flexuosa, Goldenberg, 1855, (*Ulodendron flexuosum*,) Flora Sarræpontana fossilis, vol. 1, pl. 2, fig. 10, and Coal Flora of Pa., p. 416, Coal Meas.

mansfieldi, Lesquereux, 1880, Coal Flora of Pa., p. 414, Coal Meas.

pulchella, Lesquereux, 1860, Geo. Sur. Ark., vol. 2, p. 311, Coal Meas.

secretæ, Lesquereux, 1880, Coal Flora of Pa., p. 417, Coal Meas.

tortuosa, Lindley & Hutton, 1835, Foss. Flora, vol. 2, p. 11, Coal Meas.

tuberculata, Brongniart, 1838, Hist. d. Veg. Foss., vol. 2, pl. 28, and Coal Flora of Pa., p. 411, Coal Meas.

Harlania, syn. for *Arthropycus*.

halli, syn. for *Arthropycus harlani*.



FIG. 38.—*Halonina flexuosa*.

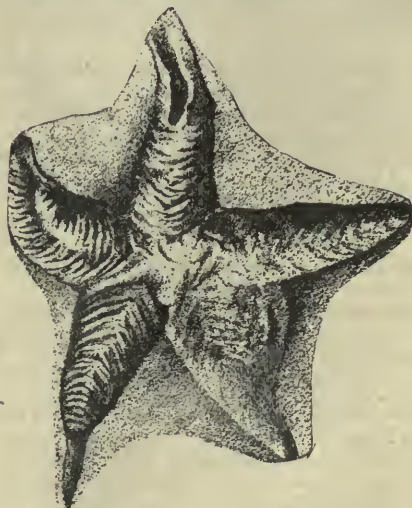


FIG. 39.—*Heliophycus stelliforme*.

HELIOPHYCUS, Miller & Dyer, 1878, Cont. to Pal. No. 2, p. 2. [Ety. *helios*, the sun;

- phukos*, sea-plant.] * Star-like frond, having five rays; transversely wrinkled. Type H. stelliforme.
- stelliforme, Miller & Dyer, 1878, Cont. to Pal. No. 2, p. 2, Hud. Riv. Gr.
- HIPODORPHYCUS, Hall & Whitfield, 1872, 24th Rep. N. Y. St. Mus. Nat. Hist., p. 203. [Ety. *hippodos*, horse-foot; *phukos*, sea-plant.] Founded upon cavities in sandstone, having a form similar to that which a putty ball will assume, when pressed between thumb and finger, leaving a rounded rim on three sides of the disc, the compressed margin being truncate. Type H. cowlesi.
- cowlesi, Hall & Whitfield, 1872, 24th Rep. N. Y. St. Mus. Nat. Hist., p. 203, Chemung Gr.
- HYMENOPHYLLITES, Gœppert, 1836, Syst. Filic. Foss. [Ety. from the genus *Hymenophyllum*.] Frond membranaceous, many times regularly pinnately divided or irregularly cut, lobed with pinnatifid or dichotomous divisions, decurring on a broad common rachis, which is sometimes indistinct; veins pinnate, percurrent, solitary in each division. Type H. gersdorfi.
- adnascens*, see *Rhacophyllum adnascens*.
- alatus*, see *Sphenopteris alata*.
- arborescens*, see *Rhacophyllum arborescens*.
- ballantini*, see *Sphenopteris ballantini*.
- capillaris*, Lesquereux, 1858, Geo. Sur. Pa., vol. 2, p. 863. Coal Meas.
- clarki*, see *Rhacophyllum clarki*.
- curtilobus*, Dawson, 1862, Quar. Jour. Geo. Soc., vol. 18, p. 321, and Acad. Geol., p. 552; Devonian.
- delicatus*, Brongniart, 1828, Hist. d. veg. Foss., p. 185, Coal Meas.
- flexicaulis*, see *Sphenopteris flexicaulis*.
- furcatus*, see *Sphenopteris furcata*.
- gersdorfi*, Gœppert, 1836, Syst. Filic. Foss. Devonian.
- giganteus*, see *Rhacophyllum lactuca*.
- gutbieranus*, Unger, 1850, Gen. et. sp., p. 132, Coal Meas.
- hildrethi*, see *Sphenopteris hildrethi*.
- inflatus*, see *Rhacophyllum inflatum*.
- lactuca*, see *Rhacophyllum lactuca*.
- mollis*, see *Rhacophyllum molle*.
- myriophyllum*, Brongniart, 1828, (*Sphenopteris myriophylla*.) Hist. d. Veg. Foss., p. 184, Coal Meas.
- obtusilobus*, Gœppert, 1836, Syst. Filic. Foss., Devonian.
- pentadactylus*, Dawson, 1863, Can. Nat. and Geol., vol. 8, and Acad. Geol., p. 485, Coal Meas.
- pinnatifidus*, Lesquereux, 1866, Geo. Sur. Ill., vol. 2, p. 436, Coal Meas.
- schlothheimi*, Brongniart, 1828, (*Sphenopteris schlothheimi*.) Hist. d. Veg. Foss., p. 193, Coal Meas.
- spinosa*, see *Sphenopteris spinosa*.
- splendens*, see *Sphenopteris splendens*.
- strongi*, see *Rhacophyllum strongi*.
- subfurcatus*, Dawson, 1868, Acad. Geol., p. 55, Devonian.
- tenuifolius*, Brongniart, 1828, (*Sphenopteris tenuifolia*.) Hist. d. Veg. Foss., p. 190, Coal Meas.
- thalliformis*, see *Rhacophyllum thalliforme*.
- trichomanoides*, see *Sphenopteris trichomanoides*.
- tridactylites*, see *Sphenopteris tridactylites*.
- ICHNORPHYCUS, Hall, 1852, Pal. N. Y., vol. 2, p. 26. [Ety. *ichnos*, a foot-print; *phukos*, a seaweed.] Tridactyle impressions somewhat resembling a foot-track, the middle stem being the longer. Type I. *tridactylum*.
- tridactylum*, Hall, 1852, Pal. N. Y., vol. 2, p. 26, Clinton Gr.
- IDIOPHYLLUM, Lesquereux, 1880, Coal Flora of Pa., p. 159. [Ety. *idios*, peculiar; *phyllon*, leaf.] Leaves small, round, or broadly obovate; medial nerve thick, gradually narrowed and effacing in joining the borders; lateral secondary veins sub-opposite, thick, passing in an inside curve toward the borders, gradually effaced in the reticulation; venules more or less continuous; sometimes crossing each other in contrary directions, and forming, by intersections, quadrate or rhomboidal meshes. Type I. *rotundifolium*.
- rotundifolium*, Lesquereux, 1880, Coal Flora of Pa., p. 160, Coal Meas.
- KNORRIA, Sternberg, 1825, Essai d. Exp. Geogn.-botan. d. l. Flor. du Monde primitif fasc. 4, p. 37. [Ety. proper name.] Trunks covered with elongated semiconical or truncate tubercles placed in spiral order more or less imbricated, leaving, after falling off, round convex marks, with a single, vascular scar in the middle; leaves long, linear, more or less inflated at the base, with a flat medial nerve. Type K. *imbricata*.
- imbricata*, Sternberg, 1825, Flor. d. monde primitif fasc. 4, p. 37, Kaskaskia Gr.



FIG. 40.
Hymenophyllum
curtilobus.



FIG. 41.—Ichnophycus tridactylum.

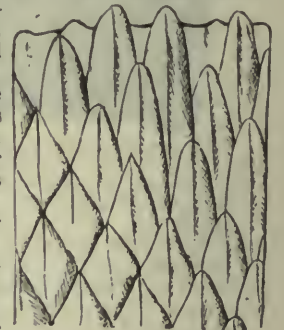


FIG. 42.
Knorrria imbricata.

- selloni, Sternberg, 1825, Flor. d. monde primitif fasc. 4, p. 37-50, Coal Meas.
- taxina, Lindley & Hutton, 1833-5, Foss. Flora, vol. 2, p. 37, Coal Meas.
- LEPIDOCYSTRIS**, Lesquereux, 1880, Coal Flora of Pa., p. 454. [Ety. *lepis*, scale; *kustis*, bladder.] Spore cases long, naked, attached in right angle and opposite to a broad rachis; or short, placed in spiral order upon long, flexuous axes; or isolated sporanges, detached from strobiles of unknown character. Type *L. pectinatus*.
- angularis*, Lesquereux, 1880, Coal Flora of Pa., p. 456, Coal Meas.
- bullatus*, Lesquereux, 1870, (Carpolithes *bullatus*.) Geo. Sur. Ill., vol. 4, p. 463, Coal Meas.
- fraxiniformis*, Gœppert & Berger, 1848, (Carpolithes *fraxiniformis*.) De Fruct. et Sem., p. 26, Coal Meas.
- lineatus*, Lesquereux, 1880, Coal Flora of Pa., p. 454, Coal Meas.
- obtusis*, Lesquereux, 1858, (Brachyphyllum *obtusum*.) Geo. of Pa., vol. 2, p. 876, Coal Meas.
- pectinatus*, Lesquereux, 1880, Coal Flora of Pa., p. 454, Coal Meas.
- quadrangularis*, Lesquereux, 1880, Coal Flora of Pa., p. 453, Coal Meas.
- vesicularis*, Lesquereux, 1870, (Carpolithes *vesicularis*.) Geo. Sur. Ill., vol. 4, p. 462, Coal Meas.
- LEPIDODENDRON**, Sternberg, 1820, Essai d'un expose Geognostico-botanique de la flore du monde primitif, 1st Cahier, p. 25. [Ety. *lepis*, scale; *dendron*, tree.] Surface of the stem marked by scars, points of leaf attachments; leaf scars (bolsters) rhomboidal, oblong, upon the bark of large trees or small branches, variable in size according to their position, often disfigured; central cicatrices (inside scars) rhomboidal, transversely dotted by three points (vascular scars) bearing, generally, under the lower margin two, oval small tubercles, scars of bundles of vessels (appendages) placed on each side of a medial line (*cauda*), which, like the appendages, is more or less distinct, sometimes deep and wrinkled across, sometimes obsolete. Type *L. dichotomum*.
- aculeatum*, Sternberg, 1820, Essai d. Exp. Geogn.-botan. d. l. flor. d. monde primitif, 1st Cahier, p. 25, and Coal Flora of Pa., p. 371, Coal Meas.
- acuminatum*, Gœppert, 1852, Foss. Fl. d. Uebergangsgebirge, p. 185, Subcarboniferous.
- andrewsi*, Lesquereux, 1880, Coal Flora of Pa., p. 389, Coal Meas.
- alveolare*, see *Sigillaria alveolaris*.
- binerve*, Bunbury, 1847, Quar. Jour. Geo. Soc., vol. 3, p. 431, Coal Meas.
- bordæ*, Wood, 1860, Proc. Acad. Nat. Sci., p. 239, Coal Meas.
- brittsi*, Lesquereux, 1880, Coal Flora of Pa., p. 363, Coal Meas.
- carinatum*, Lesquereux, 1858, Geo. Sur. Pa., vol. 2, p. 875, Coal Meas.
- chemungense*, Hall, 1843, (Sigillaria *chemungensis*.) Geo. Rep. 4th Dist. N. Y., p. 275, Chemung Gr.
- chilaloeum*, Syn. for *L. distans*.
- clypeatum*, Lesquereux, 1858, Geo. Sur. Pa., vol. 2, p. 875, Coal Meas.
- conicum*, Lesquereux, 1858, Geo. Sur. Pa., vol. 2, p. 874, Coal Meas.
- corrugatum*, Dawson, 1860, Quar. Jour. Geo. Soc., vol. 15, p. 313, and Acad. Geol., p. 253, Waverly Gr.
- costatum*, Lesquereux, 1866, Geo. Sur. Ill., vol. 2, p. 453, Kaskaskia Gr.
- crenatum*, Sternberg, 1820, Flor. d. monde primitif, 1st Cahier, p. 25, and Coal Flora of Pa., p. 394, Coal Meas.
- cruciatum*, Lesquereux, 1870, Geo. Sur. Ill., vol. 4, p. 432, Coal Meas.
- cuspidatum*, Lesquereux, 1880, Coal Flora of Pa., p. 388, Coal Meas.
- cyclostigma*, Lesquereux, 1880, Coal Flora of Pa., p. 394, Coal Meas.
- decurtatum*, Dawson, 1863, Can. Nat., vol. 8, and Acad. Geol., p. 487, Coal Meas.
- dichotomum*, Sternberg, 1820, Flor. d. monde primitif, 1st Cahier, p. 25, and Coal Flora of Pa., p. 384, Coal Meas.
- dikrocheilum*, Wood, 1860, Proc. Acad. Nat. Sci., p. 239, Coal Meas.
- dilatatum*, Lindley & Hutton, 1831, Foss. Flora, vol. 1., p. 27, Coal Meas.
- diplostegiodes*, Lesquereux, 1860, Geo. Sur. Ark., vol. 2., p. 311, Coal Meas.
- distans*, Lesquereux, 1858, Geo. Sur. Pa., vol. 2, p. 874, Coal Meas.
- drepanaspis*, Wood, 1860, Proc. Acad. Nat. Sci., Phil., vol. 12, p. 240, Coal Meas.
- dubium*, Wood, syn. for *L. rimosum*.
- elegans*, Sternberg, 1824, (Lycopodolithes *elegans*.) Vers. Darst. Flor. d. Vorwelt 4 fasc., FIG. 43.—*Lepidodendron distans*, p. 8, Coal Meas.
- forulatum*, Lesquereux, 1870, Geo. Sur. Ill., vol. 4, p. 431, Coal Meas.
- gaspanum*, Dawson, 1859, Quar. Jour. Geo. Soc., vol. 15, p. 484, and Acad. Geol., p. 541, Catskill Gr. Probably the same as Vanuxem's *Sigillaria simplicitas*.
- giganteum*, Lesquereux, 1858, Geo. Sur. Pa., vol. 2., p. 874, Coal Meas.
- gracile*, Lindley & Hutton, 1831, Foss. Flora, vol. 1, p. 30, Coal Meas.
- greeni*, Lesquereux, 1870, Geo. Sur. Ill., vol. 4, p. 43, Coal Meas.
- harcourtii*, Witham, 1832, Trans. Nat. Hist. Soc., New, upon Tyne, p. 51, Coal Meas.
- ichthyolepis*, Wood, 1860, (Lepidophloios *ichthyolepis*.) Proc. Acad. Nat. Sci. Phil., p. 240, Coal Meas.



FIG. 43.—*Lepidodendron distans*, p. 8, Coal Meas.

ingens, Wood, syn. for *L. aculeatum*.
lanceolatum, Lesquereux, 1880, Coal Flora of Pa., p. 369, Coal Meas.
latifolium, Lesquereux, 1880, Coal Flora of Pa., p. 370, Coal Meas.
lesquereuxi, Wood, syn. for *L. clypeatum*.
longifolium, Brongniart, 1828, Prodr. Hist. Veg. Foss., p. 85, and Coal Flora of Pa., p. 373, Coal Meas.
magnum, Wood, 1860, Proc. Acad. Nat. Sci., Phil., p. 239, Coal Meas.
mammillatum, Lesquereux, syn. for *L. veltheimanum*.
marginatum, Presl, 1826, (*Bergeria marginata*.) in Sternberg Flor. d. Vorw., p. 134, and Coal Flora of Pa., p. 784, Coal Meas.
mekiston, Wood, syn. for *L. modulatum*.
mielcki, Gœppert, 1836, Syst. Filic. Foss., p. 465, and Coal Flora of Pa., p. 395, Coal Meas.
modulatum, Lesquereux, 1858, Geo. Sur. Pa., vol. 2, p. 874, Coal Meas.
morrisanum, Lesquereux, 1870, Geo. Sur. Ill., vol. 4, p. 430, Coal Meas.
obovatum Sternberg, 1820, Flor. d. monde primitif, 1st Cahier, p. 25, Coal Meas.
obscurum, Lesquereux, 1866, Geo. Sur. Ill., vol 2, p. 453, Kaskaskia Gr.
obtusum, Lesquereux, 1858, Geo. Sur. Pa., vol. 2, p. 875, Coal Meas.
oculatum, Lesquereux, syn. for *L. distans*.
oceni, Wood, syn. for *L. vestitum*.
personatum, Dawson, 1863, Can. Nat. and Geo.; vol. 8, and Acad. Geol., p. 488, Coal Meas.
pictoense, Dawson, 1863, Can. Nat. and Geo., vol. 8, and Acad. Geol. p. 487, Coal Meas.
plicatum, Dawson, 1863, Can. Nat. and Geo. vol. 8, and Acad. Geol., p. 488, Coal Meas.
plumarium, Lindley & Hutton, 1835, Foss. Flora, vol. 3, p. 151, Coal Meas.
politum, syn. for *L. modulatum*.
primævum, Rogers, 1858, Geo. Sur. Pa., vol. 2, p. 675, Ham. Gr.
quadrangulatum, Schlotheim, 1820, (*Palmacites quadrangulatus*.) Petrefactenkunde, p. 395, and Coal Flora of Pa., p. 383, Coal Meas.
quadrilaterale, Lesquereux, 1880, Coal Flora of Pa., p. 389, Coal Meas.
radiato-plicatum, Dawson, 1873, Rep. Foss. Plants, p. 32, Subcarboniferous.
radicans, Lesquereux, 1866, Geo. Sur. Ill., vol. 2, p. 454, Coal Meas.
rectangulum, Wood, 1860, Proc. Acad. Nat. Sci. Phil., vol. 12, p. 519, Coal Meas.
rhombicum, Presl, 1833, (*Bergeria rhombica*.) in Sternberg's Flor. d. Vorw., vol. 2, p. 184, Coal Meas.
rigens, Lesquereux, 1870, Geo. Sur. Ill., vol. 4, p. 429, Coal Meas.
rigidum, Lesquereux, 1884, Coal Flora of Pa., p. 839, Coal Meas.
rimosum, Sternberg, 1820, Flor. d. monde primitif, 1st Cahier, p. 25, and Coal Flora of Pa., p. 392, Coal Meas.

rugosum, syn. for *L. dichotomum*.
rushvillense, Andrews, 1875, Ohio Pal., vol. 2; p. 423, Coal Meas.
salebrosum, Wood, 1860, Proc. Acad. Nat. Sci., Phil., p. 520, Coal Meas.
scobiniforme, Meek, 1876, Bull. Phil. Soc. Wash., p. 13, Waverly Gr. Probably a syn. for *L. corrugatum*.

scutatum, Lesquereux, 1880, Coal Flora of Pa., p. 369, Coal Meas.

selaginoides, Sternberg, 1820, Flor. d. monde primitif, 2d Cahier, p. 35, Coal Meas.

sigillarioides, Lesquereux, 1858, founded upon a decocted specimen of *L. vestitum* or *L. latifolium*.

simplex, Lesquereux, 1866, Geo. Sur. Ill., vol. 2, p. 454, Coal Meas.

squamiferum, Lesquereux, 1880, Coal Flora of Pa., p. 376, Coal Meas.

sternbergi, Brongniart, 1828, Prodr. Hist. Veg. Foss., p. 85, Coal Meas.

tetragonum, Sternberg, 1821, Flor. d. monde primitif, 2d Cahier, p. 35, Coal Meas.

tijoni, Lesquereux, 1870, Geo. Sur. Ill., vol. 4, p. 431, Coal Meas.

tumidum, Bunbury, 1847, (*Lepidophloios tumidum*.) Quar. Jour. Geol. Soc., vol. 3, p. 432, Coal Meas.

turbinatum, Lesquereux, 1866, Geo. Sur. Ill., vol 2, p. 453, Kaskaskia Gr.

undulatum, Sternberg, 1820, Flor. d. monde primitif, 1st Cahier, p. 25, Coal Meas.

ureum, Wood, 1860, Proc. Acad. Nat. Sci., p. 240, Coal Meas.

veltheimanum, Sternberg, 1823, Vers. Darst. Flora der Vorwelt, vol. 1, p. 12, Kaskaskia Gr.

venustum, Wood, syn. for *L. obtusum*.
vestitum, Lesquereux, 1858, Geo. Sur. Pa., vol. 2; p. 874, Coal Meas.

wortheni, Lesquereux, 1866, Geo. Sur. Ill., vol. 2, p. 452, Coal Meas.

LEPIDOPHLOIOS, Sternberg, 1823, Vers. Darst. Flora der Vorwelt. [Ety. *lepis*, scale; *phloios*, the bark.] Stems arborescent, erect, with four ranked branches disposed in spiral order; leaves coriaceous, linear, long, narrow, with a thick medial



FIG. 44.—*Lepidodendron sternbergi*.

nerve, bearing at base thick, suberect or recurved bolsters, inflated in the upper part and dotted with small vascular points; leaf-scars transversely rhomboidal, marked horizontally by three vascular scars, minutely papillose under the cortex. Type *L. laricinum*.

acadianus, Dawson, 1863, Can. Nat. and Geo., vol. 8, and Acad. Geol. p. 489, Coal Meas.

antiquus, Dawson, 1871, Foss. Plants Canada, p. 36, Devonian.

auriculatus, Lesquereux, 1870, Geo. Sur. Ill., vol. 4, p. 439, Coal Meas.

crassicaulis, Corda, 1845, Beitrage zur Flora der Vorwelt, p. 18, Coal Meas.

dilatatus, Lesquereux, 1884, Coal Flora of Pa., p. 781, Coal Meas.

ichthyoderma, Lesquereux, 1880, Coal Flora of Pa., p. 426, Coal Meas.

ichthyolepis, see *Lepidodendron ichthyolepis*.

irregularis, Lesquereux, 1860, Geo. Sur. Ark. vol. 2, p. 311, Coal Meas.

laricinum, Sternberg, 1820, (*Lepidodendron laricinum*,) Flor. d. monde primitif, 1st Cahier, p. 25, Coal Meas.

lesquereuxi, Andrews, 1875, Ohio Pal., vol. 2, p. 423, Coal Meas.

macrolepidotus, Goldenberg, 1862, Flora sarreptontana fossilis, vol. 3, p. 37, Coal Meas.

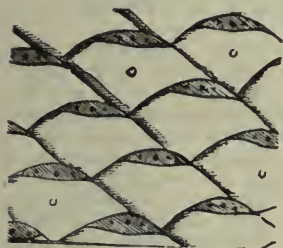


FIG. 45.—*Lepidophlois macrolepidotus*.

obcordatus, Lesquereux, 1866, Geo. Sur. Ill., vol. 2, p. 457, Coal Meas.

parvus, Dawson, 1863, Can. Nat. and Geo., vol. 8, and Acad. Geol., p. 490, Coal Meas.

platystigma, Dawson, 1863, Can. Nat. and Geo., vol. 8, and Acad. Geol., p. 490, Coal Meas.

prominulus, Dawson, 1863, Can. Nat. and Geo., vol. 8, and Acad. Geol., p. 489, Coal Meas.

protuberans, Lesquereux, 1870, Geo. Sur. Ill., vol. 4, p. 440, Coal Meas.

sigillarioides, Lesquereux, 1880, Coal Flora of Pa., p. 425, Coal Meas.

tetragonum, Dawson, 1863, Can. Nat. and Geo., vol. 8, and Acad. Geol., p. 490, Coal Meas.

tumidus, Lesquereux, see *Lepidodendron tumidum*.

LEPIDOPHYLLUM, Brongniart, 1828, Prodr. d. Hist. Veg. Foss., p. 87. [Ety. *lepis*, scale; *phyllon*, leaf.] Blades or bracts, either joined to sporanges, or sporangiophores of *Lepidostrobus*, or isolated. Type *L. majum*.

acuminatum, Lesquereux, 1858, Geo. Sur. Pa., vol. 2, p. 875. The name was preoccupied by Gutbier in 1843, but as it is a *Lepidostrobus* the name may be retained.

affine, Lesquereux, 1858, Geo. Sur. Pa., vol. 2, p. 875, Coal Meas.

auriculatum, Lesquereux, 1866, Geo. Sur. Ill., vol. 2, p. 457, Coal Meas.

brevifolium, Lesquereux, 1858, Geo. Sur. Pa., vol. 2, p. 876, Coal Meas.

campbellianum, Lesquereux, 1884, Coal Flora of Pa., p. 786, Coal Meas.

coriaceum, Lesquereux, 1884, Coal Flora of Pa., p. 787, Coal Meas.

cultriforme, Lesquereux, 1884, Coal Flora of Pa., p. 785, Coal Meas.

elegans, Lesquereux, 1884, Coal Flora of Pa., p. 787, Coal Meas.

fallax, Lesquereux, 1884, Coal Flora of Pa., p. 786, Coal Meas.

foliaceum, see *Lepidostrobus foliaceus*.

gracile, Lesquereux, 1884, Coal Flora of Pa., p. 786, Coal Meas.

hastatum, see *Lepidostrobus hastatus*.

intermedium, Lindley & Hutton, 1831, Foss. Flora, vol. 1, p. 125, Coal Meas.

lanceolatum, see *Lepidostrobus lanceolatus*.

linearifolium, Lesquereux, 1880, Coal Flora of Pa., p. 452, Coal Meas.

majum, Brongniart, 1828, Prodr. d'une Hist. Veg. Foss., p. 87, and Coal Flora of Pa., p. 449, Coal Meas.

mansfieldi, Lesquereux, 1880, Coal Flora of Pa., p. 449, Coal Meas.

minutum, Lesquereux, 1884, Coal Flora of Pa., p. 787, Coal Meas.

morrisanum, Lesquereux, 1880, Coal Flora of Pa., p. 448, Coal Meas.

obtusum, Lesquereux, 1858, Geo. Sur. Pa., vol. 2, p. 875, Coal Meas.

plicatum, Lesquereux, 1858, Geo. Sur. Pa., vol. 2, p. 876, Coal Meas.

rostellatum, Lesquereux, 1870, Geo. Sur. Ill., vol. 4, p. 443, Coal Meas.

striatum, Lesquereux, 1870, Geo. Sur. Ill., vol. 4, p. 443, Coal Meas.

trinerve, Brongniart, 1828, Prodr. Hist. Veg. Foss., p. 87, and Lindley & Hutton's Foss. Flora, vol. 2, p. 195, Coal Meas.

truncatum, see *Lepidostrobus truncatus*.

tumidum, Lesquereux, 1880, Coal Flora of Pa., p. 448, Coal Meas.

LEPIDOSTROBUS, Brongniart, 1828, Prodr. d. Hist. Veg. Foss., p. 87. [Ety. *lepis*, scale; *strobilus*, cone.] Strobiles cylindrical or ovate, oblong, conical; composed of sporanges (spore-cases) subcylindrical or clavate, emarginate at the apex, supported in the middle lengthwise by bracts formed of a pedicel, attached like the sporanges in right angle to the axis, linear or oblanceolate, either simple, not longer than the sporanges, or prolonged into lanceolate, obtuse or acuminate laminae, curved upward on the outside of the strobiles and imbricated on their sides, or merely inflated

- at the outer end, and covering the apex of the sporanges by a rhomboidal small shield; spores, triquetre on one side, half globular on the other, like those of the Lycopods, homomorphous or dimorphous. Type *L. ornatus*.
- acuminatus*, Lesquereux, 1858, (*Lepidophyllum acuminatum*.) *Geo. Pa.*, vol. 2, p. 875, *Coal Meas.*
- aldrichi*, Lesquereux, 1880, *Coal Flora of Pa.*, p. 441, *Coal Meas.*
- butleri*, Lesquereux, 1884, *Coal Flora of Pa.*, p. 840, *Coal Meas.*
- connivens*, Lesquereux, 1870, *Geo. Sur. Ill.*, vol. 4, p. 442, *Coal Meas.*
- foliaceus*, Lesquereux, 1870, (*Lepidophyllum foliaceum*.) *Geo. Sur. Ill.*, vol. 4, p. 444, *Coal Meas.*
- globosus*, Dawson, 1861, *Can. Nat. and Geo.*, vol. 6, p. 174, *Devonian.*
- goldenbergi*, Schimper, 1872, *Traité de Paleontologie Vegetale*, vol. 2, p. 61, *Coal Meas.*
- hastatus*, Lesquereux, 1858, (*Lepidophyllum hastatum*.) *Geo. Sur. Pa.*, vol. 2, p. 876, *Coal Meas.*
- incertus*, Lesquereux, 1880, *Coal Flora of Pa.*, p. 442, *Coal Meas.*
- lancei*, Lesquereux, 1880, *Coal Flora of Pa.*, p. 439, *Coal Meas.*
- lanceolatus*, Brongniart, 1828, (*Lepidophyllum lanceolatum*.) *Prodr. d. Hist. d. Veg. Foss.*, p. 87, and *Coal Flora of Pa.*, p. 436, *Coal Meas.*
- lancifolius*, Lesquereux, 1870, *Geo. Sur. Ill.*, vol. 4, p. 442, *Coal Meas.*
- latus*, Lesquereux, 1884, *Coal Flora of Pa.*, p. 841, *Coal Meas.*
- longifolius*, Dawson, 1863, *Can. Nat. and Geo.*, vol. 8, and *Acad. Geol.* p. 489, *Coal Meas.*
- manfieldi*, Lesquereux, 1880, *Coal Flora of Pa.*, p. 444, *Coal Meas.*
- mirabilis*, Newberry, 1873, (*Polysporin mirabilis*.) *Ohio Pal.*, vol. 1, p. 362, *Low. Coal Meas.*
- oblongifolius*, Lesquereux, 1870, *Geo. Sur. Ill.*, vol. 4, p. 441, *Coal Meas.*



FIG. 40.
Lepidostrobus hastatus.

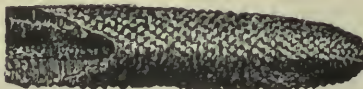


FIG. 47.—*Lepidostrobus ornatus*. Cone $\frac{1}{2}$ size.

- ornatus*, Parkinson, 1811, *Organic Remains*, vol. 1, pl. 9, fig. 1, and *Coal Flora of Pa.*, p. 440, *Coal Meas.*
- ovatifolius*, Lesquereux, 1870, *Geo. Sur. Ill.*, vol. 4, p. 441, *Coal Meas.*
- pinaster*, Lindley & Hutton, 1837, *Foss. Flora*, vol. 3, p. 129, *Coal Meas.*
- prælongus*, Lesquereux, 1880, *Coal Flora of Pa.*, p. 433, *Coal Meas.*

- princeps*, Lesquereux, 1866, *Geo. Sur. Ill.*, vol. 2, p. 455, *Coal Meas.*
- quadratus*, Lesquereux, 1880, *Coal Flora of Pa.*, p. 444, *Coal Meas.*
- richardsoni*, Dawson, 1861, *Can. Nat. and Geo.*, vol. 6, p. 174, *Devonian.*
- salisburyi*, Lesquereux, 1880, *Coal Flora of Pa.*, p. 443, *Coal Meas.*
- spectabilis*, Lesquereux, 1880, *Coal Flora of Pa.*, p. 435, *Coal Meas.*
- squamosus*, Dawson, 1863, *Can. Nat. and Geo.*, vol. 8, and *Acad. Geol.*, p. 489, *Coal Meas.*
- stachioides*, sec *Asterophyllites stachioides*.
- trigonolepis*, Bunbury, 1847, *Quar. Jour. Geo. Soc.*, vol. 3, p. 432, *Coal Meas.*
- truncatus*, Lesquereux, 1870, *Geo. Sur. Ill.*, vol. 4, p. 442, *Coal Meas.*
- variabilis*, Lindley & Hutton, 1833, *Foss. Flora*, vol. 1, p. 31, and *Coal Flora of Pa.*, p. 434, *Coal Meas.*
- LEPIDOXYLON**, Lesquereux, 1878, *Proc. Am. Phil. Soc.*, p. 334, and *Coal Flora of Pa.*, p. 557. [*Ety. lepis*, scale; *xylon*, wood.] Stems large, tapering to a point; bark thin, covered with leafy scales; leaves variable, sublinear, narrowed or enlarged to the point of attachment, forking upward in two or more laciniae; nervation distinct with the gluss; primary nerves parallel, buried in the epidermis, inflated or half round; intermediate veinlets thin, visible on the decorticated face. Type *L. anomalum*.
- anomalum*, Lesquereux, 1880, *Coal Flora of Pa.*, p. 557, *Coal Meas.*
- LEPTOPHYLLUM**, Dawson, 1862, *Quar. Jour. Geo. Soc.*, vol. 18, p. 316. [*Ety. leptos*, slender; *phlois*, the bark of a tree.] Stem covered with continuous rhombic areoles, each with a single small scar a little above its center, and above this a very slight furrow; decorticated stems, with spiral punctiform scars in slight depressions; bark thin, pith cylinder very large, with transverse markings of the character of *Sternbergia*. Type *L. rhombicum*.
- rhombicum*, Dawson, 1862, *Quar. Jour. Geo. Soc.*, vol. 18, p. 316, *Devonian.*
- LESCUROPTERIS**, Schimper, 1869, *Paleontologie Vegetale*, vol. 1, p. 465. [*Ety. proper name*; *pterus*, a fern.] Fronds large, bi



FIG. 48.—*Lescuropteris adlantites*.

tripinnate; rachis broad; foliate; pinnae pinnatifid, close, oblique; divisions ovate, acute, inclined outside, connate

to the middle, decurrent to the rachis; primary nerve thin, dichotomous; lower pairs of lateral veins emerging from the rachis, the other alternately from the midrib, forking twice, the upper forking once or simple. Type *L. moorii*.
adiantites, Lesquereux, 1854, (Neuropteris *adiantites*,) Bost. Jour. Nat. Hist., vol. 6, p. 419, and Coal Flora of Pa., p. 163, Coal Meas.

moorii, Lesquereux, 1858, (Neuropteris *moorii*,) Geo. Sur. Pa., vol 2, p. 860, Coal Meas.

LESLEYA, Lesquereux, 1880, Coal Flora of Pa., p. 142. [Ety. proper name.] Pinnæ simple, very entire, sublanceolate, gradually narrowing toward the base, traversed by a thick costa effaced under the apex; veins oblique, curved, equal, repeatedly dichotomous. Type *L. grandis*.

grandis, Lesquereux, 1880, Coal Flora of Pa., p. 143, Coal Meas.

microphylla, Lesquereux, 1884, Coal Flora of Pa., p. 831, Coal Meas.



FIG. 49.—*Licrphyucus ottawense*.

LICRPHYCUS, Billings, 1862, Pal. Foss., vol. 1, p. 99. [Ety. *likros*, a fan; *phykos*, sea-weed.] Composed of numerous, elongated, subcylindrical stems, radiating from a common root, and remaining single, or branching at an acute angle. Type *L. ottawense*.

flabellum, Miller & Dyer, 1878, Jour. Cin. Soc. Nat. Hist., vol. 1, p. 25, Hud. Riv. Gr.

formosum, Billings, 1866, Catal. Sil. Foss. Antic., p. 72, Hud. Riv. Gr.

hiltonense, Billings, 1862, Pal. Foss., vol. 1, p. 101, Black Riv. and Trenton Gr.

hudsonicum, Billings, 1862, Pal. Foss., vol. 1, p. 101, Hud. Riv. Gr.

minor, Billings, 1862, Pal. Foss., vol. 1, p. 100, Trenton Gr.

ottawense, Billings, 1862, Pal. Foss., vol. 1, p. 99, Trenton Gr.

robustum, Billings, 1866, Catal. Sil. Foss. Antic., p. 72, Hud. Riv. Gr.

vagans, Billings, 1866, Catal. Sil. Foss. Antic., p. 72, Hud. Riv. Gr.

Lithodictyon becki, Conrad. Not properly defined; but see Dictyophyton *becki*.

LONCHOPTERIS, Brongniart, 1828, Prodr. Hist. Veg. Foss., p. 59. [Ety. *lonche*, spear; *pterus*, fern.] Pinnate or bipinnate;

pinnules contiguous at the base, nearly at right angles to petiole, oblong-elongate, obtuse, middle-sized veins reticulated with finer ones. Type *L. bricei*.

tenuis, Dawson, 1863, Can. Nat. and Geol., vol. 8, and Acad. Geol., p. 483, Coal Meas.

Lycopodiolithes elegans, see *Lepidodendron elegans*.

LYCOPODITES, Brongniart, 1822, Mem. du Mus. d'Hist. Nat. de Paris, and *Lycopodiolithis* of Schlotheim and Sternberg. [Ety. from *Lycopodium*, the club moss.] Plants herbaceous;

leaves of the same or of two different forms upon the same branches, distichous or in spiral order; fructifications in small cylindrical spikes. Type *L. pinniformis*.

annularifolius, Lesquereux, 1870, Geo. Sur. Ill., vol. 4, p. 426, Coal Meas.

arborescens, Lesquereux, 1884, Coal Flora of Pa., p. 778, Coal Meas.

asterophyllitifolius, Lesquereux, 1866, Geo. Sur. Ill., vol. 2, p. 447, Coal Meas.

cavifolius, Lesquereux, 1861, Geo. Sur. Ky., vol. 4, p. 437, Coal Meas.

comosus, Dawson, 1863, Quar. Jour. Geo. Soc., vol. 19, p. 462, Devonian.

flexifolius, Lesquereux, 1884, Coal Flora of Pa., p. 779, Coal Meas.

lacei, Lesquereux, 1884, Coal Flora of Pa., p. 780, Coal Meas.

matthewi, Dawson, 1861, Can. Nat. and Geo., vol. 6, p. 171, and Acad. Geol., p. 540, Devonian.

meekei, Lesquereux, 1870, Geo. Sur. Ill., vol. 4, p. 426, Coal Meas.

ortoni, Lesquereux, 1880, Coal Flora of Pa., p. 357, Coal Meas.

pendulus, Lesquereux, 1880, Coal Flora of Pa., p. 357, Coal Meas.



FIG. 50.—*Lycopodites matthewi*; a, branch and leaves; b, c, d leaves.

pendulus, Lesquereux, 1880, Coal Flora of Pa., p. 357, Coal Meas.

pendulus, Lesquereux, 1880, Coal Flora of Pa., p. 357, Coal Meas.

pendulus, Lesquereux, 1880, Coal Flora of Pa., p. 357, Coal Meas.

pendulus, Lesquereux, 1880, Coal Flora of Pa., p. 357, Coal Meas.

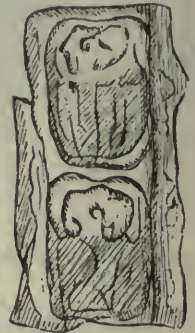
plumula, see *Plumalina plumula*.
richardsoni, Dawson, 1863, Quar. Jour. Geo. Soc., vol. 19, p. 461, Devonian.
simplex, Lesquereux, 1884, Coal Flora of Pa., p. 779, Coal Meas.
strictus, Lesquereux, 1880, Coal Flora of Pa., p. 360, Coal Meas.
uncinatus, Lesquereux, 1866, (Selaginites *uncinatus*.) Geo. Sur. Ill., vol. 2, p. 446, Coal Meas.
vanuxemi, Dawson, 1862, Quar. Jour. Geo. Soc., vol. 18, p. 314, Syn. for *Plumalina plumula*.
MACROSTACHYA, Schimper, 1869, Traité de Paléontologie Végétale, vol. 1, p. 332. [Ety. *makros*, long; *stachys*, a plant.] Plants arborescent, articulate; articulations close; cortex thin, smooth or striate; impressions of the internal surface plano-costate; furrows narrow, alternating at the articulations; leaves appressed, linear, carinate or marked with a medial nerve, acuminate, finely truncate; leaf scars marked upon the articulations by transversely oval rings, like the links of a chain; scars of branches verticillate, large, round, umbonate, with a stigmarioid central mamilla; spikes very large, cylindrical; bracts lanceolate, costate in the middle, imbricate, scarcely longer than the internodes. Type *M. infundibuliformis*.
aperta, Lesquereux, 1858, (*Asterophyllites apertus*.) Geo. Sur. Pa., vol. 2, p. 852, Coal Meas.
communis, Lesquereux, 1884, Coal Flora of Pa., p. 828, Coal Meas.
infundibuliformis, Brongniart, 1828, (*Equisetum infundibuliforme*.) Hist. Veg. Foss., t. 1, p. 119, Coal Meas.
lanceolata, Lesquereux, 1858, (*Asterophyllites lanceolatus*.) Geo. Sur. Pa., vol. 2, p. 852, Coal Meas.
minor, Lesquereux, 1884, Coal Flora of Pa., p. 829, Coal Meas.
MEGALOPTERIS, Dawson, 1871, Foss. Plants Dev. and Up., Sil. Formations, p. 51. [Ety. *megale*, great; *pteris*, fern.] Fronds very large, pinnate, ultimate pinnæ oblique, sublinear or lanceolate, entire, the lower side broadly decurrent on the rachis, which thus becomes alate, the upper narrowed in a curve, confluent; midrib thick, canaliculate on the upper surface, half cylindrical on the lower, gradually narrowed, but distinct to the apex of the leaves; veins open, emerging from the rachis in a more open angle of divergence, curving upward in reaching the borders, close dichotomous. Type *M. dawsoni*.
abbreviata, Lesquereux, 1880, Coal Flora of Pa., p. 151, Coal Meas.
dawsoni, Hartt, 1868, (*Neuropteris dawsoni*.) Acad. Geol., p. 550, Devonian.
dentata, Lesquereux, 1884, Coal Flora of Pa., p. 833, Coal Meas.
fasciculata, Lesquereux, 1880, Coal Flora of Pa., p. 150, Coal Meas.

hartti, Andrews, 1875, Ohio Pal., vol. 2, p. 416, Coal Meas.
lata, Andrews, 1875, Ohio Pal., vol. 2, p. 417, Coal Meas.
marginata, Lesquereux, 1880, Coal Flora of Pa., p. 152, Coal Meas.
minima, Andrews, 1875, Ohio Pal., vol. 2, p. 416, Coal Meas.
ovata, Andrews, 1875, Ohio Pal., vol. 2, p. 417, Coal Meas.
rectinervis, Lesquereux, 1884, Coal Flora of Pa., p. 744, Coal Meas.
serrata, Lesquereux, 1884, Coal Flora of Pa., p. 834, Coal Meas.

FIG. 51.—*Megalopteris southwelli*.

southwelli, Lesquereux, 1880, Coal Flora of Pa., p. 148, Coal Meas.

MEGAPHYTON, Artis, 1828, Antedil. Phytol., p. 20. [Ety. *megas*, great; *phyton*, a plant.] Scars large, round-quadrate in outline, mostly contiguous, placed in opposite biserial rows; internal disks convex, with central or vascular impressions in the form of a horseshoe, or a medial band dividing the disks into two lobes, joined in the middle. Type *M. frondosum*.
goldenbergi, Weiss, 1860, Zeitsch. d. deutsch. Geo. Gesellsch. XII, p. 510, Coal Meas.
grandeuryi, Lesquereux, 1880, Coal Flora of Pa., p. 350, Coal Meas.
humile, Dawson, 1863, Can. Nat. and Geol., vol. 8, and Acad. Geol. p. 486, Coal Meas.
maclayi, Lesquereux, 1866, Geo. Sur. Ill., vol. 2, p. 458, Coal Meas.
magnificum, Dawson, 1863, Can. Nat. and Geol., vol. 8, and Acad. Geol., p. 486, Coal Meas.

FIG. 52.—*Megaphyton protuberans*.

protuberans, Lesquereux, 1866, Geo. Sur. Ill., vol. 2, p. 458, Kaskaskia Gr.
Nematophycus, Carruthers, 1872, Month. Micro. Jour. Syn. for Prototaxites.
logani, see Prototaxites logani.

NEMATOPHYLLUM, Fontaine & White, 1880, Perm. or Up. Carb. Flora, p. 35. [Ety. *nema*, thread; *phyllon*, leaf.] Stem covered with a thick, very finely striate epidermis, internodes remote, swollen; leaves verticillate, numerous, very long and thread-like, of equal width throughout, finely striate, without nerves, united at the base in a narrow annular band. Type *N. angustum*.

angustum, Fontaine & White, 1880, Perm. or Up. Carb. Flora, p. 35, Coal Meas. or Permian.

NEMATOXYLON, Dawson, 1863, Quar. Jour. Geo. Soc., vol. 19, p. 466. [Ety. *nema*, a thread; *xylon*, wood.] Carruthers, Penhallow, and others say this genus belongs to the Algæ, and is a syn. for *Nematophycus*. Fragments of wood, with a smooth bark and a tissue wholly composed of elongated cylindrical cells, with irregular pores or markings; no pith, medullary rays or rings of growth. Type *N. crassum*.

crassum, Dawson, 1863, Quar. Jour. Geo. Soc., vol. 19, p. 466, Devonian.

tenue, Dawson, 1863, Quar. Jour. Geo. Soc., vol. 19, p. 467, Devonian.

Nephropteris, Brongniart, 1828, Tab. des gener.

elegans, see *Cyclopteris elegans*.

fimbriata, see *Neuropteris fimbriata*.

germari, see *Cyclopteris germari*.

hirsuta, see *Cyclopteris hirsuta*.
laciniata, see *Cyclopteris laciniata*.

orbicularis, see *Cyclopteris orbicularis*.

trichomanoides, see *Cyclopteris trichomanoides*.

undans, see *Cyclopteris undans*.

NERIOPTERIS, Newberry, 1873, Ohio Pal., vol. 1, p. 378. [Ety. *nerion*, the oleander; *pteris*, a fern.] Frond pinnate or bipinnate; rachis strong, punctate; pinnules lanceolate, simple, entire; medial nerve strong, extending from base to summit; secondary nerves given off at an acute angle, numerous simple or forked at

base, parallel, equal; fructifications marginal. Type *N. lanceolata*.
lanceolata, Newberry, 1873, Ohio Pal., vol. 1, p. 381, Coal Meas.

NEUROPTERIS, Brongniart, 1822, Mem. du Mus. d'Hist. Nat. de Paris, t. 8, p. 203, and Prodr. d. Hist. d. Veg. Foss., p. 52.

[Ety. *neuron*, nerve; *pteris*, fern.] Fronds simple, bi, tri-pinnate; pinnules varying from round to ovate, obtuse, or obtusely acuminate, mostly entire, rounded, cordate, or auricled at the base, attached to the rachis by the middle; sessile, or rarely short pedicled; veins either from the base of the pinnules or from a costa, diverging fan-like and arched backward, in passing toward the borders, many times dichotomous; costa generally dissolved at or below the middle; basilar veins simple or in fascicles. Type *N. acuminata*.

acuminata, Schlotheim, 1820, (Filicites acuminatus,) Petrefactenkunde, p. 412, and Coal Flora of Pa., p. 123, Coal Meas.

acutifolia, Brongniart, 1828, Hist. d. Veg. Foss., p. 229, Coal Meas.

adiantites, see *Lescuropteris adiantites*.

agassizi, Lesquereux, 1880, Coal Flora of Pa., p. 117, Coal Meas.

angustifolia, Brongniart, 1828, Hist. d. Veg. Foss., p. 231, and Coal Flora of Pa., p. 89, Coal Meas.

anomala, Lesquereux, 1880, Coal Flora of Pa., p. 118, Coal Meas.

aspera, Lesquereux, 1880, Coal Flora of Pa., p. 121, Coal Meas.

attenuata, Lindley & Hutton, 1837, Foss. Flora, vol. 3, p. 65, Coal Meas.

auriculata, Brongniart, 1828, Hist. d. Veg. Foss., p. 236, Coal Meas.

biformis, Lesquereux, 1880, Coal Flora of Pa., p. 121, Coal Meas.

blissi, Lesquereux, 1884, Coal Flora of Pa., p. 737, Coal Meas.

callosa, Lesquereux, 1880, Coal Flora of Pa., p. 115, Coal Meas.

capitata, Lesquereux, 1870, Geo. Sur. Ill., vol. 4, p. 383, Coal Meas.

carri, Lesquereux, 1884, Coal Flora of Pa., p. 731, Coal Meas.

cisti, Brongniart, 1828, Hist. d. Veg. Foss., p. 238, Coal Meas.

clarksoni, Lesquereux, 1858, Geo. Sur. Pa., vol. 2, p. 357, Coal Meas.

collinsi, Lesquereux, 1870, Geo. Sur. Ill., vol. 4, p. 382, Coal Meas.

cordata, Brongniart, 1828, Hist. Veg. Foss., p. 229, and Coal Flora of Pa., p. 91, Coal Meas.

cordato-ovata, see *Pseudopteropteris cordato-ovata*.

coriacea, Lesquereux, 1870, Geo. Sur. Ill., vol. 4, p. 387, Coal Meas.

crassa, Dawson, 1868, Acad. Geol., p. 551, Devonian.

crenulata, Brongniart, 1828, Hist. Veg. Foss., p. 234, and Coal Flora of Pa., p. 116, Coal Meas.

cyclopteroides, Dawson, 1863, Can. Nat. and Geol., vol. 8, and Acad. Geol. p. 482, Coal Meas.

dawsoni, see *Megalopteris dawsoni*.



FIG. 53.—*Neuropteris lanceolata*. Single pinnule.

decipiens, Lesquereux, 1880, Coal Flora of Pa., p. 93, Coal Meas.
 delicatula, Lesquereux, 1858, Geo. Sur. Pa., vol. 2, p. 858, Coal Meas.
 dentata, Lesquereux, 1858, Geo. Sur. Pa., vol. 2, p. 859, Coal Meas.
 desori, Lesquereux, 1854, Bost. Jour. Nat. Hist., vol. 6, p. 418, and Geo. Sur. Pa., vol. 2, p. 859, Coal Meas.
 dictyopteroides, Fontaine & White, 1880, Perm. or Up. Carb. Flora, p. 49, Coal Meas. or Permian.
 dilatata, Lindley & Hutton, 1835, (Cyclopteris dilatata,) Foss. Flora, vol. 2, p. 29, Coal Meas.
 elrodi, Lesquereux, 1880, Coal Flora of Pa., p. 107, Coal Meas.
 eveni, Lesquereux, 1866, Geo. Sur. Ill., vol. 2, p. 430, Coal Meas.
 fasciculata, Lesquereux, 1870, Geo. Sur. Ill., vol. 4, p. 381, Coal Meas.
 fimbriata, Lesquereux, 1854, (Cyclopteris fimbriata,) Jour. Bost. Soc. Nat. Hist., p. 416, and Coal Flora of Pa., p. 81, Coal Meas.
 fissa, Lesquereux, 1858, Geo. Sur. Pa., vol. 2, p. 857, Coal Meas.
 flexuosa, Sternberg, 1825, Vers. Darst. Flora der Vorwelt, p. 16, Coal Meas.
 germari, Gœppert, 1836, (Adiantites germari,) Systema Filicum Fossilium, p. 218, and Coal Flora of Pa., p. 113, Coal Meas.
 gibbosa, Lesquereux, 1858, Geo. Sur. Pa., vol. 2, p. 858, Coal Meas.
 gigantea, Sternberg, 1825, Vers. Darst. Flora der Vorwelt, p. 16, Coal Meas.
 grangeri, Brongniart, 1828, Hist. Veg. Foss., p. 237, and Coal Flora of Pa., p. 105, Coal Meas.
 griffithi, Lesquereux, 1884, Coal Flora of Pa., p. 737, Coal Meas.
 heterophylla, Brongniart, 1822, (Filicites heterophylla) Mem. du Mus. d'Hist. Nat. de Paris, t. 8, p. 203, Coal Meas.

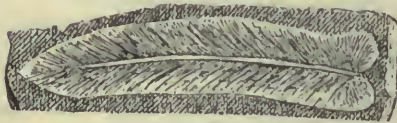


FIG. 54.—*Neuropteris hirsuta*.

hirsuta, Lesquereux, 1854, Bost. Jour. Nat. Hist., vol. 6, p. 417, and Coal Flora of Pa., p. 88, Coal Meas.
inflata, Lesquereux, 1866, Geo. Sur. Ill., vol. 2, p. 431, Coal Meas.
ingens, Lindley & Hutton, 1833, Foss. Flora, vol. 2, p. 29, Coal Meas.
lacerata, syn. for *Neuropteris fimbriata*.
laciniata, Lesquereux, 1858, (Cyclopteris laciniata,) Geo. Sur. Pa., vol. 2, p. 855, Coal Meas.
loshi, Brongniart, 1828, Hist. d. Veg. Foss., p. 242, and Coal Flora of Pa., p. 98, Coal Meas.
microphylla, Brongniart, 1828, Hist. Veg. Foss., p. 245, Coal Meas.

minor, Lesquereux, 1858, Geo. Sur. Pa., vol. 2, p. 859, Coal Meas.
missouriensis, Lesquereux, 1880, Coal Flora of Pa., p. 104, Coal Meas.
moori, see *Lescuropteris moorii*.
oblongifolia, Lesquereux, 1884, Coal Flora of Pa., p. 732, Coal Meas.
obscura, Lesquereux, 1880, Coal Flora of Pa., p. 108, Coal Meas.
odontopteroides, Fontaine & White, 1880, Perm. or Up. Carb. Flora, p. 50, Coal Meas. or Permian.
pachyderma, Lesquereux, 1866, Geo. Sur. Ill., vol. 2, p. 430, Coal Meas.
perelegans, Dawson, 1863, Can. Nat. and Geol., vol. 8, and Acad. Geol., p. 482, Coal Meas.
platynervis, Fontaine & White, 1880, Perm. or Up. Carb. Flora, pl. 8, fig. 2, Coal Meas. or Permian.
plicata, Sternberg, 1825, Vers. Darst. Flora der Vorwelt, p. 74, and Coal Flora of Pa., p. 96, Coal Meas.
polymorpha, Dawson, 1862, Quar. Jour. Geo. Soc., vol. 18, p. 320, Devonian.
rarinervis, Bunbury, 1847, Quar. Jour. Geo. Soc., vol. 3, p. 425, and Coal Flora of Pa., p. 109, Coal Meas.
reniformis, Brongniart, 1828, (Cyclopteris reniformis,) Hist. d. Veg. Foss., p. 216, and Coal Flora of Pa., p. 77, Coal Meas.
retorquata, Dawson, 1871, Foss. Plants Canada, p. 50, Devonian.
rogersi, Lesquereux, 1858, Geo. Sur. Pa., vol. 2, p. 856, Coal Meas.
rotundifolia, Brongniart, 1828, Hist. Veg. Foss., p. 238, and Coal Flora of Pa., p. 97, Coal Meas.
selwyni, Dawson, 1871, Foss. Plants Canada, p. 50, Devonian.
serrulata, Dawson, 1862, Quar. Jour. Geo. Soc., vol. 18, p. 320, Devonian.
smilacifolia, Sternberg, 1824, Vers. Darst. Flora der Vorwelt, vol. 2, p. 29, Coal Meas.
smithsi, Lesquereux, 1876, Geo. Rep. of Alabama, p. 76, and Coal Flora of Pa., p. 106, Coal Meas.
soreti, Brongniart, 1828, Prodr. Hist. Veg. Foss., p. 53, and Hist. d. Veg. Foss., t. 1, p. 244, Coal Meas.
speciosa, Lesquereux syn. for *N. rogersi*.
subfalcata, Lesquereux, 1880, Coal Flora of Pa., p. 102, Coal Meas.
tenuifolia, Sternberg, 1825, Vers. Darst. Flora der Vorwelt, p. 17, and Coal Flora of Pa., p. 100, Coal Meas.
tenuinervis, see *Odontopteris tenuinervis*.
trichomanoides, Brongniart, 1828, (Cyclopteris trichomanoides,) Hist. d. Veg. Foss., p. 217, and Coal Flora of Pa., p. 79, Coal Meas.
undans, Lesquereux, 1854, Bost. Jour. Nat. Hist., vol. 6, p. 418, and Geo. Sur. Pa., vol. 2, p. 859, Coal Meas.
verbenifolia, Lesquereux, 1866, Geo. Sur. Ill., vol. 2, p. 431, Coal Meas.

vermicularis, Lesquereux, 1861, Geo. Sur. Ky., vol. 4, p. 434, Coal Meas.
villiersi, Brongniart, 1828, Prodr. Hist. Veg. Foss., p. 53, Coal Meas.

NÆGGERATHIA, Sternberg, 1828, Essai d'un expose Geognostico-botanique de la Flore du monde primitif, 2d Cahier, p. 37. [Ety. proper name.] Branch with a slender rachis bearing pinnate leaves attached to the stem by a semi-twisted base, dilated upward, veins flabellate and dichotomous. Type *N. foliosa*.

beinertiana, Gœppert, 1842, Gatt. d. Foss. Pflanzen, Coal Meas.

bockschii, see *Aneimites bockschii*.

bockschiana, syn. for *Aneimites bockschii*.
dispar, Dawson, 1863, Can. Nat. and Geol., vol. 8, and Acad. Geol., p. 480, Coal Meas.



FIG. 55.

Næggerathia dispar.

flabellata, Lindley & Hutton, 1832, Foss. Flora, vol. 1, p. 89, Coal Meas.

gilboensis, Dawson, 1871, Quar. Jour. Geo. Soc., vol. 27, p. 273, Chemung Gr.

minor, see *Archæopteris minor*.

obliqua, see *Archæopteris obliqua*.

obtusata, see *Aneimites obtusus*.

ODONTOPTERIS, Brongniart, 1822, Mem. du Mus.

d'Hist. Nat. de Paris, t. 8, p. 203. [Ety. *odous*, tooth; *pterus*, fern.] Fronds large, bipinnate; pinnæ opposite or subalternate; pinnules of various forms, generally oblong, obtuse, joined to the rachis by their whole base, sometimes decurrent, either disjointed and separate to the base or connate to the middle, generally becoming confluent toward the top of the pinnæ, and gradually effaced in passing to a terminal leaflet; lower pinnules sometimes attached to the main rachis and difform; veins emerging from the rachis, more rarely from a midrib; veinlets thin, dichotomous, diverging straight or in curve, in passing to the borders. Type *O. brardi*.

abbreviata, Lesquereux, 1880, Coal Flora of Pa., p. 138, Coal Meas.

æqualis, Lesquereux, 1866, Geo. Sur. Ill., vol. 2, p. 434, Coal Meas.

affinis, Lesquereux, 1884, Coal Flora of Pa., p. 742, Coal Meas.

alata, Lesquereux, 1858, Catal. Pottsville Foss., p. 6, and Coal Flora of Pa., p. 131, Coal Meas.

alpina, Sternberg, 1825, (*Neuropteris alpina*.) Flora d. Vorwelt, vol. 2, p. 76, and Coal Flora of Pa., p. 126, Coal Meas.

antiqua, Dawson, 1863, Can. Nat. and Geo., Coal Meas.

bradleyi, Lesquereux, 1870, Geo. Sur. Ill., vol. 4, p. 390, Coal Meas.

brardi, Brongniart, 1822, Mem. du Mus. d'Hist. Nat. de Paris, t. 8, p. 205, tab. 2, fig. 5, and Coal Flora of Pa., p. 132, Coal Meas.

britannica, Guttier, 1842, Abdrucke u. Verst. d. Zwick. Schwarzk. u. sei. Umgeb. Zwick., p. 68, and Coal Flora of Pa., p. 830, Coal Meas.

cornuta, Lesquereux, 1880, Coal Flora of Pa., p. 128, Coal Meas.

crenulata, of Brongniart, as identified by Lesquereux in Geo. Sur. Pa., vol. 2, p. 860, is *O. subcrenulata*.

dawsoniana, n. sp. Devonian. Proposed instead of *O. squamosa*, in Quar. Jour. Geo. Soc. Lond., vol. 37, p. 305, which was preoccupied.

deformata, Lesquereux, 1880, Coal Flora of Pa., p. 141, Coal Meas.

densifolia, Fontaine & White, 1880, Perm. or Up. Carb. Flora, p. 54, Coal Meas. or Permian.

dilatata, Lesquereux, 1884, Coal Flora of Pa., p. 831, Coal Meas.

dubia, Lesquereux, 1858, Geo. Sur. Penn., vol. 2, p. 860, Coal Meas.

gracillima, Newberry, 1873, Ohio Pal., vol. 1, p. 382, Coal Meas.

heterophylla, Lesquereux, 1866, Geo. Sur. Ill., vol. 2, p. 433, Coal Meas.

intermedia, Lesquereux, 1860, Geo. Sur. Ark., vol. 2, p. 313, Coal Meas.

lescurei, Wood, 1860, Trans. Am. Phil. Soc., vol. 13, p. 348, Coal Meas.

monstruosa, Lesquereux, 1884, Coal Flora of Pa. p. 741, Coal Meas.

nervosa, Fontaine & White, 1880, Perm. or Up. Carb. Flora, p. 52, Coal Meas. or Permian.

neuropteroides, Newberry, 1873, Ohio Pal., vol. 1, p. 381. The name was preoccupied by Roemer, and the species has been named *O. newberryi*.

newberryi, Lesquereux, 1880, Coal Flora of Pa., p. 127, Low. Coal Meas.

obtusiloba var *rarinervis*, Fontaine & White, 1880, Perm. or Up. Carb. Flora, p. 52, Coal Meas. or Permian.

pachyderma, Fontaine & White, 1880, Perm. or Up. Carb. Flora, p. 53, Coal Meas. or Permian.

patens, Lesquereux, 1884, Coal Flora of Pa., p. 740, Coal Meas.



FIG. 56.

Odontopteris gracillima.

reichiana, Lesquereux, 1884, Coal Flora of Pa., p. 831, Coal Meas.
 rotundifolia, Wood, 1866, Trans. Am. Phil. Soc., vol. 13, p. 348, Coal Meas.
 schlothelimi, Brongniart, 1828, Hist. d. Veg. Foss., p. 256, and Coal Flora of Pa., p. 136, Coal Meas.



FIG. 57.—*Odontopteris schlothelimi*.

sphenopteroides, Lesquereux, 1880, Coal Flora of Pa., p. 139, Coal Meas.
 squamosa, Lesquereux, 1854, Bost. Jour. Nat. Hist., vol. 6, p. 419, and Geo. Sur. Pa., vol. 2, p. 860, Coal Meas.
 squamosa, Dawson, 1881, Quar. Jour. Geo. Soc. Lond., vol. 37, p. 305, Devonian. The name was preoccupied. See *O. dawsonana*.
 subcrenolata, Lesquereux, 1880, Coal Flora of Pa., p. 137, Coal Meas.
 subcuneata, Bunbury, 1847, Quar. Geo. Jour., vol. 3, p. 427, and Coal Flora of Pa., p. 134, Coal Meas.
 tenuinervis, Lesquereux, 1858, (*Neuropteris tenuinervis*.) Geo. Sur. Pa., vol. 2, p. 859, Coal Meas.
 wortheni, Lesquereux, 1866, Geo. Sur. Ill., vol. 2, p. 432, Coal Meas.

OLIGOCARPIA, Gœppert, 1841–48, Die Gattungen der fossilen Pflanzen, p. 3. [Ety. *oligos*, few; *karpos*, fruit.] Fronds bipinnate or tripinnatifid; primary pinnae oblong-lanceolate; secondary divisions, open, linear, pinnately divided in oblong or half round lobes or leaflets, connate at the base, crenulate; primary and secondary veins nearly of the same size, thin but distinct; lateral veins curved to the borders, simple or forked. Type *O. gutbieri*.
 alabamensis, Lesquereux, 1875, Geo. Rep. Ala., p. 76, and Coal Flora of Pa., p. 266, Coal Meas.
 flagellaris, Lesquereux, 1858, (*Sphenopteris flagellaris*.) Geo. Sur. Pa., vol. 2, p. 862, Coal Meas.
 gutbieri, Gœppert, 1841–48, Die Gattungen der fossilen Pflanzen, p. 3, Coal Meas.

ORMOXYLON, Dawson, 1871, Foss. Plants Canada, p. 14. [Ety. *ormos*, a chain, a cord; *xylon*, wood.] Woody stems, with cells of the character of those of *Dadoxylon*, very thick walled, with three rows of hexagonal areoles, having oval pores and medullary rays of one row of cells. Pith cavity composed of a series of spherical chambers, separated by thick, transverse cellular partitions. Type *O. erianum*.
 erianum, Dawson, 1871, Foss. Plants Canada, p. 14, Portage Gr.

sphenopteroides, Lesquereux, 1880, Coal Flora of Pa., p. 139, Coal Meas.
 squamosa, Lesquereux, 1854, Bost. Jour. Nat. Hist., vol. 6, p. 419, and Geo. Sur. Pa., vol. 2, p. 860, Coal Meas.
 squamosa, Dawson, 1881, Quar. Jour. Geo. Soc. Lond., vol. 37, p. 305, Devonian. The name was preoccupied. See *O. dawsonana*.

ORTHOGONIOPTERIS, Andrews, 1875, Ohio Pal., vol. 2, p. 418. [Ety. *orthogoniopteris*, rectangular-fern.] Frond simply pinnate; pinnules alternate, lanceolate or oblong-linear, rounded and tapering to an acute point, enlarged and decurrent on the lower side to an auricle rounded in the upper part in joining the lamina a little above its point of attachment to the rachis; medial nerve thick, ascending to the apex; nervules fine and numerous, uniform, at right angle to the midrib, decurring to it at the point of attachment, forking once near the base. Type *O. clara*.
 clara, Andrews, 1875, Ohio Pal., vol. 2, p. 419, Coal Meas.
 gilberti, Andrews, 1875, Ohio Pal., vol. 2, p. 420, Coal Meas.

Pachyphyllum, Lesquereux, 1858, Geo. Sur. Pa., vol. 2. [Ety. *pachys*, thick; *phyllon*, a leaf.] This name was preoccupied in the class *Polypi*. See *Rhacophyllum*.

affine, see *Rhacophyllum affine*.

fimbriatum, see *Rhacophyllum fimbriatum*.

hirsutum, see *Rhacophyllum hirsutum*.

laceratum, see *Rhacophyllum laceratum*.

lactuca, see *Rhacophyllum lactuca*.

PACHYPTERIS, Brongniart, 1828, Prodr. Hist. Veg. Foss., p. 49. [Ety. *pachys*, thick; *pterus*, fern.] Frond pinnate or bipinnate, bearing opposite coriaceous pinnules, with a medial nerve or without nervation, narrowed toward the base, not joined to the rachis. Type *P. lanceolata*.

gracillima, Lesquereux, 1870, Geo. Sur. Ill., vol. 4, p. 419, Coal Meas.

PALEOPHYCUS, Hall, 1847, Pal. N. Y., vol. 1, p. 7. [Ety. *palaios*, ancient; *phykos*, seaweed.] Stems simple or dichotomous, branches cylindrical or slightly flattened, obtuse, surface smooth or dotted. Type *P. tubulare*.

articulatum, Winchell, 1864, Am. Jour. Sci. and Arts, 2d series, vol. 37, p. 231, Potsdam Gr.

beauharnoisense, Billings, 1862, Pal. Foss., vol. 1, p. 98, Calif. Gr.

beverleyense, Billings, 1862, Pal. Foss., vol. 1, p. 97, Potsdam Gr.

congregatum, Billings, 1861, Pal. Foss., vol. 1, p. 3, Potsdam Gr.

divaricatum, Lesquereux, 1876, 7th Ann. Rep. Geol. Sur. Ind., p. 138, Coal Meas.

funiculus, Billings, 1862, Pal. Foss., vol. 1, p. 98, Calif. Gr.

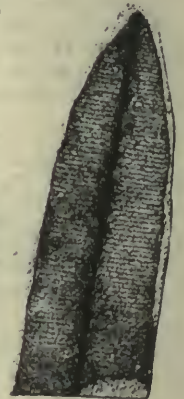


FIG. 58. *Orthogoniopteris clara*, part of a pinnule.



FIG. 59.
Palaeophycus
gracile.

- gracile, Lesquereux, 1876, 7th Ann. Rep. Geol. Sur. Ind., p. 137, Coal Meas.
 incipiens, Billings, 1861, Pal. Foss., vol. 1, p. 2, Potsdam Gr.
 informe, Winchell, 1864, Am. Jour. Sci. and Arts, vol. 37, p. 232, Potsdam Gr.
 irregulare, Hall, 1847, Pal. N. Y., vol. 1, p. 8, Calcif. Gr.
 milleri, Lesquereux, 1876, 7th Ann. Rep. Geol. Sur. Ind., p. 136, Coal Meas.
 obscurum, Billings, 1862, Pal. Foss., vol. 1, p. 93, Trenton Gr.
 occidentale, Whitfield, 1877, Rep. Pal. Black Hills, p. 7, and Geol. Black Hills, p. 332, Potsdam Gr.
 plumosum, Whitfield, 1878, Ann. Rep. Geo. Sur. Wis., p. 50, and Geo. Wis., vol. 4, p. 169, Potsdam Gr.
 rugosum, Hall, 1847, Pal. N. Y., vol. 1, p. 63, Trenton Gr.
 simplex, Hall, 1847, Pal. N. Y., vol. 1, p. 63, Trenton Gr.
 striatum, Hall, 1852, Pal. N. Y., vol. 2, p. 22, Clinton Gr.
 tortuosum, Hall, 1852, Pal. N. Y., vol. 2, p. 6, Medina sandstone.
 tubulare, Hall, 1847, Pal. N. Y., vol. 1, p. 7, Calcif. Gr.
 virgatum, Hall, 1847, Pal. N. Y., vol. 1, p. 263, Hud. Riv. Gr.
Palaeopteris, Schimper, being preoccupied by Geinitz, see *Archæopteris*.
acidica, see *Aneimites acidicus*.
hartii, see *Archæopteris harti*.
Palæoxyris, Brongniart, 1828, Prodr. d. Hist. d. Veg. Foss., p. 137. [Ety. *palaios*, ancient; *xyris*, plant.] An inflorescence. Type *P. regularis*. The fossils which have been referred to this genus in the American palæozoic rocks are now referred to *Spirangium*.
appendiculata, see *Spirangium appendiculatum*.
corrugata, see *Spirangium corrugatum*.
prendeli, see *Spirangium prendeli*.
Palmacites oculatus, see *Sigillaria oculata*.
næggerathi, see *Trigonocarpum næggerathi*.
 PECOPTERIS, Brongniart, 1822, Class d. Veg. Foss. in Mem. du Mus. d'Hist. Nat. d. Paris, tom. 8, p. 203. [Ety. *peko*, comb; *ptēris*, fern.] Fronds, bi, tripinnate; pinnæ long, pinnatifid; pinnules adhering to the rachis by the whole base, often more or less deeply connate, not decurring; borders generally contiguous, or nearly so; secondary veins derived from the medial nerve of the pinnules, simple, bi or trifurcate. Type, *P. longifolia* is the first species mentioned in the Prodr. d. Hist. d. Veg. Foss., and the first mentioned in the Coal Flora of Pa. is *P. unita*, while *P. penniformis* is a representative species.
abbreviata, Brongniart, 1828, Hist. d. Veg. Foss., p. 337, and Coal Flora of Pa., p. 248, Coal Meas.
acuta, Brongniart, 1828, Hist. d. Veg. Foss., p. 350, and Coal Flora of Pa., p. 241, Coal Meas.
æqualis, Brongniart, 1828, Prodr. d. Hist. d. Veg. Foss., p. 58, Coal Meas.
alata, see *Sphenopteris alata*.
alata, Schimper, 1869, Pal. Veg., t. 1, p. 531, syn. for *Pseudopecopteris decurrens*.
angustipinna, Fontaine & White, 1880, Perm. or Up Carb. Flora, p. 76, Coal Meas. or Permian.
angustissima, Sternberg, 1820, Vers. Darst. Flor. d. Vorw., p. 18, and Coal Flora of Pa., p. 257, Coal Meas.
aquilina, see *Alethopteris aquilina*.
arborescens, Schlotheim, 1820, (Filicites arborescens,) Petrefaktenkunde, p. 404, and Coal Flora of Pa., p. 230, Coal Meas.
arguta, Sternberg, 1820, Vers. Darst. Flor. d. Vorw., p. 19, and Coal Flora of Pa., p. 227, Coal Meas.
aspera, Brongniart, 1828, Hist. d. Veg. Foss., p. 339, and Coal Flora of Pa., p. 242, Coal Meas.
aspidioides, Brongniart, 1828, Hist. d. Veg. Foss., p. 311, and Coal Flora of Pa., p. 756, Coal Meas.
asplenioides, Fontaine & White, 1880, Perm. or Up Carb. Flora, p. 72, Coal Meas. or Permian.
bucklandi, Brongniart, 1828, Hist. d. Veg. Foss., p. 319, and Coal Flora of Pa., p. 244, Coal Meas.
callosa, see *Pseudopecopteris callosa*.
candollana, Brongniart, 1828, Hist. d. Veg. Foss., p. 305, Coal Flora of Pa. p. 243, Coal Meas.
carri, Lesquereux, 1884, Coal Flora of Pa., p. 758, Coal Meas.
charophylloides, see *Sphenopteris charophylloides*.
cisti, Brongniart, 1828, Hist. d. Veg. Foss., p. 330, and Coal Flora of Pa., p. 243, Coal Meas.
clarki, Lesquereux, 1880, Coal Flora of Pa., p. 261, Coal Meas.
clintoni, Lesquereux, 1880, Coal Flora of Pa., p. 251, Coal Meas.
concinna, Lesquereux, 1854, Bost. Jour. Soc. Nat. Hist., vol. 6, p. 424, and Geo. Sur. Pa., vol. 2, p. 867, Coal Meas. But the name was preoccupied by Presl in 1833.
crenulata, Brongniart, not American. The form sometimes referred to it is *Pseudopecopteris subcrenulata*.
cristata, Gutbier, 1843, Gaea von Sachsen, p. 80, and Coal Flor. of Pa., p. 256, Coal Meas.
cristata, see *Sphenopteris cristata*.
cyathea, Schlotheim, 1820, (Filicites cyathea,) Petrefaktenkunde, p. 403, Coal Meas.
decurrens, see *Pseudopecopteris decurrens*.
decurrens, Dawson, 1862. The name being preoccupied, it was changed to *P. discrepans*.

- densifolia*, Dawson, 1874, Foss. Plants of Canada, p. 56, Devonian.
dentata, Brongniart, 1828, Hist. d. Veg. Foss., p. 346, and Coal Flora of Pa., p. 240, Coal Meas.
distans, Lesquereux, 1854, Bost. Jour. Soc. Nat. Hist., vol. 6, p. 423, and Geo. Sur. Pa., vol. 2, p. 866, Coal Meas. The name was preoccupied by Rost in 1839.
dournaisi, see *Callipteridium dournaisi*.
dubia, Sternberg, 1820, Tent. Flor. Primord., p. 19, and Gutbier in Gaea von Sachsen, Coal Meas.
elegans, Gœppert, 1836, (Polypodites elegans,) Syst. Filic. Foss., p. 344, and Coal Flora of Pa., p. 228, Coal Meas.
elliptica, Bunbury, 1846, Quar. Jour. Geo. Soc., vol. 2, p. 82, and Coal Flora of Pa., p. 245, Coal Meas.
elliptica, Fontaine & White, 1880, (Goniopteris elliptica,) Perm. or Up. Carb. Flora, p. 83, Coal Meas. or Permian. The name was preoccupied.
emarginata, Gœppert, 1836, (Diplazites emarginatus,) Syst. Filic. Foss., p. 274, and Coal Flora of Pa., p. 225, Coal Meas.
erosa, Gutbier, 1843, Gæa. von Sachsen, p. 81, and Coal Flora of Pa., p. 255, Coal Meas.
flavicans, Presl, 1833, in Sternberg, Vers. Darst. Flor. d. Vorw., vol. 2, p. 127. Probably not American.
georgiana, Lesquereux, 1884, Coal Flora of Pa., p. 759, Coal Meas.
germari, Weiss, 1869, (Cyatheites germari,) Foss. Flora d. Jungsten Steink. Form., Up. Coal Meas. or Permian.
germari var. *crassinervis*, Fontaine & White, 1880, Perm. or Up. Carb. Flora, p. 70, Coal Meas. or Permian.
germari var. *cuspidata*, Fontaine & White, 1880, Perm. or Up. Carb. Flora, p. 70, Coal Meas. or Permian.
goniopteroides, Fontaine & White, 1880, Perm. or Up. Carb. Flora, p. 80, Coal Meas. or Permian.
halli, Lesquereux, 1870, (Alethopteris halli,) Geo. Sur. Ill., vol. 4, p. 394, Coal Meas.
heerana, Fontaine & White, 1880, Perm. or Up. Carb. Flora, p. 77, Coal Meas. or Permian.
hemiteloides, Brongniart, 1828, Hist. d. Veg. Foss., p. 314, Coal Meas.
heterophylla, see *Alethopteris heterophylla*.
imbricata, Fontaine & White, 1880, Perm. or Up. Carb. Flora, p. 72, Coal Meas. or Permian.
inclinata, Fontaine & White, 1880, Perm. or Up. Carb. Flora, p. 80, Coal Meas. or Permian.
incompleta, Lesquereux, 1858, Geo. Sur. Pa., vol. 2, p. 868, Coal Meas.
ingens, Dawson, 1862, Quar. Jour. Geo. Soc., Lond., vol. 18, p. 322, Devonian.
lanceolata, Lesquereux, 1870, (Alethopteris lanceolata,) Geo. Sur. Ill., vol. 4, p. 398, Coal Meas.
lanceolata, Fontaine & White, 1880, Perm. or Up. Carb. Flora, p. 79, Coal Meas. or Permian. The name was preoccupied; beside, it is probably a syn. for *P. unita*.
latifolia, Fontaine & White, 1880, Perm. or Up. Carb. Flora, p. 79, Coal Meas. or Permian.
lepidorachis, Brongniart, 1828, Hist. d. Veg. Foss., p. 313, Coal Meas.
lescuriana, n. sp. Coal Meas. Proposed instead of *P. obsoleta*, Lesquereux, 1884, Coal Flora of Pa., p. 758, which name was preoccupied.
longifolia, Brongniart, 1828, Hist. d. Veg. Foss., p. 273, and Coal Flora of Pa., p. 226, Coal Meas.
loschi, Brongniart, 1828, Hist. d. Veg. Foss., p. 355, Coal Meas.
lyratifolia, Gœppert, 1841, (Sphenopteris lyratifolia,) Die Gattungen d. Foss. Pflanzen, p. 71, and Coal Flora of Pa., p. 259, Coal Meas.
mantelli, Brongniart, 1828, Prodr. d. Hist. d. Veg. Foss., p. 57, Coal Meas.
marginata, see *Alethopteris marginata*.
merianopteroides, Fontaine & White, 1880, Perm. or Up. Carb. Flora, p. 78, Coal Meas. or Permian.
microphylla, Brongniart, 1828, Hist. d. Veg. Foss., p. 340, and Coal Flora of Pa., p. 263, Coal Meas.
milleri, Harlan, 1835, Trans. Geo. Soc. Pa., Coal Meas.
miltoni, Artis, 1825, (Filicites miltoni,) Anted. Phytol. pl. 4, and Coal Flora of Pa., p. 247, Coal Meas.
muricata, see *Pseudopecopteris muricata*.
murrayana, Brongniart, as identified by Lesquereux in Geo. Sur. Ill., vol. 2, p. 443, see *Sphenopteris pseudo-murrayana*.
nervosa, see *Pseudopecopteris nervosa*.
newberryana, Fontaine & White, 1880, (Goniopteris newberryana,) Perm. or Up. Carb. Flora, p. 84, Coal Meas. or Permian.
newberryi, see *Pseudopecopteris newberryi*.
nodosa, Gœppert, 1836, (Aspidites nodosus,) Systema Filicum Fossilium, p. 372, and Coal Flora of Pa., p. 233, Coal Meas.
notata, Lesquereux, 1854, Bost. Jour. Soc. Nat. Hist., vol. 6, p. 424, and Geo. Sur. Pa., vol. 2, p. 866, Coal Meas.
oblonga, Fontaine & White, 1880, Perm. or Up. Carb. Flora, p. 83, Coal Meas. or Permian.
obsoleta, Harlan, 1835, Trans. Geo. Soc. Pa., Coal Meas.
obsoleta, Lesquereux, 1884, Coal Flora of Pa., p. 758. The name was preoccupied. See *P. lescuriana*.
oreopteroides, Schlotheim, 1820, (Filicites oreopteridius,) Petrefaktenkunde, p. 407, and Coal Flora of Pa., p. 238, Coal Meas.
ornata, Lesquereux, 1884, Coal Flora of Pa., p. 760, Coal Meas.

ovata, Brongniart, 1828, Prodr. d. Hist. d. Veg. Foss. p. 58, Coal Meas.
 ovoïdes, Fontaine & White, 1880, Coal Flora of Pa., p. 79, Coal Meas. or Permian.
 pachypteroides, Fontaine & White, 1880, Perm. or Up. Carb. Flora, p. 76, Coal Meas. or Permian.
 penniformis, Brongniart, 1822, (Filicites pennæformis,) Class des Veg. Foss., in Mem. du Mus. d'Hist. Nat. de Paris, tom. 8, p. 203, and Coal Flora of Pa., p. 239, Coal Meas.
 platynervis, Fontaine & White, 1880, Perm. or Up. Carb. Flora, p. 73, Coal Meas. or Permian.
 platyrachis, Brongniart, 1828, Hist. d. Veg. Foss. p. 312, and Coal Flora of Pa., p. 232, Coal Meas.
pluckenetii, see Pseudopecopteris pluckenetii.
 plumosa, Artis, 1825, (Filicites plumosus,) Anted. Phytol., pl. 17, Coal Meas.
 polymorpha, Brongniart, 1828, Prodr. d. Hist. d. Veg. Foss., p. 56, Coal Meas.
 preciosa, Hartt, 1868, Acad. Geol., p. 553, Devonian.
 pteroides, Schlothheim, 1820, (Filicites pteridius,) Petrefaktenkunde, p. 406, and Coal Flora of Pa., p. 249, Coal Meas.
pusilla, see Pseudopecopteris pusilla.
 quadratifolia, Lesquereux, 1880, Coal Flora of Pa., p. 234, Coal Meas.
 rarinervis, Fontaine & White, 1880, Perm. or Up. Carb. Flora, p. 71, Coal Meas. or Permian.
 rigida, Dawson, 1863, Can. Nat. and Geol., vol. 8, and Acad. Geol., p. 485, Coal Meas.
 robusta, Lesquereux, 1880, Coal Flora of Pa., p. 229, Coal Meas.
 rotundifolia, Fontaine & White, 1880, Perm. or Up. Carb. Flora, p. 73, Coal Meas. or Permian.
 rotundiloba, Fontaine & White, 1880, Perm. or Up. Carb. Flora, p. 74, Coal Meas. or Permian.
 schimperana, Fontaine & White, 1880, Perm. or Up. Carb. Flora, p. 75, Coal Meas. or Permian.
 schimperii, Lesquereux, 1884, Coal Flora of Pa., p. 835, Coal Meas.
serlii, see Alethopteris serlii.
 serpillifolia, Lesquereux, 1880, Coal Flora of Pa., p. 237, Coal Meas.
 serrula, Lesquereux, 1858, (Alethopteris serrula,) Geo. Sur. Pa., vol. 2, p. 865, Coal Meas.
 serrulata, Hart, 1868, Acad. Geol., p. 553, Devonian.
sheaferi, see Pseudopecopteris sheaferi.
sillimani, see Pseudopecopteris sillimani.
sinuata, see Callipteridium sinuatum.
 solida, Lesquereux, 1870, (Alethopteris solida,) Geo. Sur. Ill., vol. 4, p. 397, Coal Meas.
 squamosa, Lesquereux, 1870, Geo. Sur. Ill., vol. 4. p. 400, Coal Meas.

stellata, Lesquereux, 1866, (Alethopteris stellata,) Geo. Sur. Ill., vol. 2, p. 440, Low. Coal Meas.
 strongi, Lesquereux, 1870, Geo. Sur. Ill., vol. 4, p. 399, Coal Meas.
 subsalcata, Fontaine & White, 1880, Perm. or Up. Carb. Flora, p. 70, Coal Meas. or Permian.
 tæniopteroides, Bunbury, 1847, Quar. Jour. Geo. Soc., vol. 3, p. 428, Coal Meas.
 tenuinervis, Fontaine & White, 1880, Perm. or Up. Carb. Flora, p. 77, Coal Meas. or Permian.
 tenuis, Brongniart, 1828, Prodr. d. Hist. d. Veg. Foss., p. 57, Coal Meas.
 unita, Brongniart, 1828, Hist. d. Veg. Foss., p. 342, Coal Meas.
urophylla, see Alethopteris urophylla.
 vellutina, Lesquereux, 1854, Bost. Jour. Soc. Nat. Hist., vol. 6, p. 423, and Geo. Sur. Pa., vol. 2, p. 866, Coal Meas.
 venulosa, Lesquereux, 1880, Coal Flora of Pa., p. 230, Coal Meas.
 vestita, Lesquereux, 1880, Coal Flora of Pa., p. 252, Coal Meas.
 villosa, Brongniart, 1828, Hist. d. Veg. Foss., p. 316, and Coal Flora of Pa., p. 253, Coal Meas.



FIG. 60. Pectopteris unita.

PHYLLOPTERIS, Brongniart, 1849, Table d. Gen. d. Veget. Foss., pp. 22, 103. [Ety. *phyllon*, leaf; *pteris*, fern.] Pinnate,



FIG. 61.—Phyllopteris antiqua.

pinnules oblong or lanceolate, pointed, attached by the middle of the base; midrib strong, extending to the point, giving off oblique nerves, which have

obliquely pinnate nervules not anastomosing. Type *P. phillipsi*.
antiqua, Dawson, 1863, Can. Nat., vol. 8, and Acad. Geol., p. 484, Coal Meas.
Physophycus, Schimper, 1869. Syn. for *Taonurus*.
marginatus, See *Taonurus marginatus*.
Phytolithus, Martin, 1809, Petrificata Derbiensia. [Ety. *phyton*, plant; *lithos*, stone.] Applied indiscriminately to fossil wood.
cancellatus, syn. for *Lepidodendron cancellatum*.
notatus, see *Sigillaria notata*.
tessellatus, see *Sigillaria tessellata*.
transversus, see *Sternbergia transversa*.

PHYTOPSIS, Hall, 1847, Pal. N. Y., vol. 1, p. 38. [Ety. *phyton*, plant; *opsis*, resemblance.] Stems cylindrical or subcylindrical, straight or flexuous, erect or procumbent, branched; branches diverging and anastomosing; structure cellular, consisting apparently of thin laminae, with transverse divisions, or having a reticulated structure. This structure is too obscure for satisfactory determination. Type *P. tubulosa*.



FIG. 62.—*Phytopsis tubulosa*.

cellulosa, Hall, 1847, Pal. N. Y., vol. 1, p. 39, Birdseye Gr.
tubulosa, Hall, 1847, Pal. N. Y., vol. 1, p. 38, Birdseye Gr.

PINNULARIA, Lindley & Hutton, 1835, Foss. Flora, vol. 2, p. 81. [Ety. *pinna*, a feather.] Roots or rootlets divided in filaments of variable length and thickness, and generally possessing few definable characters. Type *P. capillacea*.

- calamitarum*, Lesquereux, 1858, Geo. Sur. Pa., vol. 2, p. 878, Coal Meas.
- capillacea*, Lindley & Hutton, 1835, Foss. Flora, vol. 2, p. 81, Coal Meas.
- confervoides*, Lesquereux, 1858, Geo. Sur. Pa., vol. 2, p. 878, Coal Meas.
- crassa*, Dawson, 1863, Can. Nat., vol. 8, and Acad. Geol., p. 480, Coal Meas.
- dispalans*, Dawson, 1862, Quar. Jour. Geo. Soc., vol. 18, p. 312, Devonian.
- elongata*, Dawson, 1871, Foss. Plants Can., p. 33, Devonian.
- ficoides*, Lesquereux, 1868, Geo. Sur. Pa., vol. 2, p. 878, Coal Meas.
- horizontalis*, Lesquereux, 1858, Geo. Sur. Pa., vol. 2, p. 878, Coal Meas.
- nodosa*, Dawson, 1871, Foss. Plants Can., p. 33, Devonian.
- palmatifida*, Lesquereux, 1860, (Rhizolithes palmatifidus,) Geo. Sur. Ark., vol. 2, p. 313, Coal Meas.
- pinnata*, Lesquereux, 1858, Geo. Sur. Pa., vol. 2, p. 878, Coal Meas.



FIG. 63.—*Pinnularia ramosissima*.

ramosissima, Dawson, 1863, Can. Nat., vol. 8, and Acad. Geol., p. 480, Coal Meas.

PLUMALINA, Hall, 1858, Can. Nat. and Geo., vol. 3, p. 175. [Ety. *pluma*, a small feather.] Simple fronds, with linear pinnules diverging, from each side, in the same plane, and more or less ascending. It is a peculiar plant, described, originally, as a Graptolite, to which opinion Prof. Hall still adheres. On the other hand, Prof. Dawson claims the characters prove it is a vegetable, and in this he is supported by the fact that all Graptolites had become extinct, as shown by their absence in several groups of rocks before the appearance of this form. Type *P. plumaria*.

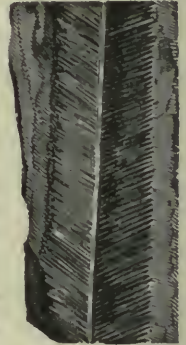


FIG. 64.

densa, Hall, 1879, 30th Rep. N. Y. St. Mus. Nat. Hist., pl. 4, fig. 6, Ham. Gr. gracilis, Shumard, 1855, (Filicites gracilis,) Geo. Rep. Mo., p. 208, Waverly Gr. in Lithographic limestone.
linearis, Lesquereux, 1880, (Trochophyllum lineare,) Coal Flora of Pa., p. 64, Waverly Gr.
plumaria, Hall, 1843, (Filicites?) Geo. Rep. p. 273, and 4th Dist. N. Y., Can. Nat. and Geo., vol. 3, p. 175, Chemung Gr.



FIG. 65.

Protoblechnum holdenti.

Polysporia, Newberry, syn. for *Lepidostrobus mirabilis*, see *Lepidostrobus mirabilis*.
PROTOBLECHNUM, Lesquereux, 1880, Coal Flora of Pa., p. 188. [Ety. *protos*, first;

plumula, Dawson, 1873, (Lycopodites plumula,) Rep. Foss. plants Low. Carb. and Millstone Grit, p. 24, Su becarboniferous.

Polyporites, Lindley & Hutton, 1833, Foss. Flora, vol. 1, p. 181. This genus was founded upon a fish-scale, and the form referred to it in Geo. Sur. Pa., vol. 2, p. 847, is quite a different thing.

Blechnum, a genus.] Fronds large, pinnate; rachis thick, scaly toward the base; pinnae long, narrow linear-lanceolate, acuminate, entire, enlarged at base on the lower side to a decurring auricle, generally free; medial nerve percurrent; lateral veins open, curving to the borders, forking twice. Type *P. holdeni*.

holdeni, Andrews, 1875, (*Alethopteris holdeni*.) Ohio Pal., vol. 2, 420, Coal Meas.

PROSTIGMA, Lesquereux, 1877, Proc. Am. Phil. Soc., p. 169. [Ety. *protos*, first; *stigma*, a brand or dot.] Stems with rhomboidal scars as in *Sigillaria*, but without vascular scars in the middle. Not a land-plant, but a fucoid. Type *P. sigillarioides*.

sigillarioides, Lesquereux, 1877, Proc. Am. Phil. Soc., p. 169, Hud. Riv. Gr.

PROTOTAXITES Dawson, 1859, Quar. Jour. Geo. Soc., vol. 15, p. 484. [Ety. *protos*, first; *taxus*, yew-tree; so named from the spirally marked cells characteristic of the genus *Taxites*.] Woody and branching trunks, with concentric rings of growth and medullary rays; cells of pleurenchyma not in regular lines, cylindrical, thick-walled, with a double series of spiral fibers; discs or bordered pores few, circular and indistinct. The specimens found are usually silicified, with the bark in a coaly state. Type *P. logani*.

logani, Dawson, 1859, Quar. Jour. Geo. Soc., vol. 15, p. 484, Devonian. This is the oldest known exogenous tree in America, according to Dawson, but Carruthers says it is a huge sea-weed and has named it *Nematophycus logani*.

PSARONIUS, Cotta, 1832, Dendrol in Beziehung, p. 27. [Ety. *psaros*, speckled.] Stems of tree-ferns, covered below by adventive roots, increasing by their superposition the conical base of the trunks; cortex thick, parenchymatous; woody cylinder, subdivided into branches composed of fascicles of vessels either half cylindrical or diversely plicate, immersed in cellular medullary tissue. Type *P. helmintholithus*.

erianus, Dawson, 1871, Foss. Plants Can., p. 58, Ham. Gr.

textilis, Dawson, 1871, Foss. Plants Can., p. 59, Ham. Gr.

PSEUDOPEOPTERIS, Lesquereux, 1880, Coal Flora of Pa., p. 189. [Ety. *pseudo*, false; *Pecopteris*, a genus.] Primary rachis forking near the base in diverging branches of equal size, or divaricate and dichotomous; branches poly-pinnate, ultimate divisions sometimes forked; pinnules connate or separated to the base, of various shape, oblong-obtuse or ovate-lanceolate, oblique or in right angle, decurring to the rachis and bordering it by a narrow wing; lateral veins oblique, generally forking once, the lowest pair twice. Type *P. mazonana*.

abbreviata, Lesquereux, 1854, (*Sphenopteris abbreviata*.) Bost. Jour. Soc. Nat. Hist., vol. 6, p. 419, and Geo. Sur. Pa., vol. 2, p. 861, Coal Meas.

acuta, Brongniart, 1828, (*Sphenopteris acuta*.) Hist. d. Veg. Foss., p. 207, and Coal Flora of Pa., p. 215, Coal Meas.

anceps, Lesquereux, 1880, Coal Flora of Pa., p. 207, Coal Meas.

andræana, Roehl, 1868, (*Sphenopteris andræana*.) Fossile Flora der Steinkohlen formation Westphalens, p. 62, and Coal Flora of Pa., p. 754, Coal Meas.

callosa, Lesquereux, 1866, (*Pecopteris callosa*.) Geo. Sur. Ill., vol. 2, p. 442, Low. Coal Meas.

cordato-ovata, Weiss, 1869, (*Neuropteris cordato-ovata*.) Foss. Flor. d. jungst. Steink. form., p. 28, and Coal Flora of Pa., p. 205, Coal Meas.

decipiens, Lesquereux, 1854, (*Sphenopteris decipiens*.) Bost. Jour. Soc. Nat. Hist., vol. 6, p. 420, and Geo. Sur. Pa., vol. 2, p. 862, Coal Meas.

decurrens, Lesquereux, 1854, (*Pecopteris decurrens*.) Bost. Jour. Soc. Nat. Hist., vol. 6, p. 424, and Geo. Sur. Pa., vol. 2, p. 867, Coal Meas.

denudata, Lesquereux, 1880, Coal Flora of Pa., p. 212, Coal Meas.

dimorpha, Lesquereux, 1880, Coal Flora of Pa., p. 201, Coal Meas.

glandulosa, Lesquereux, 1854, (*Sphenopteris glandulosa*.) Bost. Jour. Soc. Nat. Hist., vol. 6, p. 420, and Geo. Sur. Pa., vol. 2, p. 862, Coal Meas.

hispida, Lesquereux, 1884, Coal Flora of Pa., p. 755, Coal Meas.

hymenophylloides, Lesquereux, 1870, (*Alethopteris hymenophylloides*.) Geo. Sur. Ill., vol. 4, p. 393, Coal Meas.

irregularis, Sternberg, 1833, (*Sphenopteris irregularis*.) Vers. Geog. Darst. Flor. d. Vorw., vol. 2, p. 68, Coal Meas.

latifolia, Brongniart, 1828, (*Sphenopteris latifolia*.) Hist. d. Veg. Foss., p. 205, and Coal Flora of Pa., p. 215, Coal Meas.

macilenta, Lindley & Hutton, 1835, Foss. Flora, vol. 2, pl. 151, and Coal Flora of Pa., p. 219, Coal Meas.

mazonana, Lesquereux, 1870, (*Alethopteris mazonana*.) Geo. Sur. Ill., vol. 4, p. 391, Low. Coal Meas.

muricata, Brongniart, 1828, (*Pecopteris muricata*.) Hist. d. Veg. Foss., p. 352, and Coal Flora of Pa., p. 203, Coal Meas.

nervosa, Brongniart, 1828, (*Pecopteris nervosa*.) Hist. d. Veg. Foss., p. 297, and Coal Flora of Pa., p. 197, Coal Meas.

newberryi, Lesquereux, 1854, (*Sphenopteris newberryi*.) Bost. Jour. Soc. Nat.



FIG. 66. *Pseudopecopteris mazonana*.

Hist., vol. 6, p. 420, and Geo. Sur. Pa., vol. 2, p. 862, Coal Meas.

nummularia, Gutbier, 1842, Abdrucke u. Verst. d. Zwick. Schwarzk. u. Seiner. Umgebungen, p. 43, and Coal Flora of Pa., p. 752, Coal Meas.

obtusiloba, Brongniart, 1828, (Sphenopteris obtusiloba,) Hist. d. Veg. Foss., p. 204, and Coal Flora of Pa., p. 753, Coal Meas.

pluckeneti, Schlotheim, 1820, (Filicites pluckeneti,) Petrefaktenkunde, p. 410, and Coal Flora of Pa., p. 199, Coal Meas.

polyphylla, Lindley & Hutton, 1835, (Sphenopteris polyphylla,) Foss. Flora, vol. 2, pl. 147, and Coal Flora of Pa., p. 218, Coal Meas.

pusilla, Lesquereux, 1854, (Pecopteris pusilla,) Bost. Jour. Soc. Nat. Hist., vol. 6, p. 424, and Geo. Sur. Pa., vol. 2, p. 866, Coal Meas.

sheaferi, Lesquereux, 1858, (Pecopteris sheaferi,) Catal. Potts. Ass'n, p. 11, and Coal Flora of Pa., p. 194, Coal Meas.

sillimani, Brongniart, 1828, (Pecopteris sillimani,) Hist. d. Veg. Foss., p. 353, and Coal Flora of Pa., p. 206, Coal Meas.

speciosa, Lesquereux, 1880, Coal Flora of Pa., p. 216, Coal Meas.

spinulosa, Lesquereux, 1870, (Althropteris spinulosa,) Geo. Sur. Ill., vol. 4, p. 396, Coal Meas.

subcrenulata, Lesquereux, 1880, Coal Flora of Pa., p. 193, Coal Meas.

subnervosa, Roemer, F. A., 1860, Paleontographica, vol. 9, p. 192, and Coal Flora of Pa., p. 198, Coal Meas.

trifoliata, Artis, 1825, (Filicites trifoliatus,) Anted. Phytol., pl. 2, and Coal Flora of Pa., p. 217, Coal Meas.

virginiana, Meek, 1875, (Cyclopteris virginiana,) Bull. Phil. Soc. of Washington, p. 18, and Coal Flora of Pa., p. 217, Waverly Gr.

PSILOPHYTON, Dawson, 1859, Quar. Jour. Geo. Soc., vol. 15, p. 478. [Ety. *psilon*, smooth; *phyton*, stem.] Stems dichotomous; young branches carinate; rhizomes cylindrical, villous or scaly; marked with round scars, points of attachment of cylindrical rootlets; leaves in spiral order, small or rudimentary, acicular, squarrose, open; fructifications in small, naked sporanges, spindle-shaped or clavate, axillary, or in pairs at the extremity of the branches. Type *P. princeps*.

cornutum, Lesquereux, 1877, Proc. Am. Phil. Soc., p. 165, Low. Held. Gr.

elegans, Dawson, 1862, Quar. Jour. Geo. Soc., vol. 18, p. 315, Devonian.

glabrum, Dawson, 1862, Quar. Jour. Geo. Soc., vol. 18, p. 315, Devonian.

gracillimum, see *Dendrograptus gracillimum*.

princeps, Dawson, 1859, Quar. Jour. Geo. Soc., vol. 15, p. 479, Upper Silurian and

Devonian. This is the oldest known plant in America. It is supposed to have grown in a marsh.



FIG. 67.—*Psilophyton princeps*.

princeps var. *ornatum*, Dawson, 1871, Foss. Plants, p. 33, Devonian.

robustum, Dawson, 1859, Quar. Jour. Geo. Soc., vol. 15, p. 479, Devonian.

Ptilocarpus, Lesquereux, 1870, Geo. Sur. Ill., vol. 4, p. 493, Syn. for *Cardiocarpon*.

bicornutus, see *Cardiocarpon bicornutum*.

Ptilophyton, Dawson, 1878, Scottish Devonian Plants in Can. Nat., vol. 8. This is founded upon *Lycopodites vanuxemi* as the type, which is the same as *Plumalina plumula*, and falls therefore as a synonym.

gracile, see *Plumalina gracilis*.

lineare, Lesquereux, see *Plumalina linearis*.

plumula, see *Lycopodites plumula*.

vanuxemi, syn. for *Plumalina plumula*.

RHABDOCARPUS, Gœppert & Berger, 1848, De Fruct. et Sem., p. 20. [Ety. *rhabdos*, stria; *karpos*, fruit.] Seeds ovate or oblong, costate or striate, acute or acuminate, surrounded by a putamen sometimes deficient. Type *R. tunicatus*.

abnormalis, Lesquereux, 1884, Coal Flora of Pa., p. 818, Coal Meas.

acuminatus, Newberry, 1873, Ohio Pal., vol. 1, p. 378, Coal Meas.

amygdaliformis, Gœppert & Berger, 1848, De Fruct. et Sem., p. 21, Coal Meas.

apiculatus, Newberry, 1873, Ohio Pal., vol. 1, p. 377, Coal Meas.

arcuatus, Lesquereux, 1861, Geo. Sur. Ky., vol. 4, p. 434, Coal Meas.

beinertianus, Gœppert & Berger, 1848, De Fruct. et Sem., p. 20, and Coal Flora of Pa., p. 844, Coal Meas.

bockshianus, Gœppert & Berger, 1848, De Fruct. et Sem., p. 21, and Coal Flora of Pa., p. 844, Coal Meas. FIG. 68.—*Rhabdocarpus carinatus*.

carinatus, Newberry, 1873, Ohio Pal., vol. 1, p. 376, Coal Meas.

clavatus, Sternberg, 1820, (Carpolithes clavatus,) Vers. Darst. Flora der Vor-



- welt, and Coal Flora of Pa., p. 581, Coal Meas.
- cornutus, Lesquereux, 1880, Coal Flora of Pa., p. 583, Coal Meas.
- costatus, Newberry, 1873, Ohio Pal., vol. 1, p. 378, Coal Meas., syn. ? for *R. acuminatus*.
- danai, Foster, 1854, Ann. of Sci., vol. 1, p. 129, and Ohio Pal., vol. 1, p. 376, Coal Meas.
- emarginatus, Lesquereux, 1884, Coal Flora of Pa., p. 818, Coal Meas.
- howardi, Lesquereux, 1880, Coal Flora of Pa., p. 575, Coal Meas.
- inflatus, Lesquereux, 1884, Coal Flora of Pa., p. 815, Coal Meas.
- insignis, Dawson, 1863, Can. Nat. and Geol., vol. 8, and Acad. Geol., p. 478, Coal Meas.
- insignis*, Lesquereux, 1880, Coal Flora of Pa., p. 575. The name being preoccupied, it has been called *R. lescurianus*.
- jacksonensis, Lesquereux, 1866, (*Carpolithes jacksonensis*.) Geo. Sur. Ill., vol. 2, p. 461, Low. Coal Meas.
- lævis, Newberry, 1873, Ohio Pal., vol. 1, p. 377, Coal Meas.
- laticostatus, Lesquereux, 1884, Coal Flora of Pa., p. 815, Coal Meas.
- lescurianus, S. A. Miller, 1883, 2d. Ed. Am. Pal. Foss., p. 256, Coal Meas. Proposed instead of *R. insignis*, Lesquereux, which was preoccupied.
- mammillatus, Lesquereux, 1870, Geo. Sur. Ill., vol. 4, p. 461, Coal Meas.
- minutus, Lesquereux, 1860, Geo. Sur. Ark., vol. 2, p. 313, Coal Meas.
- multistriatus, Presl, 1833, (*Carpolithes multistriatus*.) in Sterberg's Flor. d. Vorw., vol. 2, p. 208, and Coal Flora of Pa., p. 578, Coal Meas.
- oblongus, Fontaine & White, 1880, Perm. or Up. Carb. Flora, p. 98, Coal Meas. or Permian.
- pachytesta, Lesquereux, 1884, Coal Flora of Pa., p. 816, Coal Meas.
- platimarginatus, Lesquereux, 1860, (*Carpolithes platimarginatus*.) Geo. Sur. Ark., vol. 2, p. 312, Low. Coal Meas.
- subglobosus, Lesquereux, 1884, Coal Flora of Pa., p. 817, Coal Meas.
- tenax, Lesquereux, 1884, Coal Flora of Pa. p. 818, Coal Meas.
- venosus*, Sternberg, as identified by Lesquereux, 1858, Geo. Sur. Pa., vol. 2, p. 870, Coal Meas. Not noticed in Coal Flora of Pa., and probably not American.
- RHACHOPTERIS**, Dawson, 1862, Quar. Jour. Geo. Soc., vol. 18, p. 323. [Ety. *rachis*, a stalk; *pteris*, fern.] Detached leaf-stalks of ferns; stipes half an inch wide or less; unevenly striate, giving off opposite branches, which are abruptly broken off at short distances from the stipe. Type *R. pinnata*.
- affinis*, Lesquereux, 1870, (*Stigmarioides affinis*.) Geo. Sur. Ill., vol. 4, p. 455, Coal Meas.
- cyclopteroides*, Dawson, 1862, Quar. Jour. Geo. Soc., vol. 18, p. 323, Catskill Gr.
- gigantea*, Dawson, 1871, Foss. Plants Can., p. 57, Ham. Gr.
- palmata*, Dawson, 1871, Foss. Plants of Canada, p. 57, Ham. Gr.
- pinnata*, Dawson, 1862, Quar. Jour. Geo. Soc., vol. 18, p. 323, Catskill Gr.
- punctata*, Dawson, 1862, Quar. Jour. Geo. Soc., vol. 18, p. 323, Catskill Gr.
- selago*, Lesquereux, 1870, (*Stigmarioides selago*.) Geo. Sur. Ill., vol. 4, p. 456, Coal Meas.
- squamosa*, Lesquereux, 1884, Coal Flora of Pa., p. 838, Coal Meas.
- striata*, Dawson, 1862, Quar. Jour. Geo. Soc., vol. 18, p. 323, Chemung Gr.
- tenuistriata*, Dawson, 1862, Quar. Jour. Geo. Soc., vol. 18, p. 323, Ham. Gr.
- RHACOPHYLLUM**, Schimper, 1869, Palæontologie Vegetale, vol. 1, p. 684. [Ety. *rakos*, rugged; *phyllon*, leaf.] Fronds either flabelliform, many times subdivided or pinnate, irregularly pinnatifid, bipinnatifid; rachis flat, often much dilated, scarcely thicker than the foliaceous lamina, which is very variable in the size and the mode of its divisions; veins numerous, more or less indistinct, following the rachis in parallel bundles, dichotomous in the foliaceous divisions. Type, *R. flabellatum*.
- adnascens*, Lindley & Hutton, 1835, (*Schizopteris adnascens*.) Foss. Flora, vol. 2, p. 57, and Coal Flora of Pa., p. 321, Coal Meas.
- affine*, Lesquereux, 1858, (*Pachyphyllum affine*.) Geo. Sur. Pa., vol. 2, p. 863, Coal Meas.
- arborescens*, Lesquereux, 1870, (*Hymenophyllites arborescens*.) Geo. Sur. Ill., vol. 4, p. 415, Coal Meas.
- browni*, Dawson, 1861, (*Cyclopteris browni*.) Quar. Jour. Geo. Soc., vol. 17, p. 32, Portage Gr.
- clarki*, Lesquereux, 1866, (*Hymenophyllites clarki*.) Geo. Sur. Ill., vol. 2, p. 438, Coal Meas.
- corallinum*, Lesquereux, 1880, Coal Flora of Pa., p. 317, Coal Meas. Misspelled *corralum* in the text.
- cornutum*, Lesquereux, 1880, Coal Flora of Pa., p. 317, Coal Meas.
- expansum*, Lesquereux, 1880, Coal Flora of Pa., p. 313, Coal Meas.
- filiciforme*, Gutbier, 1842, (*Fucoides filiciformis*.) Abdr. u. Verst. d. Zwick. Schwarzkr. u. sein. Umg., p. 11, and Coal Flora of Pa., p. 316, Coal Meas.
- filiforme*, Gutbier, 1842, (*Fucoides filiformis*.) Abdr. u. Verst. d. Zwick. Schwarzkr. u. sein. Umg., p. 12, and Coal Flora of Pa., p. 838, Coal Meas.
- fimbriatum*, Lesquereux, 1858, (*Pachyphyllum fimbriatum*.) Geo. Sur. Pa., vol. 2, p. 863, Coal Meas.
- flabellatum*, Sternberg, 1833, (*Aphlebia flabellata*.) Flor. d. Vorw., vol. 2, p. 112, and Coal Flora of Pa., p. 311, Coal Meas.

- fucoidem, Lesquereux, 1880, Coal Flora of Pa., p. 325, Coal Meas.
 hamulosum, Lesquereux, 1880, Coal Flora of Pa., p. 321, Coal Meas.
 hirsutum, Lesquereux, 1858, (Pachyphyllum hirsutum,) Geo. Sur. Pa., vol. 2, p. 863, Coal Meas.
 inflatum, Lesquereux, 1870, (Hymenophyllites inflatus,) Geo. Sur. Ill., vol. 4, p. 414, Coal Meas.
 irregulare, Germar, 1844, (Aphlebia irregularis,) Verst. d. Steink. v. Wettin u. Löbejün, p. 57, and Coal Flora of Pa., p. 326, Coal Meas.
 laceratum, Lesquereux, 1858, (Pachyphyllum laceratum,) Geo. Sur. Pa., vol. 2, p. 863, Coal Meas.
 laciniatum, Fontaine & White, 1880, Perm. or Up. Carb. Flora, p. 94, Coal Meas. or Permian.

FIG. 69.—*Rhacophyllum lactuca*.

- lactuca*, Sternberg, 1833, (Schizopteris lactuca,) Flor. d. Vorw. vol. 2, p. 112, and Coal Flora of Pa., p. 315, Coal Meas.
 membranaceum, Lesquereux, 1880, Coal Flora of Pa., p. 312, Coal Meas.
 molle, Lesquereux, 1870, (Hymenophyllites molles,) Geo. Sur. Ill., vol. 4, p. 418, Coal Meas.
 scolopendrites, Lesquereux, 1858, (Scolopendrites dentatus,) Geo. Sur. Pa., vol. 2, p. 868, Coal Meas.
 spinosum, Lesquereux, 1880, Coal Flora of Pa., p. 320, Coal Meas.
 strongi, Lesquereux, 1870, (Hymenophyllites strongi,) Geo. Sur. Ill., vol. 4, p. 417, Coal Meas.
 thaliforme, Lesquereux, 1870, (Hymenophyllites thaliformis,) Geo. Sur. Ill., vol. 4, p. 417, Coal Meas.
 trichoideum, Lesquereux, 1880, Coal Flora of Pa., p. 322, Coal Meas.
 truncatum, Lesquereux, 1880, Coal Flora of Pa., p. 311, Coal Meas.
Rhizolites, F. Braun, 1847, in Flora, etc. [Ety. *rhiza*, root; *lithos*, stone.]
palmatifidus, see *Pinnularia palmatifidus*.
Rhizopteris, Schimper, 1869, Traité de Paléontologie Vegetale, vol. 1, p. 699. [Sig. the rhizomas of ferns.] This genus, as the name indicates, comprehends the

rhizomas of ferns. Type, *R. lycopodioides*. Some of the species of *Lycopodites* as *L. uncinatus* have been referred to it.

- Rhizomorpha*, Roth, as identified by Lesquereux, Coal Flora of Pa., p. 3. [Ety. *rhiza*, root; *morpha*, form.] Fungous filaments of hard substance, disposed in branches abnormally divided, and often anastomosing; generally living under the decaying bark of trees.
 sigillarie, Lesquereux, 1877, Proc. Am. Phil. Soc., p. 174, and Coal Flora of Pa., p. 3, Coal Meas.
Rotularia longifolia, see *Sphenophyllum longifolium*.
Rusomyces, Hall, 1852, Pal. N. Y., vol. 2, p. 23. [Ety. *rusos*, rugose; *phykos*, sea-plant.] Simple or branched stems, transversely wrinkled, and often possessing a central longitudinal depression. Type *R. clavatum*.
 asperum, Miller & Dyer, 1878, Jour. Cin. Soc. Nat. Hist., vol. 1., p. 25, Utica Slate.
 bilobatum, Vanuxem, 1842, (Fucoides bilobatus,) Geo. Rep. N. Y., p. 79, Hud. Riv. and Clinton, Gr.
 clavatum, Hall, 1852, Pal. N. Y., vol. 2, p. 23, Clinton Gr.
 grenvillense, Billings, 1862, Pal. Foss., vol. 1, p. 101, Chazy Gr.
 pudicum, Hall, 1852, Pal. N. Y., vol. 2, p. 24, Hud. Riv. and Clinton Gr.
 subangulatum, Hall, 1852, Pal. N. Y., vol. 2, p. 23, Clinton Gr.
Sagenaria veltheimiana, see *Lepidodendron veltheimianum*.
 SAPORTÆA, Fontaine & White, 1880, Perm. or Up. Carb. Flora, p. 99. [Ety. proper name.] Leaves simple, subreniform, flabellate or suborbicular, cuneate, bordered at the base with a woody rim, terminal margin incised; petiole long, slender, and grooved on the upper surface; nerves parting flabellately from the summit of the petiole and the woody basal margin, all passing into the laminae; leaf substance thin. Type *S. grandifolia*.
 grandifolia, Fontaine & White, 1880, Perm. or Up. Carb. Flora, p. 101, Coal Meas. or Permian.
 salisburioides, Fontaine & White, 1880, Perm. or Up. Carb. Flora, p. 102, Coal Meas. or Permian.
Schizopteris, Brongniart, 1828, Prodr. d. Hist. d. Veg. Foss., p. 63. [Ety. *schizo*, I cleave; *pteris*, fern.] Frond lacinate,

FIG. 70.—*Rusomyces bilobatum*.

or cut in linear erect or curved divisions, sometimes enlarged at the top, marked with thin parallel veins without branching, being split in fascicles with the divisions. Type *S. anomala*.

adnascens, see *Rhacophyllum adnascens*.

lactuca, see *Rhacophyllum lactuca*.

Schultzia, Gæppert, 1848, Permian Flora, p. 161. [Ety. proper name.] Stems either single or branching, bearing on short alternate pedicels small cones or strobiles of an ovate, truncate form, a compound of imbricate, broadly linear pointed scales, united at the base. Type *S. anomala*.

bracteata, see *Cordaianthus bracteatus*.

Scolopendrites, Lesquereux, 1858, Geo. Sur. Pa., vol. 2, p. 868. This name is abandoned.

dentatus, see *Rhacophyllum scolopendrites*.

Selaginites Brongniart, 1828, Prodr. d. Hist. d. Veg. Foss., p. 84. Stems dichotomous; leaves small, numerous, imbricated, sometimes enlarged at the base, scarcely leaving any visible scars. Type *S. patens*. The genus is regarded as synonymous with *Lycopodites*.

cavifolius, see *Lycopodites cavifolius*.

crassus, Lesquereux, 1866, Geo. Sur. Ill., vol. 2, p. 446, syn. for *Lycopodites cavifolius*.

formosus, Dawson, 1861, Can. Nat., vol. 6, p. 176. Not a plant, but a fragment of a crustacean.

uncinatus, see *Lycopodites uncinatus*.

SIGILLARIA, Brongniart, 1822, Class. des Veg. Foss. in Mem. du Mus. d'Hist. Nat. de Paris, tom. 8, p. 203. [Ety. *sigillum*, a seal; from the seal-like scars of fallen leaves stamped upon the bark.] Trunks large, simple or dichotomous near the apex, marked by leaf-scars in vertical series, separated by furrows or placed in spiral order, either contiguous or more or less distant, very variable in size and shape, round, oval, truncate, or emarginate, hexagonal, transversely rhomboidal, with three vascular scars, one simple, medial, punctiform, the two others lateral of semi-lunar or linear shape. Leaves linear, long, triplicate, carinate, or plane, with a distinct medial nerve. Type *S. punctata*.

acuminata, Newberry, 1874, Proc. Cleveland Acad. Sci., p. 164, and Coal Flora of Pa., p. 496, Coal Meas.

alternans, Sternberg, 1833, Flor. der Vorw., vol. 2, p. 50, Coal Meas.

alveolaris, Sternberg, 1820, (Lepidodendron alveolare.) Essai d'un exposé Geognostico-botanique de la Flore du monde primitif, 1st Cahier, p. 25, Coal Meas.

angusta, Brongniart, 1828, Hist. d. Veg. Foss.; Coal Meas.

approximata, Fontaine & White, 1880, Perm. or Up. Carb. Flora, p. 96, Coal Meas.

attenuata, Lesquereux, 1858, Catal. Potts. Foss., p. 17, and Coal Flora of Pa., p. 488, Coal Meas.

biercei, syn. for *S. ichthyolepis*.

brardi, Brongniart, 1822, Class. des Veg. Foss. tab. 1, fig. 5, and Coal Flora of Pa., p. 477, Coal Meas.

bretonensis, Dawson, 1865, Quar. Jour. Geo. Soc., vol. 20, p. 148, and Acad. Geol., p. 475, Coal Meas.

brochanti, Brongniart, 1828, Hist. d. Veg. Foss., p. 442, and Coal Flora of Pa., p. 842, Coal Meas.

brongniarti, Geinitz, 1855, Die Verst. d. Steink. form. Sachsen, p. 47, Coal Meas.

browni, Dawson, 1861, Quar. Jour. Geo. Soc., vol. 17, and Acad. Geol., p. 180, Coal Meas.

catenoides, Dawson, 1865, Quar. Jour. Geo. Soc., vol. 20, p. 147, and Acad. Geol., p. 474, Coal Meas.

catenulata, Lindley & Hutton, 1831, Foss. Flora, vol. 1, p. 163, Coal Meas.

chemungensis, see *Lepidodendron chemungense*.

cisti, see *Caulopteris cisti*.

corrugata, Lesquereux, 1861, Geo. Sur. Ky., vol. 4, p. 437; redefined 1870, Geo. Sur. Ill., vol. 4, p. 445, Coal Meas.

cortei, Brongniart, 1828, Prodr. d. Hist. d. Veg. Foss., p. 64, and Coal Flora of Pa., p. 495, Coal Meas.

cuspidata, Brongniart, 1828, Prodr. d. Hist. d. Veg. Foss., p. 65, and Coal Flora of Pa., p. 486, Coal Meas.

cymatoides, Wood, 1860, Proc. Acad. Nat. Sci., vol. 12, p. 520, Coal Meas.

defrancii, Brongniart, 1828, Prodr. d. Hist. d. Veg. Foss., p. 66, Coal Meas.

dentata, Newberry, 1874, Proc. Cleveland Acad. Sci., p. 165, Coal Meas.

dilatata, Lesquereux, 1858, Geo. Sur. Pa., vol. 2, p. 871, Coal Meas.

discoidea, Lesquereux, 1858, Geo. Sur. Pa., vol. 2, p. 873, Coal Meas.

dournaisi, Brongniart, 1828, Hist. d. Veg. Foss., p. 441, Coal Meas.

dubia, Lesquereux, 1858, Geo. Sur. Pa., vol. 2, p. 872, syn. for *S. cortei*.

elegans, Sternberg, 1826, (Favularia elegans.) Tent. flor. primord., p. 14, Coal Meas.

elliptica, Brongniart, 1828, Hist. d. Veg. Foss., p. 447, and Coal Flora of Pa., p. 494, Coal Meas.

elongata, Brongniart, 1822, Ann. des Sci. Nat., tom. 4, p. 23, Coal Meas.

eminens, Dawson, 1863, Can. Nat., vol. 8, and Acad. Geol. p. 475, Coal Meas.

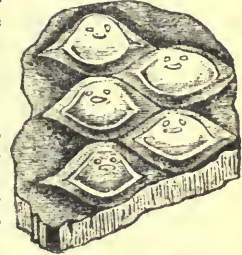
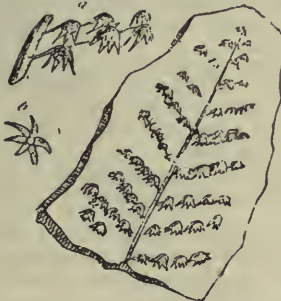


FIG. 71.—*Sigillaria brardi*.

- fissa*, Lesquereux, 1858, *Geo. Sur. Pa.*, vol. 2, p. 871, *Coal Meas.*
flexuosa, Lindley & Hutton, 1837, *Foss. Flora*, vol. 3, p. 147, *Coal Meas.*
grandeuryi, Lesquereux, 1884, *Coal Flora of Pa.*, p. 795, *Coal Meas.*
hexagona, Schlotheim, 1820, (*Palmacites hexagonus*.) *Petrefaktenkunde*, p. 394, and *Coal Flora of Pa.*, p. 483, *Coal Meas.*
ichthyolepis, Sternberg, 1833, *Flora d. Vorw.*, vol. 2, p. 38, and *Coal Flora of Pa.*, p. 482, *Coal Meas.*
intermedia, Brongniart, 1828, *Hist. d. Veg. Foss.*, p. 474, *Coal Meas.*
knorri, Brongniart, 1828, *Prodr. d. Hist. d. Veg. Foss.*, p. 65, *Coal Meas.*
lacoii, Lesquereux, 1880, *Coal Flora of Pa.*, p. 499, *Coal Meas.*
lævigata, Brongniart, 1828, *Prodr. d. Hist. d. Veg. Foss.*, p. 64, and *Coal Flora of Pa.*, p. 500, *Coal Meas.*
leioderma, Brongniart, 1828, *Hist. d. Veg. Foss.*, p. 422, and *Coal Flora of Pa.*, p. 476, *Coal Meas.*
lepidodendrifolia, Brongniart, 1828, *Prodr. d. Hist. d. Veg. Foss.*, p. 426, and *Coal Flora of Pa.*, p. 477, *Coal Meas.*
leptoderma, Lesquereux, 1880, *Coal Flora of Pa.*, p. 489, *Coal Meas.*
lescurii, Schimper, 1869, *Trait. de Paléontologie Vegetale*, vol. 2, p. 85, *Coal Meas.*
leveretti, Lesquereux, 1884, *Coal Flora of Pa.*, p. 800, *Coal Meas.*
lorenzi, Lesquereux, 1880, *Coal Flora of Pa.*, p. 473, *Coal Meas.*
lorwayana, Dawson, 1873, *Rep. on Foss. Plants*, p. 43, *Subcarboniferous*.
mammillaris, Brongniart, 1828, *Hist. d. Veg. Foss.*, p. 451, and *Coal Flora of Pa.*, p. 483, *Coal Meas.*
marginata, Lesquereux, 1880, *Coal Flora of Pa.*, p. 498, *Coal Meas.*
marinaria, Hildreth, 1837, *Am. Jour. Sci. and Arts*, vol. 31, p. 30, *Low. Coal Meas.*
massiliensis, Lesquereux, 1870, *Geo. Sur. Ill.*, vol. 4, p. 446, *Coal Meas.*
menardi, Brongniart, 1828, *Hist. d. Veg. Foss.*, p. 430, and *Coal Flora of Pa.*, p. 479, *Coal Meas.*
monostigma, Lesquereux, 1866, *Geo. Sur. Ill.*, vol. 2, p. 449, *Coal Meas.*
notata, Steinhaur, 1818, (*Phytolithus notatus*.) *Trans. Am. Phil. Assoc.*, vol. 1, p. 294, and *Coal Flora of Pa.*, p. 486, *Coal Meas.*
obliqua, Brongniart, 1828, *Hist. Veg. Foss.*, p. 429, and *Coal Flora of Pa.*, p. 470, *Coal Meas.*
obovata, Lesquereux, 1858, *Geo. Sur. Pa.*, vol. 2, p. 872, *Coal Meas.*
oculata, Schlotheim, 1820, (*Palmacites oculatus*.) *Petrefaktenkunde*, p. 394, *Coal Meas.*
orbicularis, Brongniart, 1828, *Prodr. d. Hist. d. Veg. Foss.*, p. 65, *Coal Meas.*
organum, Sternberg, 1820, (*Syringodendron organum*.) *Flor. der Vorw.*, p. 23, and Lindley & Hutton, 1831, *Foss. Flora*, Vol. 1, p. 199, *Coal Meas.*
ornithicoides, Wood, 1860, *Proc. Acad. Nat. Sci.*, vol. 12, p. 238, and *Trans. Am. Phil. Soc.*, vol. 13, p. 348, *Coal Meas.*
ovalis, Lesquereux, 1880, *Coal Flora of Pa.*, p. 495, *Coal Meas.*
oweni, see *Didymophyllum oweni*.
pachyderma, see *Syringodendron pachyderma*.
palpebra, Dawson, 1862, *Quar. Jour. Geo. Soc.*, vol. 18, p. 307, and *Acad. Geol. p.* 536, *Devonian*.
perplexa, Wood, 1866, *Proc. Acad. Nat. Sci. Phil.* vol. 12, p. 237, *Coal Meas.*
pittstonana, Lesquereux, 1880, *Coal Flora of Pa.*, p. 493, *Coal Meas.*
planicosta, Dawson, 1863, *Can. Nat. and Geol.*, vol. 8, and *Acad. Geol.*, p. 474, *Coal Meas.*
polita, Lesquereux, 1858, *Geo. Sur. Pa.*, vol. 2, p. 872, *Coal Meas.*
pulchra, Newberry, 1874, *Proc. Cleveland Acad. Sci.* p. 165, *Coal Meas.*
pyriformis, Brongniart, 1828, *Prodr. d. Hist. d. Veg. Foss.*, p. 65, and *Coal Flora of Pa.*, p. 799, *Coal Meas.*
reniformis, Brongniart, 1822, *Ann. des Sci. Nat.*, t. 4, p. 32, and *Coal Flora of Pa.*, p. 501, *Coal Meas.*
reticulata, Lesquereux, 1860, *Geo. Sur. Ark.*, vol. 2, p. 310, *Coal Meas.*
rugosa, Brongniart, 1828, *Prodr. Hist. Veg. Foss.*, p. 64, and *Coal Flora of Pa.*, p. 497, *Coal Meas.*
saulli, Brongniart, 1828, *Hist. Veg. Foss.*, vol. 1, p. 456, and *Coal Flora of Pa.*, p. 842, *Coal Meas.*
schimperii, Lesquereux, 1858, *Geo. Sur. Pa.*, vol. 2, p. 871, *Coal Meas.*
schlotheimiana, Brongniart, 1828, *Hist. Veg. Foss.* p. 469, *Coal Meas.* *American Sp. (?)*
sculpta, Lesquereux, 1858, *Geo. Sur. Pa.*, vol. 2, p. 871, *Coal Meas.* *Syn. for S. obliqua?*
scutellata, Brongniart, 1822, *Class. des Veg. Foss.*, tab. 1, fig. 4, *Coal Meas.*
semina, Lesquereux, 1870, *Geo. Sur. Ill.*, vol. 4, p. 463, *Coal Meas.*
serlii, Brongniart, 1828, *Hist. d. Veg. Foss.*, p. 433, and *Coal Flora of Pa.*, p. 480, *Coal Meas.*
sillimani, Brongniart, 1828, *Hist. Veg. Foss.*, p. 459, and *Coal Flora of Pa.*, p. 493, *Coal Meas.*
simplicitas, Vanuxem, 1843, *Geo. Rep. 3d Dist. N. Y.*, p. 190, *Catskill Gr.*
solanus, Wood, 1860, *Proc. Acad. Nat. Sci.*, *Coal Meas.* [*Solanus* in text; *solenotus* on plate; *solena* in *Trans. Am. Phil. Soc.*, vol. 13.]
spinulosa, Germ., 1844, *Vers. v. Wettin*, etc., p. 58, *Coal Meas.*
stellata, Lesquereux, 1858, *Geo. Sur. Pa.*, vol. 2, p. 871, *Coal Meas.*
striata, Dawson, 1863, *Can. Nat. and Geol.*, vol. 8, and *Quar. Jour. Geo. Soc.*, vol. 15, p. 147, *Coal Meas.*
sydenensis, Dawson, 1863, *Can. Nat. and*

- Geol., vol. 8, and Acad. Geol., p. 475, Coal Meas.
- tessellata, Steinhaur, 1818, (Phytolithus tessellatus,) Trans. Am. Phil. Assoc., vol. 1, p. 295, and Coal Flora of Pa., p. 481, Coal Meas.
- vanuxemi, Gœppert, 1852, Die fossile Flora des Uebergangsgebirges, p. 546, and Coal Flora of Pa., p. 505, Coal Meas.
- venosa, Brongniart, 1828, Hist. d. Veg. Foss., p. 424, and Coal Flora of Pa., p. 842, Coal Meas.
- voltzi, Brongniart, 1828, Prodr. d. Hist. d. Veg. Foss., p. 65, and Coal Flora of Pa., p. 492, Coal Meas.
- williamsi, Lesquereux, 1880, Coal Flora of Pa., p. 488, Coal Meas.
- yardleyi, Lesquereux, 1858, Catal. Potts. Foss., p. 17, and Coal Flora of Pa., p. 491, Coal Meas.
- SIGILLARIOIDES, Lesquereux, 1870, Geo. Sur. Ill., vol. 4, p. 449. [Ety. from its resemblance to the genus *Sigillaria*.] Fragments of roots bearing stigmarioid leaves attached to sigillarioid rhomboidal scars. Type *S. radicans*.
- radicans, Lesquereux, 1870, Geo. Sur. Ill., vol. 4, p. 449, Coal Meas.
- stellaris, see *Stigmaria stellaris*.
- SIGILLARIOSTROBUS, Lesquereux, 1884, Coal Flora of Pa., p. 794. [Ety. the genus, *Sigillaria*; *strobos*, cone.] Sporangies attached in horizontal rows to a vertical axis, supported by persistent sporangio-phores, with lanceolate scales, turned up and imbricate. Type *S. laurencianus*.
- laurencianus, Lesquereux, 1884, Coal Flora of Pa., p. 794, Coal Meas.
- Solenoula*, Wood, 1860, Proc. Acad. Nat. Sci., vol. 12, p. 238. [Ety. *solen*, a channel; *ou'os*, entire.] Probably a decorticated *Syringodendron*. Type *S. psilophleus*.
- psilophleus*, Wood, 1860, Proc. Acad. Nat. Sci., p. 238, Coal Meas.
- SOROCLADUS, Lesquereux, 1880, Coal Flora of Pa., p. 327. [Ety. *soros*, a heap: one of the fruit dots on the back of the frond; *klado*, I break in pieces.] A name proposed for fruiting fragments not well understood. Type *S. stellatus*.

FIG. 72.—*Sorocladus asteroides*.

- asteroides, Lesquereux, 1870, (Staphylopteris asteroides,) Geo. Sur. Ill., vol. 4, p. 406, Coal Meas.

- ophioglossoides, Lesquereux, 1880, Coal Flora of Pa., p. 329, Coal Meas.
- sagittatus, Lesquereux, 1870, (Staphylopteris sagittatus,) Geo. Sur. Ill., vol. 4, p. 407, Coal Meas.
- stellatus, Lesquereux, 1860, (Staphylopteris stellata,) Geo. Sur. Ark., vol. 2, p. 309, Coal Meas.
- wortheni, Lesquereux, 1870, (Staphylopteris wortheni,) Geo. Sur. Ill., vol. 4, p. 405, Coal Meas.

- SPHENOPHYLLUM, Brongniart, 1828, Prodr. d. Hist. Veg. Foss., p. 68. [Ety. *sphen*, a wedge; *phyllon*, a leaf.] It was called *Sphenophyllites* by Brongniart in 1822. Plant herbaceous; stems articulate, inflated at the articulations, pinnately, bipinnately divided; leaves verticillate, sessile, wedge-form, with lateral borders entire, crenulate, dentate, or lacinate-lobate at the upper margin; medial nerve none; veins straight dichotomous; fructifications in cylindrical spikes, with bracts curved upward in a sharp flexure from near the base; sporanges globular in the axils of the bracts. Type *S. schlotheimi*.
- angustifolium, Germar, 1844, Verst. d. Steink. v. Wett., u. Löbejün, and Coal Flora of Pa., p. 726, Coal Meas.
- antiquum, Dawson, 1861, Can. Nat., vol. 6, p. 170, Devonian.
- bifurcatum, Lesquereux, 1860, Geo. Sur. Ark., vol. 2, p. 309, Coal Meas.
- brevifolium, Newberry, not defined.
- cornutum, Lesquereux, 1870, Geo. Sur. Ill., vol. 4, p. 421, Coal Meas.
- densifolium, Fontaine & White, 1880, Perm. or Up. Carb. Flora, p. 37, Coal Meas. or Permian. Syn. (?) for *S. angustifolium*.
- emarginatum, Brongniart, 1828, Prodr. d. Hist. Veg. Foss., p. 68, and Coal Flora of Pa., p. 53, Coal Meas.
- erosum, Lindley & Hutton, 1833, Foss. Flora, vol. 1, p. 43, and Coal Flora of Pa., p. 55, Coal Meas.
- filiculme, Lesquereux, 1858, Geo. Rep. Pa., vol. 2, p. 853, Coal Meas.
- fontainianum, S. A. Miller, 1883, 2d. Ed. Am. Pal. Foss., p. 258, Up. Coal Meas. Proposed instead of *S. latifolium*, in Perm. or Up. Carb. Flora, p. 36, which was preoccupied.
- latifolium, Wood, 1866, Trans. Am. Phil. Soc., vol. 13, p. 347, Coal Meas.
- latifolium, Fontaine & White, 1880. The name was preoccupied. See *S. fontainianum*.
- longifolium, Germar, 1831, (Rotularia longifolia,) Isis, p. 426, and Coal Flora of Pa., p. 53, Coal Meas.
- oblongifolium, Germar, 1844, Verst. d. Steink. v. Wett., u. Löbejün, p. 12, and Coal Flora of Pa., p. 57, Coal Meas.
- primævum, Lesquereux, 1877, Proc. Am. Phil. Soc., p. 167, Hud. Riv. Gr. I think this is not a plant.

saxifragifolium, Sternberg, 1825, (Rotularia saxifragifolia,) Vers. Darst. Flora der Vorwelt, and Coal Flora of Pa., p. 726, Coal Meas.



FIG. 73.
Sphenophyllum
schlothheimi.

Sphenopteris, Brongniart, 1822, Mem. du Mus. d'Hist. Nat. de Paris, tom. 8, p. 203. [Ety. *sphen*, wedge; *pteris*, fern.]

Fronde bi, tri, polypinnate; divisions open or in right angles; pinnules narrowed at base, often decurring or cuneiform, pinnately lobed; lobes rarely entire, crenulate, dentate, or lacinate; primary nerve slender, alternately dichotomous, simple, branches entering the base of each lobe to pass by branchlets into the subdivisions of the lamina. Type *S. elegans*.

abbreviata, see *Pseudoptopteris abbreviata*.

acrocarpa, Fontaine & White, 1880, Perm. or Up. Carb. Flora, p. 40, Coal Meas. or Permian.

acuta, See *Pseudoptopteris acuta*.

adiantoides, Lindley & Hutton, 1835, Foss. Flora, vol. 2, p. 91, Coal Meas.

alata, Brongniart, 1828, (*Pecopteris alata*,) Hist. d. Veg. Foss., p. 361, Coal Meas.

alabamensis, see *Oligocarpia alabamensis*.

artemesiifolia see *Eremopteris artemesiifolia*.

auriculata, Fontaine & White, 1880, Perm. or Up. Carb. Flora, p. 42, Coal Meas. or Permian.

ballantini, Andrews, 1875, (*Hymenophyllites ballantini*,) Ohio Pal., vol. 2, p. 422, Coal Meas.

brittsi, Lesquereux, 1880, Coal Flora of Pa., p. 277, Coal Meas.

canadensis, Dawson, 1863, Can. Nat. and Geol., vol. 8, and Acad. Geol. p. 243, Coal Meas.

charophylloides, Brongniart, 1828, (*Pecopteris charophylloides*,) Hist. d. Veg. Foss., p. 357, and Coal Flora of Pa., p. 270, Coal Meas.

communis, Lesquereux, 1884, Coal Flora of Pa., p. 762, Coal Meas.

coriacea, Fontaine & White, 1880, Perm. or Up. Carb. Flora, p. 41, Coal Meas. or Permian.

crenata, Lindley & Hutton, 1835, Foss. Flora, vol. 2, pl. C., and Coal Flora of Pa., p. 835, Coal Meas.

cristata, Brongniart, 1828, (*Pecopteris cristata*,) Hist. d. Veg. Foss., p. 356,

and Coal Flora of Pa., p. 273, Coal Meas.

davallana, Gœppert, 1841, Gatt. d. Foss. Pflanzen, Coal Meas.

decipiens, see *Pseudoptopteris decipiens*.
delicatula, see *Hymenophyllites delicatulus*.

dentata, Fontaine & White, 1880, Perm. or Up. Carb. Flora, p. 42, Coal Meas. or Permian.

dilatata, as identified by Lesquereux. Syn. for *Pseudoptopteris decipiens*.

disssecta, Brongniart, 1828, Hist. d. Veg. Foss., p. 183, and Coal Flora of Pa., p. 836, Coal Meas.

divaricata, Gœppert, 1836, (*Cheilanthes divaricatus*,) Syst. Filic. Foss., p. 238, and Coal Flora of Pa., p. 767, Coal Meas.

dubuissoni, Brongniart, 1828, Hist. d. Veg. Foss., p. 195, and Coal Flora of Pa., p. 275, Coal Meas.

elegans, Brongniart, 1822, Class. d. Veg. Foss. pl. 2, fig. 2, and Coal Flora of Pa., p. 287, Coal Meas.

fascicularis, Roemer, 1866, Beitr. in Palæont., vol. 9, p. 179, and Coal Flora of Pa., p. 837, Coal Meas.

flaccida, Crepin, 1874, Bull. Acad. Roy. of Belgium, p. 7, and Coal Flora of Pa., p. 291, Coal Meas.



FIG. 74.—Sphenopteris crenata.

flagellaris, see *Oligocarpia flagellaris*.

flexicaulis, Lesquereux, 1860, (*Hymenophyllites flexicaulis*,) Geo. Sur. Ark., vol. 2, p. 309, Coal Meas.

foliosa, Fontaine & White, 1880, Perm. or Up. Carb. Flora, p. 44, Coal Meas. or Permian.

inciformis, Lesquereux, 1884, Am. Naturalist, vol. 18, p. 921, Carboniferous.

fureata, Brongniart, 1828, Hist. d. Veg. Foss., p. 179, and Coal Flora of Pa., p. 282, Coal Meas.

gersdorffii, see *Hymenophyllites gersdorffii*.
glandulosa, see *Pseudoptopteris glandulosa*.

goniopteroides, Lesquereux, 1880, Coal Flora of Pa., p. 269, Coal Meas.

gracilis, Brongniart, 1828, Hist. d. Veg. Foss., p. 197, and Coal Flora of Pa., p. 276, Coal Meas.

gravenhorsti, Brongniart, 1828, Hist. Veg. d. Foss., p. 191, and Coal Flora of Pa., p. 274, Coal Meas.

- hartti, Dawson, 1862, Quar. Jour. Geol. Soc., vol. 18, p. 321, Devonian.
- harveyi, Lesquereux, 1884, Coal Flora of Pa., p. 766, Coal Meas.
- hastata, Fontaine & White, 1880, Perm. or Up. Carb. Flora, p. 46, Coal Meas. or Permian.
- hildrethi, Lesquereux, 1858, (Hymenophyllites hildrethi,) Geo. Sur. of Pa., vol. 2, p. 863, Coal Meas.
- hitchcockiana, Dawson, 1862, Quar. Jour. Geol. Soc., vol. 18, p. 321, Devonian.
- hœninghausi, Brongniart, 1828, Hist. Veg. d. Foss., p. 199, and Coal Flora of Pa., p. 288, Coal Meas.
- hymenophylloides, Brongniart, 1828, Prodr. d. Hist. d. Veg. Foss., p. 51, and Coal Flora of Pa., p. 764, Coal Meas.
- inæquilateralis, Lesquereux, 1884, Coal Flora of Pa., p. 765, Coal Meas.
- intermedia, Lesquereux, 1858, Geo. Sur. Pa., vol. 2. The name was preoccupied in 1852 by Ettingshausen. It is now *S. mediana*.
- irregularis, see *Pseudopecopteris irregularis*.
- larischii, Stur, 1877, (Calymmotheca larischii,) Culin Flora, p. 168, and Coal Flora of Pa., p. 288, Coal Meas.
- latifolia, see *Pseudopecopteris latifolia*.
- latori, Dawson, 1863, Can. Nat., vol. 8, and Acad. Geol., p. 483, Coal Meas.
- laxa, Hall, 1843, Geo. Rep. 4th Dist. N. Y., Chemung Gr. This name was preoccupied by Sternberg. See *Archæopteris hallana*.
- lescuriana, Fontaine & White, 1880, Perm. or Up. Carb. Flora, p. 44, Coal Meas. or Permian.
- lesquereuxi, Newberry, 1858, Geo. Sur. Pa., vol. 2, p. 862, Coal Meas.
- linearis, Sternberg, 1820, Vers. Darst. Flor. d. Vorw., p. 15, Low. Coal Meas.
- lyratifolia, see *Pecopteris lyratifolia*.
- macilenta, see *Pseudopecopteris macilenta*.
- marginata, Dawson, 1862, Quar. Jour. Geol. Soc., vol. 18, p. 321, Devonian.
- mediana, Lesquereux, 1880, Coal Flora of Pa., p. 271, Coal Meas.
- microcarpa, Lesquereux, 1880, Coal Flora of Pa., p. 280, Coal Meas.
- microloba, Gœppert, 1836, Syst. Filic. Foss., p. 238, Coal Meas.
- minutisecta, Fontaine & White, 1880, Perm. or Up. Carb. Flora, p. 43, Coal Meas. or Permian.
- mixta, Schimper, 1869, Traité de Paléontologie Végétale, p. 382, and Coal Flora of Pa., p. 276, Coal Meas.
- munda, Dawson, 1863, Can. Nat. and Geo., vol. 8, and Acad. Geol., p. 483, Coal Meas.
- myriophylla, see *Hymenophyllites myriophyllus*.
- newberryi, see *Pseudopecopteris newberryi*.
- obovata, Lindley & Hutton, 1835, Foss. Flora, vol. 2, p. 75, and Coal Flora of Pa., p. 769, Coal Meas.
- obtusiloba, see *Pseudopecopteris obtusiloba*.
- pachynervis, Fontaine & White, 1880, Perm. or Up. Carb. Flora, p. 46, Coal Meas. or Permian.
- paupercula, Lesquereux, 1866, Geo. Sur. Ill., vol. 2, p. 435, Coal Meas.
- pilosa, see *Callipteris pilosa*.
- plicata, Lesquereux, 1858, Geo. Sur. Pa., vol. 2, p. 862, Coal Meas.
- polyphylla, see *Pseudopecopteris polyphylla*.
- pseudomurrayana, Lesquereux, 1880, Coal Flora of Pa., p. 271, Coal Meas.
- pterota, Wood, 1866, Trans. Am. Phil. Soc., vol. 13, p. 348, Coal Meas.
- quercifolia, Gœppert, 1836, Syst. Filic. Foss., p. 252, and Coal Flora of Pa., p. 286, Coal Meas.
- recurva, Dawson, 1863, Quar. Jour. Geol. Soc., vol. 19, p. 464, Devonian.
- rigida, Brongniart, 1828, Hist. Veg. Foss., p. 201, Coal Meas.
- royi, Lesquereux, 1884, Coal Flora of Pa., p. 768, Coal Meas.
- scaberrima, Lesquereux, 1870, Geo. Sur. Ill., vol. 4, p. 408, Coal Meas.
- schlotheimi, see *Hymenophyllites schlotheimi*.
- solida, Lesquereux, 1884, Coal Flora of Pa., p. 769, Coal Meas.
- spinosa, Gœppert, 1841, Gatt. Foss. Pflanzen, p. 70, and Coal Flora of Pa., p. 281, Coal Meas.
- splendens, Dawson, 1871, Foss. Plants Canada, p. 53, Devonian.
- splendens, Lesquereux, 1870, (Hymenophyllites splendens,) Geo. Sur. Ill., vol. 4, p. 413, Coal Meas.
- squamosa, Lesquereux, 1858, Geo. Sur. Pa., vol. 2, p. 862, Coal Meas.
- subalata, Weiss, 1869, Foss. Flora d. jungst. Steink. form., p. 57, and Coal Flora of Pa., p. 272, Coal Meas.
- tenella, Brongniart, 1828, Hist. Veg. Foss., p. 186, and Coal Flora of Pa., p. 836, Coal Meas.
- tenuifolia, see *Hymenophyllites tenuifolius*.
- tracyana, Lesquereux, 1884, Coal Flora of Pa., p. 766, Coal Meas.
- trichomanoides, Brongniart, 1828, Hist. d. Veg. Foss., p. 182, and Coal Flora of Pa., p. 286, Coal Meas.
- tridactylites, Brongniart, 1828, Hist. d. Veg. Foss. p. 181, and Coal Flora of Pa., p. 284, Coal Meas.
- trifoliata, see *Pseudopecopteris trifoliata*.
- SPHENOTHALLUS, Hall, 1847, Pal. N. Y., vol. 1, p. 261. [Ety. *sphen*, a wedge; *thallos*, a branch or frond.] Stem with diverging wedge-formed leaves, thickened, and sometimes subcoriaceous. Type *S. angustifolius*.

angustifolius, Hall, 1847, Pal. N. Y., vol. 1, p. 261, Hud. Riv. Gr.



FIG. 75.—*Sphenothallus angustifolius*.

latifolius, Hall, 1847, Pal. N. Y., vol. 1, p. 262, Hud. Riv. Gr.

SPIRANGIUM, Schimper, 1874, *Traité de Paléontologie Végétale*, vol. 2, p. 514. [Ety. *speira*, that which is twisted; from the coiled marking around the pod.] Oblong or spindle-shaped bodies formed of narrow linear leaves, interwoven or twisted in spiral, with the ends united into a pedicel, which joins them horizontally or in umbels. Type *S. carbonarium*.

appendiculatum, Lesquereux, 1870, (Palæoxyris *appendiculata*.) *Geo. Sur. Ill.*, vol. 4, p. 465, Coal Meas.

corrugatum, Lesquereux, 1870, (Palæoxyris *corrugata*.) *Geo. Sur. Ill.*, vol. 4, p. 466, Coal Meas.

intermedium, Lesquereux, 1880, Coal Flora of Pa., p. 521, Coal Meas.

multiplicatum, Lesquereux, 1880, Coal Flora of Pa., p. 520, Coal Meas.

prendeli, Lesquereux, 1870, *Geo. Sur. Ill.*, vol. 4, p. 464, Coal Meas.

Spirophyton, Hall, 1863, 16th Rep. N. Y. St. Mus. Nat. Hist. p. 78. [Ety. *speira*, a coil; *phyton*, a plant.] Syn. for *Taonurus*.

cauda-galli, see *Taonurus caudagalli*.

crassum, see *Taonurus crassus*.

typus, see *Taonurus typus*.

velum, see *Taonurus velum*.

SPORANGITES, Dawson, 1863, *Can. Nat. and Geol.*, vol. 8, and *Proc. Geol. Soc. Lond.*, vol. 15, p. 164. [Sig. seed-vessel.]

Spores and spore-cases of *Lepidodendron*, *Calamites*, and similar plants, which can not be otherwise referred. Type *S. papillatus*.

acuminatus, Dawson, 1861, (*Annularia acuminata*.) *Can. Nat.*, vol. 6, and *Acad. Geol.*, p. 540, Portage Gr.

bilobatus, Dawson, 1863, *Proc. Am. Ass. Ad. Sci.*, vol. 32, p. 260, Marcellus Shale.

glaber, Dawson, 1863, *Can. Nat.*, vol. 8, and *Acad. Geol.*, p. 491, Coal Meas.

huronensis, Dawson, 1871, *Am. Jour. Sci. and Arts*, p. 257, Ham. Gr.

papillatus, Dawson, 1863, *Can. Nat.*, vol. 8, and *Acad. Geol.*, p. 491, Coal Meas.

SPOROCYSTIS, Lesquereux, 1880, *Coal Flora of Pa.*, p. 458. [Ety. *sporos*, seed; *kustis*, bladder.] Agglomerations of macrospores grouped together or cohering or agglutinate by the borders, more generally without cases, and therefore of uncertain reference. Type *S. planus*.



FIG. 76.
Sporangites
papillatus.

planus, Lesquereux, 1880, *Coal Flora of Pa.*, p. 458, Coal Meas.

Staphylopteris, 1838, Presl, in *Sternb. Vers. Darst. Flora der Vorwelt*. [Ety. *staphyle*, bunch of grapes; *pteris*, fern.] Not an American palæozoic genus.

asteroides, see *Sorocladus asteroides*.

sagittata, see *Sorocladus sagittatus*.

stellata, see *Sorocladus stellatus*.

wortheni, see *Sorocladus wortheni*.

STEMMATOPTERIS, Corda, 1845, *Beiträge zur Flora der Vorwelt*, p. 76. [Ety. *stematatos*, a wreath; *pteris*, fern.] Trunks erect, cylindrical; scars large, disciform, oval, round, or ovate, not contiguous, disposed in quincuncial or spiral order; outside borders or rings flat; internal disk formed by impressions of fascicles of vascular tissues, shaped like a horse-shoe, the horns curving inward in the upper part of the scars, either short and hooked, or descending below the middle of the scars, and there united. Type *S. peltigera*.

anceps, Lesquereux, 1884, *Coal Flora of Pa.*, p. 838, Coal Meas.

angustata, Lesquereux, 1880, *Coal Flora of Pa.*, p. 339, Coal Meas.

cyelostigma, Lesquereux, 1880, *Coal Flora of Pa.*, p. 341, Coal Meas.

emarginata, Lesquereux, 1880, *Coal Flora of Pa.*, p. 337, Coal Meas.

gigantea, Lesquereux, 1858, (*Caulopteris gigantea*.) *Geo. of Pa.*, vol. 2, p. 869, Coal Meas.

hirsuta, Lesquereux, 1880, *Coal Flora of Pa.*, p. 337, Coal Meas.

insignis, Lesquereux, 1870, (*Caulopteris insignis*.) *Geo. Sur. Ill.*, vol. 4, p. 459, Coal Meas.

microstigma, Lesquereux, 1884, *Coal Flora of Pa.*, p. 838, Coal Meas.

mimica, Lesquereux, 1880, *Coal Flora of Pa.*, p. 341, Coal Meas.

polita, Lesquereux, 1880, *Coal Flora of Pa.*, p. 342, Coal Meas.

punctata, Lesquereux, 1858,



FIG. 77.—*Stematopteris mimica*, leaf scar.

quercuformis, Dawson, 1863, *Can. Nat.*, vol. 8, and *Acad. Geol.*, p. 491, Coal Meas.

schimperii, Lesquereux, 1880, *Coal Flora of Pa.*, p. 338, Coal Meas.

squamosa, Lesquereux, 1880, Coal Flora of Pa., p. 339, Coal Meas.
 wortheni, Lesquereux, 1866, (Caulopteris wortheni,) Geo. Sur. Ill., vol. 2, p. 459, Coal Meas.

STERNBERGIA, Artis, 1825, Antediluvian Phytology, p. 8. [Ety. proper name.] The piths of Dadoxylon, Sigillaria, and other plants usually preserved as casts in sandstone, retaining more or less perfectly the transverse partitions into which the pith cylinders were divided in the process of growth. Type *S. transversa*.

transversa, Steinhaur, 1818, (Phytolithus transversus,) Trans. Am. Phil. Ass'n., vol. 1, p. 295, Coal Meas.
 var. angularis, Dawson, 1865, Quar. Jour. Geo. Soc., vol. 22, p. 165, Coal Meas.

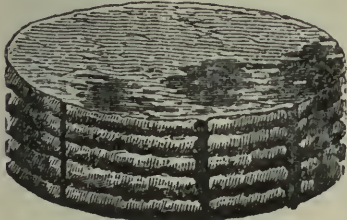


FIG. 78.—*Sternbergia angularis*, pith of Dadoxylon.

var. *approximata*, Dawson, 1865, Quar. Jour. Geo. Soc., vol. 22, p. 165, Coal Meas.

var. *distans*, Dawson, 1865, Quar. Jour. Geo. Soc., vol. 22, p. 165, Coal Meas.

var. *obscura*, Dawson, 1865, Quar. Jour. Geo. Soc., vol. 22, p. 165, Coal Meas.

STIGMARIA, Brongniart, 1822, Class. d. Veg. Foss. in Mem. du. Mus. d'Hist. Nat. d. Paris, tom. 8, p. 203. [Ety. *stigma*, a dot or puncture.] Floating stems or roots, generally growing horizontally, distantly dichotomous; branches long, scarcely variable in size in their whole length, subcylindrical or compressed; pith, a woody cylinder, often eccentric, composed of fascicles of vessels disposed star-like; leaves long, tubulose, linear when flattened, leaving after disruption, on the surface of the stems, round scars composed of two concentric rings, with a central umbonate mammilla, pitted in the middle by a punctiform vascular scar. Type *S. ficoides*.

amena, Lesquereux, 1880, Coal Flora of Pa., p. 516, Coal Meas.

anabathra, Corda, 1845, Beiträge zur Flora der Vorwelt, p. 34, Coal Meas.

areolata, Dawson, 1871, Foss. Plants Canada, p. 23, Devonian.

costata, Lesquereux, 1858, Geo. Sur. Pa., vol. 2, p. 870, Coal Meas.

elliptica, Lesquereux, 1870, Geo. Sur. Ill., vol. 4, p. 451, Coal Meas.

eveni, see *Stigmarioides eveni*.

exigua, Dawson, 1862, Quar. Jour. Geo. Soc., vol. 18, p. 308, Chemung Gr.

ficoides, Brogniart, 1822, Mem. du. Mus. d'Hist. Nat. de Paris, tom. 8, p. 203, Coal Meas.

ficoides var. a, b, c, d, e, f, g, h, i, k, l, Dawson, 1865, Quar. Jour. Geo. Soc., vol. 22, p. 148, Coal Meas.

ficoides var. *reticulata*, Gœppert, 1841, Gatt. d. Foss. Pflanzen, p. 13, Coal Meas.

ficoides var. *stellata*, Gœppert, 1841, Gatt. d. Foss. Pflanzen, p. 13, Coal Meas.

ficoides var. *undulata*, Gœppert, 1841, Gatt. d. Foss. Pflanzen, p. 13, Coal Meas.

irregularis, Lesquereux, 1858, Geo. Sur. Pa., vol. 2, p. 870, Coal Meas. [Ety. from the irregularity of the scars.]

minor, Gœppert, 1841, Gatt. d. Foss. Pflanzen, p. 13, Coal Meas.

minuta, Lesquereux, 1858, Geo. Sur. Pa., vol. 2, p. 871, Coal Meas.

minutissima, Dawson, 1871, Foss. Plants Canada, p. 23, Devonian.

perlata, Dawson, 1871, Foss. Plants Canada, page 22, Devonian.

pusilla, Dawson, 1863, Quar. Jour. Geo. Soc., vol. 19, p. 460, Devonian.

radicans, Lesquereux, 1858, Geo. Sur. Pa., vol. 2, p. 870, Coal Meas.

stellaris, Lesquereux, 1870, (Sigillarioides stellaris,) Geo. Sur. Ill., vol. 4, p. 450, Coal Meas.

umbonata, Lesquereux, 1858, Geo. Sur. Pa., vol. 2, p. 870, Coal Meas.

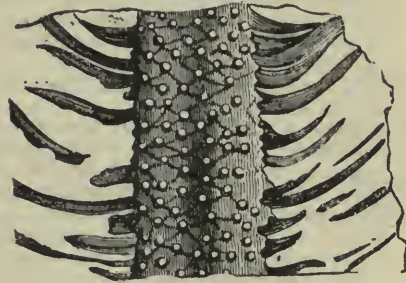


FIG. 79.—*Stigmaria ficoides*, $\frac{1}{4}$ diam.

STIGMARIOIDES, Lesquereux, 1870, Geo. Sur. Ill., vol. 4, p. 452. [Ety. from its resemblance to *Stigmaria*.] Fragments of rhizomas, with surface marked by small round impressions, irregularly disposed and without central vascular points, base of detached radicles or filaments. Type *S. eveni*.

affinis, see *Rachiopteris affinis*.

eveni, Lesquereux, 1866, (Stigmaria eveni,) Geo. Sur. Ill., vol. 4, p. 448, Coal Meas.

linearis, Lesquereux, 1870, Geo. Sur. Ill., vol. 4, p. 455, Coal Meas.

rugosus, Lesquereux, 1870, Geo. Sur. Ill., vol. 4, p. 470, Coal Meas.

selago see *Rachiopteris selago*.

- truncatus, Lesquereux, 1870, Geo. Sur. Ill., vol. 4, p. 453, Coal Meas.
- tuberosus, Lesquereux, 1870, Geo. Sur. Ill., vol. 4, p. 453, Coal Meas.
- villosus, Lesquereux, 1870, Geo. Sur. Ill., vol. 4, p. 454, Coal Meas.
- Strobilus caryophyllus*, Hildreth, 1837, Am. Jour. Sci. and Arts, vol. 31, p. 32, Coal Meas. Possibly a *Stigmaria*.
- SYRINGODENDRON, Sternberg, 1820, Essai d'un exposé Geognostico-botanique de la Flore du monde primitif, 1st Cahier, p. 26. [Ety. *syrix*, a pipe; *dendron* tree.] Cortex costate; vascular scars united in one; resembles decorticated stems of *Sigillaria*. Type *S. pes capreoli*.
- bistriatum, Wood, 1860, Proc. Acad. Nat. Sci., vol. 12, p. 521, Coal Meas.
- brongniarti, Geinitz, 1855, (*Sigillaria brongniarti*,) Verst. d. Steink. form. in Sachsen, p. 47, and Coal Flora of Pa., p. 504, Coal Meas.
- cyclostigma, Brongniart, 1828, Hist. d. Veg. Foss., p. 480, and Coal Flora of Pa., p. 505, Coal Meas.
- gracile, Dawson, 1862, Quar. Jour. Geo. Soc., vol. 18, p. 308, Waverly Gr.
- kirtlandium, Hildreth, 1837, Am. Jour. Sci. & Arts, vol. 31, p. 29, Coal Meas.
- magnificum, Wood, 1866, Trans. Am. Phil. Soc., vol. 13, p. 352, Coal Meas.
- organum*, see *Sigillaria organum*.
- pachyderma, Brongniart, 1828, (*Sigillaria pachyderma*,) Prodr. d. Hist. d. Veg. Foss., p. 65, and Coal Flora of Pa., p. 503, Coal Meas.
- pescapreoli, Sternberg, 1820, Essai d'un exposé Geognostico-botanique de la Flore du monde primitif, 1st Cahier, p. 26, Coal Meas.
- porteri, Lesquereux, 1870, Geo. Sur. Ill., vol. 4, p. 448, Coal Meas.
- SYRINGOXYLON, Dawson, 1862, Quar. Jour. Geo. Soc., vol. 18, p. 305. [Ety. *syrix*, a pipe; *xylon*, wood.] Woody tissue close, thick-walled; ducts many times the diameter of the wood-cells, thin walled, with transverse pores in several series; medullary rays of two or more series of muriform cells; growth rings, distinct. Type *S. mirabile*.
- mirabile, Dawson, 1862, Quar. Jour. Geo. Soc., vol. 18, p. 305, Ham. Gr.
- TENIOPHYLLUM, Lesquereux, 1878, Proc. Am. Phil. Soc., p. 330. [Ety. *tainia*, ribbon; *phyllon*, leaf.] Stems large, leaves crowded, fistular, flat by compression, thick, exactly linear, decurring at the base; surface smooth, opaque, or shining. Type *T. decurrens*.
- brevifolium, Lesquereux, 1880, Coal Flora of Pa., p. 788, Coal Meas.
- contextum, Lesquereux, 1878, Proc. Am. Phil. Soc., p. 332, Coal Meas.
- decurrens, Lesquereux, 1878, Proc. Am. Phil. Soc., p. 331, and Coal Flora of Pa., p. 464, Coal Meas.
- deflexum, Lesquereux, 1878, Proc. Am. Phil. Soc., p. 331, Coal Meas.
- TENIOPTERIS, Brongniart, 128, Prodr. Hist. d. Veg. Foss., p. 61. [Ety. *tainia*, ribbon; *pteris*, fern.] Fronds simple, large, linear; medial nerve canaliculate, strong; veins open, or in right angle, thin, forking a little above the base or more generally simple, parallel, sometimes joined to a marginal nerve. Type *T. vittata*.
- lescuriana, Fontaine & White, 1880, Perm. or Up. Carb. Flora, p. 91, Coal Meas. or Permian.
- newberryana, Fontaine & White, 1880, Perm. or Up. Carb. Flora, p. 91, Coal Meas. or Permian.
- smithi, Lesquereux, 1875, Geo. Rep. Ala., p. 78, and Coal Flora of Pa., p. 153, Coal Meas.

FIG. 80.—*Teniopteris smithi*.

truncata, Lesquereux, 1884, Coal Flora of Pa., p. 743, Coal Meas.

- TAONURUS, Fisher-Ooster, 1858, Foss. Fucoïden d. Schweizer Alpen, p. 41. [Ety. *taon*, peacock; *oura*, tail.] Frond membranaceous, derived from utricles attached to a lateral or central axis, erected or twisted in spiral, flattened in various ways, ribbed; ribs or striæ curved, scythe-shaped, converging to the borders, which are either free, naked or attached on one side or all around to the axis or its branches. Type *T. caudagalli*.

FIG. 81.—*Taonurus caudagalli*.

archimedes, Ringueberg, 1884, (*Spirophyton archimedes*,) Proc. Acad. Nat. Sci. Phil., p. 144, Medina Gr.

caudagalli, Vanuxem, 1842, (*Fucoïdes*

- caudagalli,) Geo. Rep. 3d Dist. N. Y., p. 128, Devonian.
- colletti, Lesquereux, 1870, (Chondrites colletti,) Geo. Sur. Ill., vol. 4, p. 379, Coal Meas.
- crassus, Hall, 1863, (Spirophyton crassum,) 16 Rep. N. Y. St. Mus. Nat. Hist., p. 83, Waverly Gr.
- marginatus, Lesquereux, 1866, (Cauler-pites marginatus,) Trans. Am. Phil. Soc., vol. 13, p. 314, Subcarb.
- retortus, Vanuxem, 1842, (Retort fucoid,) Geo. Rep. 3d Dist., N. Y., p. 176, Portage Gr.
- typus, Hall, 1863, (Spirophyton typus,) 16 Rep. N. Y. St. Mus. Nat. Hist., p. 80, Ham. or Chemung Gr.
- velum, Vanuxem, 1842, (Fucoides velum,) Geo. Rep. 3d Dist. N. Y., p. 176, Ham. Gr.
- TRICHOMANITES, Gœppert, 1836, Syst. Filic. Foss. [Ety. from the plant *Trichomanes*.] This genus is only known in America by fragments of slender pinules attached to long petioles, which are of doubtful generic affinity.
- flicula, Dawson, 1863, Quar. Jour. Geo. Soc., vol. 19, p. 464, Devonian.
- TRICHOPHYCUS, Miller & Dyer, 1878, Jour. Cin. Soc. Nat. Hist., vol. 1, p. 24. [Ety. *trichos*, hair; *phukos*, sea-weed.] Simple branching stems having markings as if by the folding down of filaments. Type *T. lanosum*.
- lanosum, Miller & Dyer, 1878, Jour. Cin. Soc. Nat. Hist., vol. 1, p. 24, Hud. Riv. Gr.
- sulcatum, Miller & Dyer, 1878, Cont. to Pal., No. 2, p. 4, Hud. Riv. Gr.
- venosum, S. A. Miller, 1879, Jour. Cin. Soc. Nat. Hist., vol. 2, p. 112, Hud. Riv. Gr.
- TRIGONOCARPUM, Brongniart, 1828, Prodr. d. Hist. Veg. Foss., p. 137. [Ety. *trigon*, triangle; *karpos*, fruit.] Fruits ovoid, compressed at the base point of insertion, three or six costate, the ribs more distinct and prominent toward the base, sometimes disappearing above; apex pitted by a small, round or triquetre mammillate cavity. Type *T. parkinsoni*.
- adamsi, Lesquereux, 1884, Coal Flora of Pa., p. 820, Coal Meas.
- ampulliforme, Lesquereux, 1884, Coal Flora of Pa., p. 823, Coal Meas.
- avellanum, Dawson, 1863, Can. Nat. and Geo., vol. 8, and Acad. Geol., p. 478, Coal Meas.
- bertholletiforme, Foster, 1853, Ann. of of Sci., vol. 1, and Ohio Pal., vol. 1, p. 369, Coal Meas.
- carbonarium, King, 1854, Proc. Acad. Nat. Sci., vol. 7., p. 66, Coal Meas.
- dawsi, Lindley & Hutton, 1837, Foss. Flora, vol. 3, p. 321, and Coal Flora of Pa., p. 586, Coal Meas.



FIG. 82.—Trichophycus lanosum.

- giffordi, Lesquereux, 1880, Coal Flora of Pa., p. 592, Coal Meas.
- grande, Lesquereux, 1884, Coal Flora of Pa., p. 821, Coal Meas.
- hildrethi, Lesquereux, 1858, Geo. Sur. Pa., vol. 2, p. 877, Coal Meas.
- hildrethi, Dawson, syn. (?) for *Trigonocarpum triloculare*.
- hookeri, Dawson, 1861, Quar. Jour. Geol. Soc., vol. 17, p. 525, Coal Meas.
- intermedium, Dawson, 1863, Can. Nat. vol. 8, and Acad. Geol., p. 478, Coal Meas.
- juglans, Lesquereux, 1866, Geo. Sur. Ill., vol. 2, p. 460, Low. Coal Meas.
- kansaseanum, Lesquereux, 1884, Coal Flora of Pa., p. 822, Coal Meas.
- magnum, Newberry, 1873, Ohio Pal., vol. 1, p. 369, Coal Meas.
- mentzelianum, Gœppert & Berger, 1848, De Fruct. et. Sem., p. 19, and Coal Flora of Pa., p. 590, Coal Meas.
- minus, Dawson, 1863, Can. Nat. and Geol., vol. 8, and Acad. Geol., p. 478, Coal Meas.
- multicarinarum, Newberry, 1873, Ohio Pal., vol. 1, p. 478, Carb. Conglomerate.
- multistriatum, Lesquereux, 1884, Coal Flora of Pa., p. 823, Coal Meas.
- nœggerathi, Sternberg, 1820, (Palmacites nœggerathi,) Flor. d. Vorw., p. 55, and Coal Flora of Pa., p. 584, Coal Meas.
- oblongum, Lindley & Hutton, 1837, Foss. Flora, vol. 3, p. 193, Coal Meas.
- oliviforme, Lindley & Hutton, 1837, Foss. Flora, vol. 3, p. 222, and Coal Flora of Pa., p. 590, Coal Meas.
- ornatum, Newberry, 1873, Ohio Pal., vol. 1, p. 368, Carb. Conglomerate.
- parkinsoni, Brongniart, 1828, Prodr. Hist. Veg. Foss., p. 137, and Coal Flora of Pa., p. 589, Coal Meas.
- perantiquum, Dawson, 1871, Foss. Plants Canada, p. 62, Devonian.
- perpusillum, Lesquereux, 1884, Coal Flora of Pa., p. oliviforme. 820, Coal Meas.
- racemosum, Dawson, 1862, Quar. Jour. Geol. Soc., vol. 18, p. 324, Devonian.
- rostellatum, Lesquereux, 1866, Geo. Sur. Ill., vol. 2, p. 460, Up. Coal Meas.
- rotundum, Dawson, 1863, Can. Nat., vol. 8, and Acad. Geol., p. 478, Coal Meas.
- saffordi, Lesquereux, 1880, Coal Flora of Pa., p. 587, Coal Meas.
- schultzanum, Gœppert & Berger, 1848, De Fruct., etc., p. 19, and Coal Flora of Pa., p. 819, Coal Meas.
- sigillariæ, Dawson, 1863, Can. Nat., vol. 8, and Acad. Geol., p. 477, Coal Meas.
- tricuspidatum, Newberry, 1873, Ohio Pal., vol. 1, p. 368, Coal Meas.
- triloculare, Hildreth, 1837, (Carpolithes trilocularis,) Am. Jour. Sci., vol. 31, p. 29, Conglomerate and Low. Coal Meas.



FIG. 83.—Trigonocarpum oliviforme.

woodruffi, Moss, 1852, Proc. Acad. Nat. Sci., vol. 5, Coal Meas.

TRIPHYLLOPTERIS, Schimper, 1874, Traité de Paléontologie Vegetale, vol. 2, p. 40. [Ety. *tria*, three; *phyllon*, a leaf; *pteris*, a fern.] Lower pinnules subopposite, tripartite or trifoliate, upper ones simple, all narrowed or contracted to a flat, slightly decurring pedicel; veins all equal, simple or dichotomous, diverging fan-like. Type *T. lescuriana*.



FIG. 84.—Triphylopteris cheathamii.

because the latter was preoccupied as a generic name in the subkingdom Mollusca; but *Trochophyllum* was preoccupied for a genus of fossil corals by Edwards & Haine, in 1851.

clavatum, see *Annularia clavata*.

lineare, see *Plumularia linearis*.

ULODENDRON, Rhode, 1823, Beitrage z. Pflanz. d. Vorwelt. [Ety. *ule*, wood; *dendron*, tree.] Arborescent; rarely branching; bearing in two opposite rows round or oval scars, im-

pressions of the base of strobiles, marked with concentric scales and a central mamilla; leaves short lanceolate, leaf scars disposed in spiral, small, rhomboidal or subrhomboidal; fructifications in long, cylindrical strobiles. Type *U. majus*.

commutatum, Schimper, 1874, Pal. Veg., vol. 2, p. 40, Coal Meas.

ellipticum, Sternberg, 1838, Vers. Darst. Flora der Vorwelt, vol. 2, p. 186, and Coal Flora of Pa., p. 405, Coal Meas.

cheathamii, Lesquereux, 1884, 13th Rep. Geo. Sur. Ind., p. 70, Coal Meas.

lescuriana, Meek, 1875, (Cyclopteris *lescuriana*.) Bull. Phil. Soc. Wash., p. 16, and Coal Flora of Pa., p. 297, Coal Meas.

Trochophyllum, Wood, 1860, Proc. Acad. Nat. Sci. This name was proposed as a substitute for *Annularia*, Sternb.,



FIG. 85.—Ulodendron elongatum.

elongatum, Lesquereux, 1870, Geo. Sur. Ill., vol. 4, p. 437, Coal Meas.

flexuosum, see *Halonium flexuosa*.

lindleyanum, Presl, 1833, in Sternberg, Vers. Darst. Flora der Vorwelt, p. 185, Coal Meas. *majum*, Rhode, 1823, Beitr. z. Pflanz. d. Vorw., pl. 3, fig. 1, and Coal Flora of Pa., p. 401, Coal Meas.

minus, Lindley & Hutton, 1831, Foss. Flora, vol. 1, p. 6, Coal Meas. *punctatum*, Lindley & Hutton, 1833, (Bothrodendron *punctatum*.) Foss. Flora, vol. 2, p. 80, and Coal Flora of Pa., p. 405, Coal Meas.

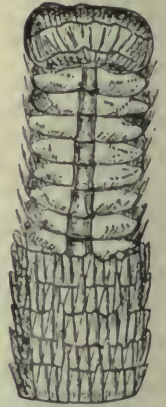


FIG. 86.—Volkmannia fertilis.

VOLKMANNIA, Sternberg, 1823, Tent. Flor. Primord., p. 30.

[Ety. proper name.] Stems striated, articulated, and the inflorescence spiked. Closely related to *Asterophyllites*. Type *V. polystachya*.

crassa, Lesquereux, 1884, Coal Flora of Pa., p. 719, Coal Meas.



FIG. 87.—Walchia pinniforinis.

fertilis, Lesquereux, 1884, Coal Flora of Pa., p. 720, Coal Meas.

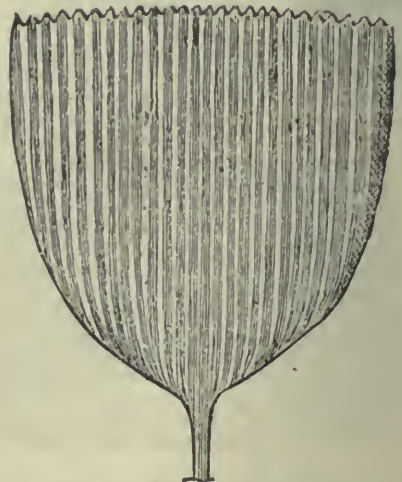


FIG. 88.—Whittleseyia elegans.

praelonga, Lesquereux, 1880, (Calamostachys *praelongus*.) Coal Flora of Pa., p. 59, Coal Meas.

WALCHIA, Sternberg, 1825, Vers. Darst. Flora der Vorwelt, p. 22. [Ety. proper name.] Arborescent, like Araucaria; branches with feathery foliage; strobiles oblong, cylindrical, or elongated, with ovate scales, sharp or lanceolate; seed minute, ovate. Type *W. pinniformis*.

gracilis, Dawson, 1863, (*Araucarites gracilis*), Can. Nat., vol. 8, and Acad. Geol. p. 474, Coal Meas.

robusta, Dawson, 1871, Rep. on Prince Edward Island, p. 43, Coal Meas.

WHITTLESEYA, Newberry, 1874, Proc. Cleveland Acad. Sci., p. 43. [Ety. proper name.] Fronds simple or pinnate, nerves fasciculate, confluent to the base, not dichotomous. Type *W. elegans*.

elegans, Newberry, 1874, Proc. Cleveland Acad. Sci., p. 43, Coal Meas.

integrifolia, Lesquereux, 1880, Coal Flora, of Pa., p. 524, Coal Meas.

microphylla, Lesquereux, 1884, Coal Flora of Pa., p. 843, Coal Meas.

undulata, Lesquereux, 1880, Coal Flora of Pa., p. 525, Coal Meas.

ANIMAL KINGDOM.

THE Animal Kingdom is divided into seven Subkingdoms, viz.: Protozoa or Protista, Cœlenterata, Echinodermata, Molluscoidea, Mollusca, Articulata, and Vertebrata.?

SUBKINGDOM PROTOZOA.

(*protos*, first; *zoon*, animal).

The Palæozoic Protozoa are included in two Classes, viz.: Rhizopoda and Porifera.

CLASS RHIZOPODA (*riza*, root; *pous*, foot).

The Rhizopoda are the simplest and lowest forms of animal life. They are generally microscopic, though some of them are more or less conspicuous to the naked eye. They abound in fresh-water ponds, where each consists of a shapeless mass, constantly changing its form, and shooting out and withdrawing finger-like processes, but visible only under the magnifying power of a microscope. They occur in marshes, ponds, lakes, and seas, and wherever dampness exists, from the greatest depths to the snow-line of the mountains. The greater portion are marine, and have tiny shells that enter into the composition of the ocean mud, and abound in the sands of every ocean shore. The simplest kinds are not provided with a shell or investing membrane, but consist of a fluid, viscid, albuminoid jelly, having an extensile and contractile power, which is regarded as the elementary basis of organic bodies in general. This jelly is called protoplasm (*protos*, first; *plasso*, I mold), and resembles in motive power the flesh of higher animals, from which character it is called sarcode (*sarx*, flesh; *eidōs*, form). The protoplasm has no fixed organs of any kind, internal or external. Dr. Carpenter, speaking of the Rhizopoda, says:

“If the views which I have expressed as to the nature and relations of their living substance be correct, that substance does not present any such differentiation as is necessary to constitute what is commonly understood as ‘organization’ even

of the lowest degree and simplest kind; so that the physiologist has here a case in which those vital operations which he is accustomed to see carried on by an elaborate apparatus are performed without any special instruments whatever—a little particle of apparently homogeneous jelly changing itself into a greater variety of form than the fabled Proteus, laying hold of its food without members, swallowing it without a mouth, digesting it without a stomach, appropriating its nutritious material without absorbent vessels or a circulating system, moving from place to place without muscles, feeling (if it has any power to do so) without nerves, propagating itself without genital apparatus; and not only this, but in many instances forming shelly coverings of a symmetry and complexity not surpassed by those of any testaceous animals."

The fresh-water, shapeless, gelatinous mass is called the *Amœba*, and it shows a voracious disposition by seizing upon minute substances and appropriating them to the nutrition of its own jelly. This it does by surrounding and inclosing the food supply, which is retained until it is dissolved or the desired part appropriated.

The lowest Order of Rhizopoda has received the name of Monera (*moneres*, simple), of which Prof. Haeckel says:

"In a state of rest most Monera appear as small globules of slime, invisible, or barely visible, to the naked eye, and at most about the size of a pin-head. When the Moner moves, there are produced on the surface of the little slime-ball finger-like processes, or very fine radiating threads, the so-called false feet, or pseudopods. The latter are simple continuous processes of the structureless, albumen-like mass of which the body consists. We are unable to perceive different parts in it, and we can obtain direct proof of the absolute simplicity of the semi-fluid mass of albumen; for, with the aid of the microscope, we can follow the Moner as it receives its nourishment. When minute bodies suitable for food, as, for instance, small particles of decayed organic bodies or microscopic plants and infusoria, accidentally come into contact with the Moner, they remain hanging to the sticky surface of the semi-fluid mass of slime, and here produce an irritation, which is followed by a strong afflux from the slimy mass of the body, and they become finally completely inclosed by it, or they are drawn into the body of the Moner by displacement of the several albuminous particles, and there digested, being absorbed by simple diffusion (endosmosis).

"Just as simple as is the nourishment is the mode of reproduction of these primitive beings, which one can not positively call animal or plant. All Monera propagate themselves only in an asexual manner by self-division. When such a speck—for example, a *Protamœba* or a *Protogenes*—has attained a certain size by the assimilation of foreign albuminous matter, it falls into two pieces; there is formed a constriction around the middle, which finally leads to the separation of the two halves. Each half becomes rounded, and then appears as an independent individual, which commences anew the simple play of the vital phenomena of nutrition and propagation. In other Monera (*Vampyrella*) the body, in the process of propagation, instead of two, falls into four equal parts; and in others again (*Protomonas*, *Protomyxa*, *Myxastrum*), at once into a large number of small globules of slime, each of which again, by simple growth, becomes like the parent body."

The marine Rhizopoda are usually furnished with a horny shell, and live, singly or socially, in shells having a series of chambers. The Sub-class Monothalamia

(*monos*, one; *thalamos*, chamber), includes those Rhizopoda which are inclosed in a single shell, and have a minute opening for the extrusion of the filamentous processes by which motion is effected. The Sub-class Polythalamia includes those having calcareous shells, consisting of a series of distinct chambers, which sometimes communicate with each other, and at other times appear to be completely closed up. Each chamber is supposed to contain an independent animal, though the individual animals may be so connected, through the openings communicating between the cells, as to constitute a common mass. In some genera each chamber presents only a single external opening, but in most genera the substance of the shell is pierced by minute pores, like a sieve, through which delicate filaments are protruded.

The Order Radiolaria (*radiolus*, a little ray,) includes many beautiful forms, living and swimming in vast multitudes near the surface of the ocean. Most of them have a complex silicious skeleton of great beauty of form and symmetry, and after death the skeletons sink to the bottom of the ocean, where they often furnish the chief part of the mud. On the island of Barbadoes, Tertiary strata 1,100 feet in thickness, consisting of marls, tripoli, and ferruginous sandstone, are largely composed of the silicious skeletons of Radiolaria. The Nicobar Islands of the Indian Archipelago, consisting of clays, marls, and arenaceous marls, to the extent of 2,000 feet in thickness of Tertiary age, are largely composed of the remains of this Order.

The Order Foraminifera (*foramen*, an aperture; *fero*, I bear,) includes all the families of Palæozoic Rhizopoda noticed in this work. They are marine shell-bearing animals, living at the bottom of oceans and seas, attached, free, or pelagic, and swimming on the surface of the water, from whence their dead shells form an incessant rain to the bottom of the ocean. They are generally microscopic, though a few are several inches in diameter. Some extinct genera are much larger than any of the living forms. Prof. Leidy obtained 18,700 shells of a single species of *Nonionina* from an ounce of mud scraped from the surface, between tides, at Atlantic City. In another sample, from Cape May, he obtained 38,400 shells; and in an ounce from the bathing beach at Newport, Rhode Island, he estimated there were 280,000 shells of several genera and species. The sediment of the Atlantic Ocean is so largely constituted of one kind of foraminiferous shell, that it is generally called Globigerina ooze. Common chalk is almost wholly composed of the shells of Foraminifera. The building stone of the city of Paris is almost wholly made of the shells of Foraminifera belonging to the Sub-order Miliola. The Numulite limestone of different countries is composed of foraminiferous shells, and so is the Fusulina limestone of Carboniferous age. The microscopic genera and species of the Palæozoic rocks have not been much studied. The classification of the Palæozoic Foraminifera, so far as they have been investigated, is as follows:

FAMILY CALCISPHERIDÆ.—Calcisphæra.

FAMILY EOOZONIDÆ.—Eoozon.

FAMILY FUSULINIDÆ.—Fusulina, Loftusia, Møellerina.

FAMILY GLOBIGERINIDÆ.—Calcarina.

FAMILY LITUOLIDÆ.—Endothyra, Nodosinella, Valvulina.

FAMILY AFFINITY, UNCERTAIN.—Rhabdaria.

CLASS PORIFERA (*poros*, canal; *phero*, I bear).

The Porifera include the Sponges, and are not to be regarded as any more highly organized than the Rhizopoda. A sponge consists of a congeries of horny filaments, interlaced in every direction so as to form an intricate network of intercommunicating cells. Imbedded in these filaments, in the majority of sponges, are a number of minute needle-shaped, or forked, or radiated silicious, or calcareous particles of various forms, called spiculæ. The spiculæ may be acicular and pointed at both ends, or have a small knob at one end, while the opposite end is pointed; or one end may be a fork, with two or three prongs. The horny filaments, with their contained spiculæ, constitute the skeleton which supports the living sponge. The living sponge consists of a mere coating of gelatinous matter spread over all the filaments, of the consistence of the white of an egg, which runs freely away from the skeleton or framework of the sponge when taken out of the water. Under the microscope this gelatinous matter is found to consist of an aggregation of sarcode cells, and each cell appears to possess an independent existence; and even when detached from its fellows it has the power to move by the extension of its substance in various directions. In a living sponge there is an infinite number of minute holes, and a lesser number of larger openings. The water is imbibed through the smaller pores, and thrown out from the larger ones. The circulation results from the action of cilia, in much the same way motion is effected by the Rhizopoda.

Sponges attach themselves to all kinds of objects, whether fixed or floating. Some cover rocks and shells with a spongy incrustation; others hang from floating sea-weeds, and others shoot up branched stems, or a massive, globular framework. The *Cliona* is a boring sponge, that imbeds itself in shells or other calcareous substances. Sponges of the same species assume very different forms. In fact, there are no animals in which the variations are as great in a single species. They attain their greatest development in tropical seas, but occur in the most northern latitudes.

The genera and species of living sponges are largely founded upon the framework and spiculæ, and of course the same characters are sought in fossil sponges for the purpose of classification. Among the Palæozoic sponges, form is of much more importance than it is among living sponges, as we may believe, because we find so many specimens of the same form and size in a given species, not only at one locality, but at distant places, even hundreds or thousands of miles apart, in the same Group of rocks; as, for instance, *Astylospongia præmorsa*, on the Island of Gottland, in the Baltic Sea, and in Tennessee and Indiana. When Silurian sponges are silicified, the surface is generally very poorly preserved, and the spiculæ perfectly preserved; but calcareous and unsilicified specimens of the same species will show a well-preserved exterior and no spiculæ. It is therefore impossible to determine whether the sponge in its living state had calcareous or silicified spiculæ. In the fossilization of sponges and other bodies, and even long after fossilization has taken place, silica will be taken up, and lime will be deposited in its place in some waters; while in other waters lime will be taken up, and silica will be deposited in its stead. An original calcareous sponge, when converted into a silicious fossil, will preserve the spiculæ; but if a sponge bears silicious spiculæ, and is converted

into a calcareous fossil, the spiculæ will disappear in the coarser lime materials. A possible exception might exist if, in the process of change, the interior of the sponge were converted into calcspar. The spiculæ, therefore, are of importance in the determination of genera and species among Palæozoic sponges, only when silicified specimens can be obtained.

The arrangement of the Palæozoic sponges into families is as follows:

FAMILY ANTHASPIDELLIDÆ.—Anthaspidella, Climacospongia, Edriospongia, Streptosolen, Zittelella.

FAMILY ARCHÆOCYATHIDÆ.—Archæocyathus, Ethmophyllum.

FAMILY ASTRÆOSPONGIDÆ.—Astræospongia.

FAMILY ASTYLOSPONGIDÆ.—Astylospongia, Aulocopina, Calathium, Conopterium, Cyathospongia, Eospongia, Palæomanon, Palæospongia, Trachyum, Trichospongia.

FAMILY BEATRICIDÆ.—Beatricea.

FAMILY BRACHIOSPONGIDÆ.—Brachiospongia, Chirosporgia.

FAMILY DICTYOSPONGIDÆ.—Cleodictya, Cyathophycus, Dictyophyton, Ectenodictya, Lyriodictya, Phragmodictya, Physospongia, Protospongia, Rauffella, Rhombodictyon, Thamnodictya, Uphantænia.

FAMILY DYSTACTOSPONGIDÆ.—Dystactospongia, Heterospongia, Saccospongia.

FAMILY LEPTONITIDÆ.—Leptonitus.

FAMILY MICROSPONGIDÆ.—Hindia, Microspongia.

FAMILY PALÆACIDÆ.—Palæacis.

FAMILY PASCEOLIDÆ.—Pasceolus.

FAMILY PATTERSONIDÆ.—Pattersonia.

FAMILY PHARETRONES.—Batospongia, Camarocladia, Cylindrocœlia, Streptospongia.

FAMILY RECEPTACULITIDÆ.—Cerionites, Receptaculites.

FAMILY STROMATOPORIDÆ.—Caunopora, Cœnostroma, Cryptozoon, Dictyostroma, Megastroma, Strophochetus, Stromatocerium, Stromatopora, Syringostroma.

FAMILY AFFINITY UNCERTAIN.—Astroconia, Fungispongia, Lepidolites, Lepotomitus.

ANTHASPIDELLA, Ulrich & Everett, (in press.) Geo. Sur. Ill., vol. 8, p. 256. [Ety. *anthos*, flower; *aspis*, shield; *ellus*, diminutive.] Saucer or funnel-shaped, supported by a short, subcylindrical stem; inosculating, radiating channels numerous, and those on the upper surface form radical canals that pass through the sponge-wall, and open into the channels of the lower surface; radiating canals closely arranged in vertical series, separated by vertical sheets of spicules; oscula on the upper surface; spicules bifid at each end, the bifurcations directed nearly at right angle, and slightly curving, and so arranged as to leave minute canals of triangular, quadrate, or polygonal form; surface sometimes covered with a dermal layer. Type A. *mammulata*.

fenestrata, Ulrich & Everett, (in press.) Geo. Sur. Ill., vol. 8, p. 264. Trenton Gr. *firma*, Ulrich & Everett, (in press.) Geo. Sur. Ill., vol. 8, p. 263, Trenton Gr. *florifera*, Ulrich & Everett, (in press.) Geo. Sur. Ill., vol. 8, p. 259, Trenton Gr. *grandis*, Ulrich & Everett, (in press.) Geo. Sur. Ill., vol. 8, p. 262, Trenton Gr. *magnifica*, Ulrich & Everett, (in press.) Geo. Sur. Ill., vol. 8, p. 265, Trenton Gr. *mammulata*, Ulrich & Everett, (in press.) Geo. Sur. Ill., vol. 8, p. 258, Trenton Gr. *obliqua*, Ulrich & Everett, (in press.) Geo. Sur. Ill., vol. 8, p. 265, Trenton Gr. *parvistellata*, Ulrich & Everett, (in press.) Geo. Sur. Ill., vol. 8, p. 260, Trenton Gr. *scutula*, Ulrich & Everett, (in press.) Geo. Sur. Ill., vol. 8, p. 261, Trenton Gr.

Archæocyathellus, Ford, 1873, Am. Jour. Sci. and Arts, 3d ser., vol. 6, p. 135, syn. for *Ethmophyllum*.

ARCHÆOCYATHUS, Billings, 1861, Pal. Foss., vol. 1, p. 3, and 354. [Ety. *arche*, beginning; *cyathus*, cup.] An elongated, cylindrical, sponge-like body; large end open; central cavity lined by an endotheca and external surface by an epitheca; intervening space being filled with poriferous and cellular tissue; walls perforated. Type A. atlanticus.

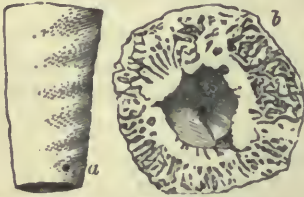


FIG. 89.—*Archæocyathus atlanticus*. a, reduced; b, transverse section.

atlanticus, Billings, 1861, Pal. Foss., vol. 1, p. 5, Up. Taconic.
billingsi, Walcott, 1886, Bull. U. S. Geo. Sur., No. 30, p. 74, Up. Taconic.
minganensis, see *Ethmophyllum minganense*, though Hinde has made it the type of a new genus, *Archæoscyphia*.
profundus, see *Ethmophyllum profundum*.
rensselaericus, see *Ethmophyllum rensselaericum*.

ASTREOSPONGIA, Roemer, 1860, Sil. Fauna d. West Tenn., p. 13. [Ety. *aster*, star; *spongia*, sponge.] Globular or disk-like, free sponge composed of regular star-shaped spicules, without order, no epitheca or canals. Type A. meniscus.

hamiltonensis, Meek & Worthen, 1866, Proc. Chi. Acad. Sci., vol. 1, p. 12, Ham. Gr.

meniscus, Roemer, 1848, (*Blumenbachium meniscus*), Leonh. and Bronn's Jahrb., p. 683, Niagara Gr.

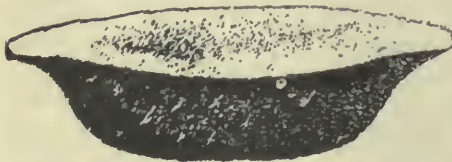


FIG. 90.—*Astræospongia meniscus*.

ASTROCONIA, Sollas, 1881, Quar. Jour. Geo. Soc. Lond., vol. 37, p. 254. [Ety. *aster*, star; *konía*, dust.] Founded upon the appearance of various spiculæ in a grayish silicious dolomite. Characters not distinct. Type A. granti. The name was preoccupied by Edwards & Haime in 1848.

granti, Sollas, 1881, Quar. Jour. Geo. Soc. Lond., vol. 37, p. 254, Niagara Gr.

ASTYLOSPONGIA, Roemer, 1860, Sil. Fauna d. West Tenn., p. 7. [Ety. *astylos*, without a pillar; *spongia*, sponge.] Globular or disk-like, free sponge; inner texture formed of small, regular, star-shaped spicules, connected by their rays; canals running from the center to the surface crossed by concentric canals. Type A. præmorsa.

bursa, Hall, 1876, 28th Rep. N. Y. St. Mus. Nat. Hist., p. 105, Niagara Gr.
christiana, Meek & Worthen, 1868, Geo. Sur. Ill., vol. 3, p. 344, Niagara Gr.

imbricato-articulata, Roemer, 1848, (*Siphonia imbricato-articulata*), Leonh. and Bronn's Jahrb., p. 685, and Sil. Fauna d. West Tenn., p. 12, Niagara Gr.

inciso-lobata, Roemer, 1848, (*Spongia inciso-lobata*), Leonh. and Bronn's Jahrb., p. 685, and Sil. Fauna d. West Tenn., p. 11, Niagara Gr.

inornata, Hall, 1863, 16th Rep. N. Y. St. Mus. Nat. Hist., p. 70, syn. for *Hindia fibrosa*.

parvula, Billings, 1861, Pal. Foss., vol. 1, p. 20, Trenton Gr.

perryi, Billings, 1861, Geo. Vermont, p. 957, Black Riv. Gr.

præmorsa, Goldfuss, 1826, (*Siphonia præmorsa*), Petref. Germ., p. 17, and Sil. Fauna d. West Tenn., p. 8, Niagara Gr.



FIG. 91.—*Astylospongia præmorsa*. Vertical section, showing cup.

stellatim-sulcata, Roemer, 1848, (*Spongia stellatim-sulcata*), Leonh. and Bronn's Jahrb., p. 686, and Sil. Fauna West Tenn., p. 11, Niagara Gr.

AULOCOPINA, Billings, 1875, Can. Nat. and Geol., vol. 7, p. 230. [Ety. *aulokoipo*, cut into pipes.] Elongate, ovate, or pyriform; upper face concave, with an osculum in the center, from which ridges radiate over the surface and descend to the base; the osculum is the opening of a central cavity, from which smaller branching canals radiate. Type A. granti.

granti, Billings, 1875, Can. Nat. and Geol., vol. 7, p. 231, Niagara Gr.

BATOSPONGIA, Ulrich, (in press,) Geo. Sur. Ill., vol. 8, p. 246. [Ety. *batos*, prickly bush; *spongia*, sponge.] Subhemispherical or subglobose, consisting of small, inosculating, subcylindrical or flattened

branches, which arise from a reticulated base; base covered with a dermal layer, which exhibits on its inner side a network of subulate or irregularly branched spicule fiber; spicules acerate, bifid, trifid, or four-rayed. Type B. spicata.

spicata, Ulrich, (in press,) Geo. Sur. Ill., vol. 8, p. 246, Coal Meas.

BEATRICEA, Billings, 1875, Rep. of Progr. Geo. Sur. Can., p. 343. [Ety. proper name.] This genus was supposed by Hyatt (Am. Jour. Sci. and Arts, 1865,) to belong to the class Cephalopoda, and he proposed a new order for the genus, to-wit: Ceriolites, from *kerion*, a honey-comb; *lithos*, a stone; and a family Ceriolidae. They are, however, long, cylindrical spongeoid bodies. Type B. nodulosa.

nodulosa, Billings, 1857, Rep. of Progr. Geo. Sur. Can., p. 344, Trenton and Hud. Riv. Gr.

undulata, Billings, 1857, Rep. of Progr. Geo. Sur. Can., p. 344, Trenton Gr.

BELEMNOSPONGIA, Ulrich, (in press,) Geo. Sur. Ill., vol. 8, p. 248. [Ety. *belemnos*, a dart; *spongia*, sponge.] Composed of elongate acerate spicules, which radiate upward and outward from a pointed base; spicules large, and joined to each other by short processes. Type B. fascicularis.

fascicularis, Ulrich, (in press,) Geo. Sur. Ill., vol. 8, p. 248, Burlington Gr.

Blumenbachium, König, 1820, Icones fossiles, sectiles.

meniscus, see *Astræospongia meniscus*.

BRACHIOSPONGIA, Marsh, 1867, Am. Jour. Sci. and Arts, 2d ser., vol. 44, p. 88. [Ety. *brachium*, arm; *spongia*, sponge.] A short vase or hollow central nucleus, throwing out large, hollow arms, which are closed at the distal extremities; skeleton comparatively thin and bearing a network of spicules; all observed specimens are silicious, and outer surface therefore destroyed. Type B. digitata.

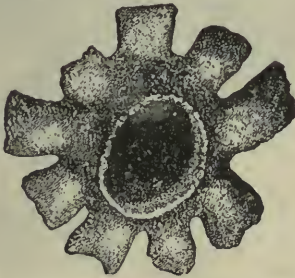


FIG. 92.—*Brachiospongia digitata*. $\frac{1}{4}$ diam., showing large gastric cavity.

digitata, Owen, 1857, (*Scyphia digitata*), Geo. of Ky., vol. 2, p. 111, Trenton Gr.

hoveyi, Marsh, 1874, Trans. Kansas Acad. Sci., p. 344, syn. for B. digitata, but

founded on a specimen having twelve arms.

lyoni, Marsh, 1867, Am. Jour. Sci. and Arts, 2d ser., vol. 44, p. 88, syn. for B. digitata, but founded on a specimen having eleven arms.

roemeriana, Marsh, 1867, Am. Jour. Sci. and Arts, 2d ser., vol. 44, p. 88, syn. for B. digitata.

CALATHIUM, Billings, 1865, Pal. Foss., vol. 1, p. 208. [Ety. *kalathos*, a small wicker basket.] Cylindro-turbinate in form, perforated by small canals arranged in longitudinal and transverse rows; apertures round, oval, or quadrangular; cup deer. Type C. formosum.

affine, Billings, 1865, Pal. Foss. vol. 1, p. 209, Quebec Gr.

anstedii, Billings, 1865, Pal. Foss., vol. 1, p. 201 and 337, Quebec Gr.

canadense, Billings, 1865, Pal. Foss., vol. 1, p. 377, Chazy Gr.

fittoni, Billings, 1865, Pal. Foss., vol. 1, p. 211, Quebec Gr.

formosum, Billings,

1865, Pal. Foss., vol. 1, p. 209, Quebec Gr. infelix, Ulrich & Everett, (in press,) Geo. Sur. Ill., vol. 8, p. 274, Trenton Gr.



FIG. 93.—*Calathium canadense*. Vertical section, showing cup.

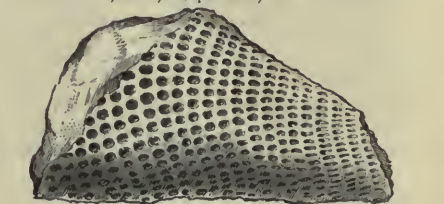


FIG. 94.—*Calathium formosum*.

pannosum, Billings, 1865, Pal. Foss., vol. 1, p. 335, Quebec Gr.

paradoxicum, Billings, 1865, Pal. Foss., vol. 1, p. 358, Calcif. Gr. Hinde, in 1889, Quar. Jour. Geo. Soc., p. 144, made this species the type of a new genus, *Nipterella*.

CALCARINA, D'Orbigny, 1826, Tableau Methodique de la Classe des Cephalopodes, in Annales des Sciences Naturelles, tome 7. [Ety. *calcis*, limestone.] Free, convoluted, depressed, spire-coiled, supplemental growths of the interior shell, aperture slit in the terminal chamber close to the penultimate convolution. A living genus in tropical seas.

ambigua, Brady, 1878, Monograph of Carboniferous and Permian foraminifera, p. 141, Carboniferous.

CALCISPHERA, Williamson, 1880, Mem. Org. of the plants of the Coal Meas., pt. 10. [Ety. *calcis*, limestone; *sphaera*, sphere.] A minute globular test, having an aperture; wall composed of minute calcareous grains. Type C. robusta.

robusta, Williamson, 1880, Mem. Org. of the Coal Meas., pt. 10, Up. Held Gr.

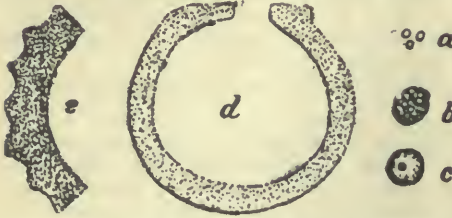


FIG. 95.—*Calelsphæra robusta*. a, natural size; b, magnified, showing sculpture; c, showing aperture; d, magnified, showing aperture; e, section of wall magnified.

CAMAROCLADIA, Ulrich & Everett, (in press.) Geo. Sur. Ill., vol. 8, p. 280. [Ety. *kamara*, arching chamber; *klados*, twig.] Small, subcylindrical branching stems; interior canals irregular, separated by thin, cribose walls; spicules three-rayed. Type C. *dichotoma*.

dichotoma, Ulrich & Everett, (in press.) Geo. Sur. Ill., vol. 8, p. 281, Trenton Gr.

CAUNOPORA, Phillips, 1841, Pal. Foss., Cornwall and Devon. and W. Somerset, p. 18. [Ety. *chaunos*, loose; *poros*, perforation.] Amorphous, composed of concentric or nearly plain masses, perforated by flexuous or vermiform small tubuli, and by larger, straight, subparallel or radiating open tubes, persistent through the mass. Type C. *placenta*.

hudsonica, Dawson, 1879, Quar. Jour. Geo. Soc., vol. 35, p. 52, Niagara Gr.

incrustans, Hall & Whitfield, 1873, (Stromatopora *incrustans*.) 23d Rep. N. Y. St. Mus. Nat. Hist., p. 227, Chemung Gr.

mirabilis, Spencer, 1884, Bull. No. 1, Univ. St. Mo., p. 47, Niagara Gr.

planulata, Hall & Whitfield, 1873, 23d Rep. N. Y. St. Mus. Nat. Hist., p. 228, Chemung Gr.

walkeri, Spencer, 1884, Bull. No. 1, Mus. Univ. St. Mo., p. 46, Niagara Gr.

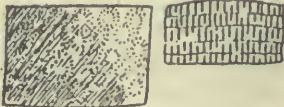


FIG. 96.—*Caunopora walkeri*, vertical and horizontal section enlarged.

CERIONITES, Meek & Worthen, 1868, Geo. Sur. Ill., vol. 3, p. 346. [Ety. *kerion*, honey-comb; *lithos*, stone.] Founded upon casts apparently holding an intermediate position between *Pasceolus* and *Receptaculites*. The pits are hexagonal and upon the convex side, perforated in the center by a minute circular opening, while those upon the

under side are imperforate. Type C. *dactyloides*.

dactyloides, Owen, 1844, (Lunulites *dactyloides*.) Rep. on Min. Lands, p. 69, Niagara Gr.



FIG. 97.—*Cerionites dactyloides*.

CHIROSPONGIA, n. gen. FIG. 97.—*Cerionites dactyloides*. [Ety. *cheir*, hand; *spongia*, sponge.] General form hand-like, or somewhat like a compressed goblet; composed of internal filamentous or fibrous substance, which is covered with a thin, lobed, vesicular parenchyma; it was firmly fastened by an expanded base to a solid rock or the sea-bottom; above the base it is a flattened obconoidal cup, with a deep sulcus down the middle of each side, bringing the sides nearly together; on each side of the sulcus the interior of the sponge is hollow, showing a large gastral cavity; the whole skeleton is openly vesicular or porous. The type species is silicified, and does not show the surface markings, but a calcareous specimen, supposed to belong to the same genus, is finely papillated. No microscopic sections have been made to ascertain the character of the spicules, but doubtless both parenchyma and fibrous substance bear spicules similar to those of *Brachiospongia*. In the surface lobes and filaments it resembles *Pattersonia*, but is distinguished by its vesicular and porous substance and coarser filaments. In its large gastral cavity, thin skeleton, and vesicular parenchyma, it resembles *Brachiospongia*. Type C. *wenti*.

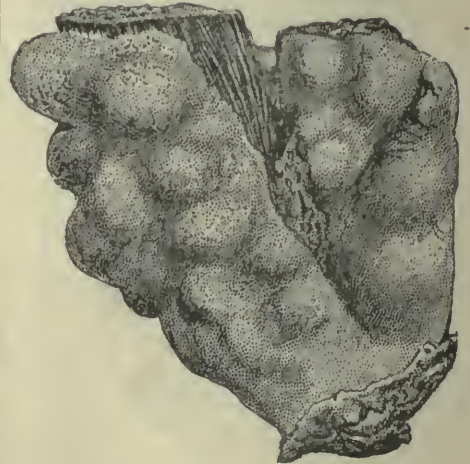


FIG. 98.—*Chirosporgia wenti*.

faberi, n. sp. This species is founded upon a calcareous fragment of the parenchyma, about one-third of which is shown in the figure. It is thin, and

belonged to the side of a large, hollow specimen. The semi-elliptical lobes are nearly equal in size, and regularly distributed in rows over the surface. The surface is reticulated with fine papillæ, presenting to the naked eye the appearance of a bryozoum. The illustration shows rhomboidal depressions instead of papillæ. Found associated with *Pattersonia* and fragments of sponge filaments near the middle of the Hud. Riv. Gr., about 350 feet above low-water mark at Cincinnati. Collector, Charles Faber.

venti, n. sp. This species is founded upon a silicified specimen having the characters above ascribed to the genus, and being well illustrated in the figure. The fibrous substance shown in the sulcus formed the basal attachment, as the parenchymatous surface tissue does not appear at the bottom. The lobes are large, somewhat semi-elliptical in outline, of unequal size, and irregularly disposed, but not pendent as in *Pattersonia*. The substance of the filaments and parenchyma, as shown, where broken off and weathered at the top and bottom of the specimen, is openly vesiculous or irregularly porous, resembling to the naked eye somewhat the appearance of *Alveolites goldfussi*. The species is named in honor of Mr. C. E. Went, of Frankfort, Ky., who found it in the Trenton Group near that city.



FIG. 99.—*Chirosporgia fabri*; reticulated depressions should indicate papillæ.

CLEODICTYA, Hall, 1884, 35th Rep. N. Y. St. Mus. Nat. Hist., p. 467. [Ety. *kleo*, closed up; *dictyon*, net.] Frond rapidly expanding from the base to a subglobose or hemispherical form, bearing a row of large, rounded nodes on the periphery; tube abruptly contracted above, and extending in a cylindrical or slightly expanded form. Substance composed of regular lattice-work of six-rayed spicules and bundles of acicular rods. Type C. *gloriosa*.

gloriosa, Hall, 1884, 35th Rep. N. Y. St. Mus. Nat. Hist., p. 479, Keokuk Gr.
mohri, Hall, 1884, 35th Rep. N. Y. St. Mus. Nat. Hist., p. 479, Keokuk, Gr.

Cnemidium, Goldfuss, 1826, Petref. Germ., p. 15. [Ety. *knemidos*, armor for the legs, a sort of boot.] Type C. *lamellosum*.

trentonensis, see *Palæospongia trentonensis*.
CŒNOSTROMA, Winchell, 1867, Proc. Am. Ass. Ad. Sci., p. 91. [Ety. *koinos*, shared in common; *stroma*, layer.] Distinguished from *Stromatopora* by the absence of central, simple, radiating tubes, which in this genus is represented by a group of more or less divergent ascending tubuli, so that the surface of the last layer presents eminences, not with a single large pore at the summit, but with several small pores diverging from their sides. Type C. *monticuliferum*.

botryoideum, Spencer, 1884, Bull. No. 1, Mus. Univ. St. Mo., p. 50, Niagara Gr.

constellatum, Hall, 1852, (*Stromatopora constellata*), Pal. N. Y., vol. 2, p. 324, Coralline limestone, Niagara Gr.

galtense, Dawson, 1879, Quar. Jour. Geol. Soc., vol. 35, p. 52, Guelph Gr.

monticuliferum, Winchell, 1866, (*Stromatopora monticulifera*), Rep. Low. Penin. Mich., p. 91, Ham. Gr.

pustuliferum, Winchell, 1866, (*Stromatopora pustulifera*), Rep. Low. Penin. Mich., p. 90, Ham. Gr.

ristigouchense, Spencer, 1884, Bull. No. 1, Univ. St. Mo., p. 49, Low. Held. Gr.

solidulum, Hall & Whitfield, 1873, (*Stromatopora solidula*), 23d Rep. N. Y. St. Mus. Nat. Hist., p. 227, Chemung Gr.

CONOPHEREUM, Winchell, 1865, Proc. Acad. Nat. Sci., p. 110. [Ety. *konos*, cone; *poterion*, cup.] Cells crowded, inseparable, rapidly enlarging, walls marked by vertical striæ, and a few pores communicate between the cells; epitheca exterior. Type C. *effusum*.

effusum, Winchell, 1865, Proc. Acad. Nat. Sci., p. 111, Waverly Gr. or Lithographic limestone.

Coscinopora infundibuliformis, see *Receptaculites infundibuliformis*.

Coscinopora sulcata, Owen, 1844, see *Receptaculites oweni*.

CRYPTOZOON, Hall, 1884, 36th Rep. N. Y. St. Mus. Nat. Hist., p. 95. [Ety. *kruptos*, hidden; *zoon*, animal.] Composed of irregular, concentric laminae, resembling *Stromatopora*, substance traversed by minute canals, which branch and anastomose irregularly. Type C. *proliferum*.

minnesotense, Winchell, 1886, 14th Ann. Rep. Geol. Minn., p. 313, Calciferous Gr.

proliferum, Hall, 1884, 36th Rep. N. Y. St. Mus. Nat. Hist., p. 95, Calciferous



FIG. 100.—*Cœnostroma constellatum*, horizontal section.

CYATHOPHYCUS, Walcott, 1879, Trans. Alb. Inst., vol. 10, p. 18. [Ety. *kuathos*, cup; *phukos*, sea-weed,] Hollow, cyathiform, with a reticulated structure. Type C. reticulatum.

reticulatum, Walcott, 1879, Trans. Alb. Inst., vol. 10, p. 18, Utica Slate.

subsphericum, Walcott, 1879, Trans. Alb. Inst., vol. 10, p. 19, Utica Slate.

CYATHOSPONGIA, Hall, 1882, Foss. Corals Niagara and Up. Held. Grs., p. 15. [Ety. *kuathos*, cup; *spongia*, sponge.] Body solid, turbinate, cyathiform; structure similar to *Astylospongia*. Type C. excrescens.

excrescens, Hall, 1882, Foss. Corals Niagara and Up. Held. Grs., p. 15, and 35th Rep. N. Y. St. Mus. Nat. Hist., p. 419, Niagara Gr.

CYLINDROCOELIA, Ulrich, 1889, Am. Geo., vol. 3, p. 245. [Ety. *kulindros*, cylinder; *koilos*, belly.] Cylindrical; central cloaca; walls thick, radiating canals. Type C. endoceroidea.

covingtonensis, Ulrich, 1889, Am. Geo., vol. 3, p. 247, Hud. Riv. Gr.

endoceroidea, Ulrich, 1889, Am. Geo., vol. 3, p. 246, Trenton Gr.

minnesotensis, Ulrich, 1889, Am. Geo., vol. 3, p. 248, Trenton Gr.

minor, Ulrich, 1889, Am. Geo., vol. 3, p. 248, Trenton Gr.

Dentalina, D'Orbigny, 1826, Ann. Des. Sci. Nat., t. 7, p. 89. [Ety. *dentale*, tooth; *in*, implying resemblance.]

priscilla, see *Nodosinella priscilla*.

DICTYOPHYTON, Hall, 1863, 16th Rep. N. Y. St. Mus., p. 87. [Ety. *dictyon*, net; *phyton*, plant.] Turbinate or infundibuliform, with nodose or conical protuberances or hollow stems externally, and marked by minute rectangular spaces, and consisting of a reticulate envelope. Type D. filitextile.

abacus, Hall, 1884, 35th Rep. N. Y. St. Mus. Nat. Hist., p. 474, Waverly Gr.

annulatum, Hall, 1863, 16th Rep. N. Y. St. Mus. Nat. Hist., p. 90, Chemung Gr.

baculum, Hall, 1884, 35th Rep. N. Y. St. Mus. Nat. Hist., p. 471, Chemung Gr.

becki, Conrad, 1837, (Lithodictyon becki.) Ann. Rep. N. Y., p. 167, and Pal. N. Y., vol. 2, p. 6, Medina Sandstone.

catilliforme, see *Phragmodictya catilliformis*.

cinctum, Hall, 1884, 35th Rep. N. Y. St. Mus. Nat. Hist., p. 472, Chemung Gr.

conradi, Hall, 1863, 16th Rep. N. Y. St. Mus. Nat. Hist., p. 89, Chemung Gr.

cylindricum, Whitfield, 1881, Bull., No. 1, Am. Mus. Nat. Hist., p. 19, Keokuk Gr.

fenestratum, Hall, 1863, 16th Rep. N. Y. St. Mus. Nat. Hist., p. 90, Chemung Gr.

filitextile, Hall, 1863, 16th Rep. N. Y. St. Mus. Nat. Hist., p. 88, Chemung Gr.

hamiltonense, Hall, 1884, 35th Rep. N. Y. St. Mus. Nat. Hist., p. 468, Ham. Gr.

irregulare, Hall, 1884, 35th Rep. N. Y. St. Mus. Nat. Hist., p. 470, Chemung Gr.

newberryi, see *Thamnodictya newberryi*.

nodosum, Hall, 1863, 16th Rep. N. Y. St. Mus. Nat. Hist., p. 91, Chemung Gr.

parallellum, Hall, 1884, 35th Rep. N. Y. St. Mus. Nat. Hist., p. 471, Chemung Gr.

patulum, Hall, 1884, 35th Rep. N. Y. St. Mus. Nat. Hist., p. 469, Chemung Gr.

prismaticum, Hall, 1884, 35th Rep. N. Y. St. Mus. Nat. Hist., p. 469, Chemung Gr.

ramosum, Lesquereux, 1884, Coal Flora of Pa., p. 827, Up. Chemung Gr.

redfieldi, Hall, 1863, 16th Rep. N. Y. St. Mus. Nat. Hist., p. 88, Waverly Gr.

rude, Hall, 1863, 16th R. p. N. Y. St. Mus. Nat. Hist., p. 90, Chemung Gr.

sacculus, Hall, 1884, 35th Rep. N. Y. St. Mus. Nat. Hist., p. 473, Waverly Gr.

telum, Hall, 1884, 35th Rep. N. Y. St. Mus. Nat. Hist., p. 470, Chemung Gr.

tenuis, Hall, 1884, 35th Rep. N. Y. St. Mus. Nat. Hist., p. 474, Waverly Gr.

tuberosum, Conrad, 1842, (Hydnoceras tuberosum,) Jour. Acad. Nat. Sci. Phil., vol. 8, p. 267, Chemung Gr.

DICTYOSTROMA, Nicholson, 1875, Ohio Pal., vol. 2, p. 254. [Ety. *dictyon*, net; *stroma*, layer.] Allied to *Stromatopora*, but the upper surface of each lamina is developed into conical points, which support the lamina above instead of pillars. The laminae have horizontal canals, and are probably minutely perforate. Type D. undulatum.

reticulatum, Spencer, 1884, Bull. Mus. Univ. St. Mo., p. 51, Niagara Gr.

undulatum, Nicholson, 1875, Ohio Pal., vol. 2, p. 254, Niagara Gr.



FIG. 101.—*Dictyostroma undulatum*.

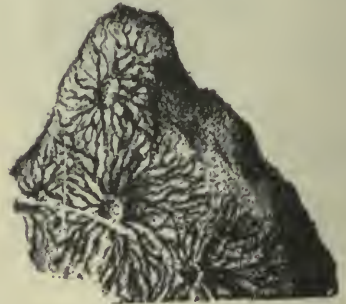


FIG. 102.

Dystactospongia insolens.

DYSTACTOSPONGIA, S. A. Miller, 1882, Jour. Cin. Soc. Nat. Hist., vol. 5, p. 42. [Ety. *dystaktos*, hard to arrange; *spongia*,

- sponge.] Massive, hemispherical, attached with a strong radiating framework. Structure vesicular. Type D. insolens.
- insolens, S. A. Miller, 1882, Jour. Cin. Soc. Nat. Hist., vol. 5, p. 43, Hud. Riv. Gr.
- minima, Ulrich, 1889, Am. Geol., vol. 3, p. 243, Hud. Riv. Gr.
- minor, Ulrich & Everett, (in press.) Geo. Sur. Ill., vol. 8, p. 278, Trenton Gr.
- rudis, Ulrich & Everett, (in press.) Geo. Sur. Ill., vol. 8, p. 279, Trenton Gr.
- ECTENODICTYA, Hall, 1884, 35th Rep. N. Y. St. Mus. Nat. Hist., p. 466. [Ety. *ektense*, stretched out; *dictyon*, net.] A reticulate frond irregularly expanded or explanate; reticulation irregular presenting radiating and concentric striae. Type E. implexa.
- burlingtonensis, Hall, 1884, 35th Rep. N. Y. St. Mus. Nat. Hist., p. 476, Waverly Gr.
- excentrica, Hall, 1884, 35th Rep. N. Y. St. Mus. Nat. Hist., p. 476, Keokuk Gr.
- expansa, Hall, 1884, 35th Rep. N. Y. St. Mus. Nat. Hist., p. 475, Waverly Gr.
- implexa, Hall, 1884, 35th Rep. N. Y. St. Mus. Nat. Hist., p. 475, Waverly Gr.
- EDRIOSPONGIA, Ulrich & Everett, (in press.) Geo. Sur. Ill., vol. 8, p. 271. [Ety. *edrion*, a seat; *spongia*, sponge.] Massive, lobate, attached by a broad base; sides irregularly dented; radiating canals, connected by tortuous, vertical ones; minute canals formed by spicules; sides covered with a dermal layer. Type E. basalis.
- basalis, Ulrich & Everett, (in press.) Geo. Sur. Ill., vol. 8, p. 272, Trenton Gr.
- ENDOTHYRA, Phillips, 1845, Proc. Geol. and Polytech. Soc. W. Riding Yorks., vol. 2, p. 279. [Ety. *entos*, within; *thura*, door.] Free, spiral, rotaliform, segments numerous, texture subarenaceous, imperforate, aperture simple. Type E. bowmani.
- baileyi, Hall, 1858, (*Rotalia baileyi*), Trans. Alb. Ins., vol. 4, p. 34, and 1882, Bull. Mus. Nat. Hist., p. 42, Warsaw Gr.
- EOSPONGIA, Billings, 1861, Pal. Foss., vol. 1, p. 18. [Ety. *eos*, dawn; *spongia*, sponge.] Subglobular, pyriform or subhemispherical, not free, pores radiating irregularly from the central axis; cup of variable depth. Type E. roemerii.
- roemerii, Billings, 1861, Pal. Foss., vol. 1, p. 19, Chazy Gr.
- varians, Billings, 1861, Pal. Foss., vol. 1, p. 19, Chazy Gr.
- Eozoon, Dawson, 1865, Can. Nat. and Geo., 2d ser., vol. 2, p. 54. [Ety. *eos*, dawn; *zoon*, animal.] Massive, in large sessile patches or irregular cylinders, growing at the surface, by the addition of suc-



FIG. 103.
Endothyra
baileyi,
magnified.

cessive laminae, internally, the chambers are flattened, irregular, with numerous rounded extensions, and separated by walls of variable thickness, penetrated by septal orifices irregularly disposed; thicker parts of the walls with fine branching tubuli; the appearance to the naked eye is something like Stromatopora. Type E. canadense.

canadense, Dawson, 1865, Can. Nat. and Geo., 2d ser., vol. 2, p. 54, Laurentian. The most ancient organism.

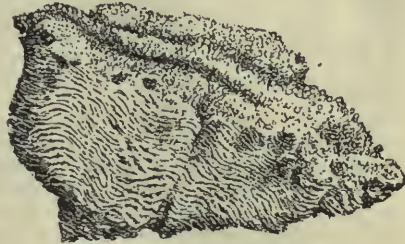


FIG. 104.—Eozoon canadense.

ETHMOPHYLLUM, Meek, 1868, Am. Jour. Sci. and Arts, 2d ser., vol. 45, p. 62. [Ety. *ethmos*, sieve; *phyllon*, plant.] Body simple, elongate, turbinate, cup-shaped, clavate or cylindro-conical, curved or straight, corrugated, lobed, or ribbed, penetrated by round or oval pores, in vertical or horizontal rows; vertical septa numerous, originating at the outer wall, and extending to the inner one, poriferous; inner wall with or without vesicular tissue, extending into the central cup; series of septa and walls sometimes repeated; spiculae branching. Type E. whitneyi.

gracile, Meek, syn. for E. whitneyi.



FIG. 105—Ethmophyllum profundum. Longitudinal and transverse section of a fragment.

minganense, Billings, 1859, (*Petraia minganensis*), Can. Nat. and Geol., vol. 4, p. 346, and Pal. Foss., vol. 1, p. 354. Calciferous Gr. Hinde, in 1889, Quar. Jour. Geo. Soc., p. 142, proposed this species as the type of a new genus Archæoscyphia.

profundum, Billings, 1861, (Archæocyathus profundus,) Pal. Foss., vol. 1, p. 4, Up. Taconic.



FIG. 106.—Ethmophyllum profundum. Base of attachment.

rarum, Ford, 1878, (Protoocyathus rarum,) Am. Jour. Sci. and Arts, 3d ser., vol. 15, p. 124, Up. Taconic. rensseleericum, Ford, 1873, (Archæocyathellus rensseleericus,) Am. Jour. Sci. and Arts, 3d ser., vol. 5, p. 211, Up. Taconic. whitneyi, Meek, 1868, Am. Jour. Sci. and Arts, 2d ser., vol. 45, p. 62, Up. Taconic.

FUNGISPONGIA, Ringueberg, 1884, Proc. Acad. Nat. Sci., p. 147. [Ety. fungus, a mushroom; spongia, a sponge.] Definition very poor. Type F. irregularis. irregularis, Ringueberg, 1884, Proc. Acad. Nat. Sci., p. 147, Clinton Gr. Very poorly defined.

FUSULINA, Fischer, 1837, Oryct. du Gouv. de Moscou., p. 126. [Ety. fusus, spindle; inus, little.] Shell fusiform, symmetrically involute, surface furrowed coincident with the septa within; aperture a narrow slit in the middle part, foramina passing through the walls; septa widening toward the extremities. Type F. cylindrica.

cylindrica, Fischer, 1837, Oryct. du Gouv. de Moscou., p. 126, Coal Meas.



FIG. 107.—Fusulina cylindrica. Natural size, magnified, and transverse section.

cylindrica var. ventricosa, see F. ventricosa. depressa, Fischer, 1837, Oryct. du Gouv. de Moscou., p. 127, Coal Meas.

elongata, Shumard, 1858, Trans. St. Louis Acad. Sci., vol. 1, p. 297. Permian Gr. gracilis, Meek, 1864, Pal. of California, vol. 1, p. 4, Coal Meas.

hyperborea, Salter, 1855, Belcher's Last Arctic Voyage, vol. 2, p. 380, Carboniferous.

robusta, Meek, 1864, Pal. California, vol. 1, p. 3, Coal Meas.

ventricosa, Meek & Hayden, 1864, Pal. Upper Mo., p. 14, Coal Meas.

HETEROSPONGIA, Ulrich, 1889, Am. Geol., vol. 3, p. 239. [Ety. heteros irregular; spongia, sponge.] Sublobate, compressed branches, covered with mouths of tortuous canals; skeleton composed of loosely interwoven spicule fibers. Type H. subramosa.

aspera, Ulrich, 1889, Am. Geol., vol. 3, p. 241, Hud. Riv. Gr.

knotti, Ulrich, 1889, Am. Geol., vol. 3, p. 241, Hud. Riv. Gr.

subramosa, Ulrich, 1889, Am. Geol., vol. 3, p. 240, Hud. Riv. Gr.

HINDIA, Duncan, 1879, Ann. and Mag. Nat. Hist., 5th ser., vol. 4, p. 91. [Ety. proper name.] Free, spheroidal, without involution of texture; small central space occupied by spicules which form a series of bifurcating, long, straight canals, that open at the surface; spicules more or less in shape of a stemmed tripod, with four limbs, and swollen or fringed at the ends. Type H. fibrosa. This may be a synonym for Microspongia; but as the latter is calcareous, and the spicules have not been determined, both generic names are retained.

fibrosa, Roemer, 1860, (Calamopora fibrosa,) Sil. Fauna W. Tenn., p. 20, Niagara Gr. inæqualis, Ulrich & Everett, (in press,) Geo. Sur. Ill., vol. 8, p. 275, Trenton Gr.

spheriodalis, Duncan, 1879, Ann. and Mag. Nat. Hist., 5th ser., vol. 4, p. 91, syn. for H. fibrosa.

parva, see Microspongia parva.

HYSTRISPONGIA, Ulrich, (in press,) Geo. Sur. Ill., vol. 8, p. 245. [Ety. hystrix, porcupine; spongia, sponge.] Subglobular or ovoid; spicules arranged radiately from the base, most of them biacerate and taper each way to pointed ends, some trifid at one end, and others four-rayed. Type H. carbonaria.

carbonaria, Ulrich, (in press,) Geo. Sur. Ill., vol. 8, p. 245, Coal Meas.

Ischadites tessellatus, see Receptaculites tessellatus.

LASIOCLADIA, Hinde, 1884. [Ety. lasios, shaggy; klados, twig.] Skeleton composed of elongate, slender, straight, acerate spicules, pointed at both ends. Type L. compressa.

hindii, Ulrich, (in press,) Geo. Sur. Ill., vol. 8, p. 249, Keokuk Gr.

LEPIDOLITES, Ulrich, 1879, Jour. Cin. Soc. Nat. Hist., vol. 2, p. 20. [Ety. lepis, scale; lithos, stone.] Subspherical or subcylindrical bodies, hollow within and consisting of exteriorly imbricating scales. Type L. dickhanti. The name was preoccupied in mineralogy. dickhanti, Ulrich, 1879, Jour. Cin. Soc. Nat. Hist., vol. 2, p. 21, Hud. Riv. Gr.

elongatus, Ulrich, 1879, Jour. Cin. Soc. Nat. Hist., vol. 2, p. 22, Hud. Riv. Gr. This is not distinct from L. dickhanti.

LEPTOMITUS, Walcott, 1886, Bull. U. S. Geo. Sur. No. 30, p. 89. [Ety. leptos, fine; mitos, thread.] Elongate bodies, formed of fine, thread-like, longitudinal lines, apparently imbedded in a delicate membrane, slowly expanding from a narrow base. Type L. zitteli.

zitteli, Walcott, 1886, Bull. U. S. Geo. Sur. No. 30, p. 89, Georgia Gr.

Leptopteron, Ulrich, 1889, Am. Geol., vol. 3, p. 239. [Ety. *leptos*, thin; *poterion*, cup.] Obconical, annulated free sponge; wall thin, outer surface reticulated. Type *L. mammiferum*. Not well defined.

mammiferum, Ulrich, 1889, Am. Geol., vol. 3, p. 239, Hud. Riv. Gr.

LOFTUSIA, Carpenter & Brady, 1869, Trans. Roy. Soc., p. 742. [Ety. proper name.] Small foraminifer, with oval or elliptical test, consisting, primarily, of a continuous lamina coiled upon itself, with interspaces divided into chambers. Type *L. persica*.

columbiana, Dawson, 1879, Quar. Jour. Geo. Soc., vol. 35, p. 74, Coal Meas.

Lunulites? dactyloides, see *Cerionites dactyloides*.

LYRODICTYA, Hall, 1884, 35th Rep. N. Y. St. Mus. Nat. Hist., p. 466. [Ety. *lyra*, lyre; *dictyon*, net.] Cyathiform, reticulate fronds composed of stellate spicules, with broad, strong, longitudinal bands of acicular spicules, showing an alternating bifurcation. Type *L. romingeri*.

romingeri, Hall, 1884, 35th Rep. N. Y. St. Mus. Nat. Hist., p. 476, Keokuk Gr.

MEGASTROMA, Dawson, 1883, Report on Redpath Mus. No. 2, p. 12. [Ety. *megas*, great; *stroma*, layer.] Somewhat like *Stromatopora*; layers consisting of two membranes, beset with spicules, pointing inwards like two brushes facing each other; membranes porous or reticulate. Type *M. laminosum*.

laminosum, Dawson, 1883, Rep. on Redpath Mus. No. 2, p. 12, Subcarboniferous.

MICROSPONGIA, Miller & Dyer, 1878, Jour. Cin. Soc. Nat. Hist., vol. 1, p. 37. [Ety. *micros*, small; *spongia*, sponge.] Free, no epitheca; compact, without large openings; structure radiate. Type *M. gregaria*.

gregaria, Miller & Dyer, 1878, Jour. Cin. Soc. Nat. Hist., vol. 1, p. 37, Hud. Riv. Gr.

parva, Ulrich, 1889, (Hindia *parva*.) Am. Geol., vol. 3, p. 244, Trenton Gr.

MÆLLERINA, Ulrich, 1886, Cont. to Am. Pal., p. 34. [Ety. proper name.] Consisting of two suborbicular, thin-walled chambers, outer one with spiral ridges, inner one smooth; at the ends of the outer chamber there is a round opening, surrounded by an elevated border, where the ridges terminate. Type *M. greenei*.

greenei, Ulrich, 1886, Cont. Am. Pal., p. 35, Up. Held. Gr.

NODOSINELLA, Brady, 1876, Monograph Carb. and Perm. Foraminifera, p. 102. [Ety. *nodus*, knot; *ellus*, diminutive.] Free, straight, or arcuate, not spiral; constricted at intervals, test imperfor-

ate, texture finely arenaceous, aperture simple or compound. Type *N. digitata*.

priscilla, Dawson, 1868, (Dentalina *priscilla*.) Acadian Geology, p. 285, Carboniferous.

NULLIPORA, Lamarck, 1801, Système des Animaux sans Vert. [Ety. *nullus*, no; *poros*, pore.] Not American Palæozoic.

? *obtexa*, White, 1862, Proc. Bost. Soc. Nat. Hist., vol. 9, p. 33, Burlington Gr.

Orbiculites? reticulata, see *Receptaculites reticulatus*.

PALÆACIS, Edwards & Haime, 1860, Hist. Nat. des Coralliaires, vol. 3, p. 171. [Ety. *palaios*, ancient; *akis*, barb.] Skeleton cuneate or turbinate, adherent, cups 1 to 12, cell-like, margins crenulate, separated by depressions; substance pierced by microscopic tubuli. Type *P. cuneiformis*.

compressus, Meek & Worthen, 1860, (Sphenopterium *compressum*.) Proc. Acad. Nat. Sci. Phil., p. 448, and Geo. Sur. Ill., vol. 2, p. 234, Keokuk Gr.

cuneatus, Meek & Worthen, 1860, (Sphenopterium *cuneatum*.) Proc. Acad. Nat. Sci., p. 448, syn. for *P. cuneiformis*.

cuneiformis, M. Edwards, 1860, Hist. Nat. d. Coralliaires, tome 3, p. 171, Warsaw Gr.

enormis, Meek & Worthen, 1860, (Sphenopterium *enorme*.) Proc. Acad. Nat. Sci., p. 448, and Geo. Sur. Ill., vol. 2, p. 146, Kinderhook Gr.

enormis, var. *depressus*, Meek & Worthen, 1866, (Sphenopterium *enorme* var. *depressum*.) Geo. Sur. Ill., vol. 2, p. 146, Kinderhook Gr.

obtusus, Meek & Worthen, 1860, (Sphenopterium *obtusum*.) Proc. Acad. Nat. Sci., p. 448, and Geo. Sur. Ill., vol. 2, p. 233, Keokuk Gr.

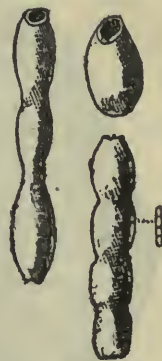


FIG. 109.—*Nodosinella priscilla*. Natural size and enlarged.



FIG. 110. *Palæacis cuneiformis*.



FIG. 111.—*Palæomanon cratera*.

PALÆOMANON, Roemer, 1860, Sil. Fauna West Tenn., p. 12. [Ety. *palaios*, ancient; *Manon*, a genus of sponges.] Cylindrical or irregular, cup-shaped, free, upper surface displaying large, dispersed openings, with inter-

FIG. 112.—*Palæospongia trentonensis*. View of calice.

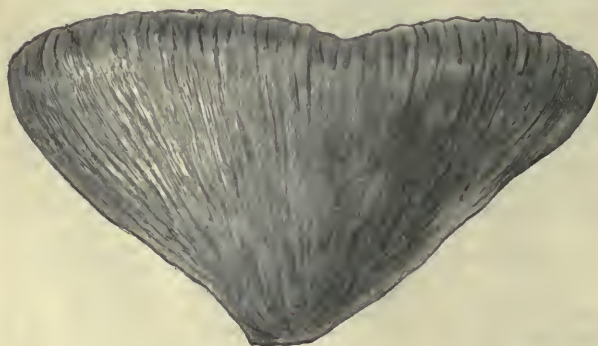
vening space minutely porous. Type *P. cratera*.

cratera, Roemer, 1848, (*Siphonia cratera*.) Leonh. und Bronn's Jahrb., p. 685, Niagara Gr.

roemeri, Walcott, 1885, Monog. U. S. Geo. Sur., vol. 8, p. 99, Devonian.

PALÆOSPONGIA, D'Orbigny, 1850, Prodr. d. Paléont., t. 1, p. 26. [Ety. *palaios*, ancient; *spongia*, sponge.] Cyathiform, irregular, surface reticulated irregularly, by concentric and transverse lines. Type *P. cyathiformis*.

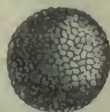
cyathiformis, Hall, 1847, (— *cyathiformis*.) Pal. N. Y., vol. 1, p. 72, Trenton Gr.

FIG. 113.—*Palæospongia trentonensis*. Side view.

trentonensis, Worthen, 1875, (*Cnemidium trentonense*.) Geo. Sur. Ill., vol. 6, p. 491, Trenton Gr.

PASCEOLUS, Billings, 1857, Rep. of Progr. Geo. Sur. Can., p. 342. [Ety.

pasceolus, leather moneybag.] Subglobular bodies marked on the cast as if by polygonal plates, and with a scar or depression for an attaching stem. Type *P. globosus*.

FIG. 114. *Pasceolus claudii*.

claudii, S. A. Miller, 1874, Cin. Quar. Jour. Sci., vol. 1, p. 6, Hud. Riv. Gr.

darwini, S. A. Miller, 1874, Cin. Quar. Jour. Sci., vol. 1, p. 5, Hud. Riv. Gr.

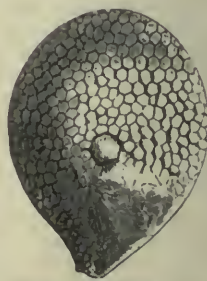
globosus, Billings, 1857, Rep. of Progr. Geo. Sur. Can., p. 343, Trenton Gr.

gregarius, Billings, 1866, Catal. Sil. Foss. Antic., p. 72, Anticosti Gr.

FIG. 115.—*Pasceolus darwini*. Upper surface.FIG. 116.—*Pasceolus darwini*. Under surface.

halli, Billings, 1857, Rep. of Progr. Geo. Sur. Can., p. 342, Anticosti Gr.

intermedius, Billings, 1866, Catal. Sil. Foss. Antic., p. 72, Anticosti Gr.

FIG. 117.—*Pasceolus halli*.

- PATTERSONIA**, S. A. Miller, 1882, Jour. Cin. Soc. Nat. Hist., vol. 5, p. 43. [Ety. proper name.] Solid, amorphous, no large openings; lobed, pendent expansions on the upper surface, and bundles of fine filaments at the base and in the interior, which do not merge into the parenchyma of the sponge; spicules unknown. Type *P. difficilis*.
- aurita*, Beecher, 1889, (Strobilospongia *aurita*.) Mem. Pea. Mus., vol. 2, p. 28, Trenton Gr.
- difficilis*, S. A. Miller, 1882, Jour. Cin. Soc. Nat. Hist., vol. 5, p. 43, Hud. Riv. Gr.
- tuberosa*, Beecher, 1889, (Strobilospongia *tuberosa*.) Mem. Pea. Mus., vol. 2, p. 28, Trenton Gr.

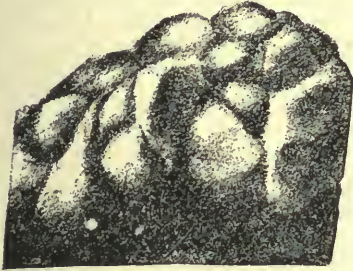


FIG. 118.—*Pattersonia difficilis*. Fragment of upper surface.

- PHRAGMODICTYA**, Hall, 1884, 35th Rep. N. Y. St. Mus. Nat. Hist., p. 466. [Ety. *phragmos*, a partition; *dictyon*, a net.] Cylindrical or cup-shaped fronds, with a concave diaphragm near the broadly expanded base. Substance composed of a reticulate tissue of six and three rayed spicules and long cylindrical rods. Type *P. catilliformis*.
- catilliformis*, Whitfield, 1881, (Dictyophyton *catilliformis*.) Bull. No. 1, Am. Mus. Nat. Hist., p. 18, Keokuk Gr.
- lineata*, Hall, 1884, 35th Rep. N. Y. St. Mus. Nat. Hist., p. 478, Keokuk Gr.
- patelliformis*, Hall, 1884, 35th Rep. N. Y. St. Mus. Nat. Hist., p. 478, Keokuk Gr.
- PHYSOSPONGIA**, Hall, 1884, Abstr. 35th Rep. N. Y. St. Mus. Nat. Hist., p. 467. [Ety. *physa*, bladder; *spongia*, sponge.] Frond cylindrical, expanding from the base; surface divided into from 8 to 24 longitudinal areas by bands of tubular spicules, and into regular quadrules by concentric bands of spicules; surface bullate; spicules anchor-shaped. Interzonate tissue finely reticulated. Type *P. dawsoni*.
- alternata*, Hall, 1884, 35th Rep. N. Y. St. Mus. Nat. Hist., p. 481, Keokuk Gr.
- colletti*, Hall, 1884, 35th Rep. N. Y. St. Mus. Nat. Hist., p. 480, Keokuk Gr.
- dawsoni*, Whitfield, 1881, (Uphantenia *dawsoni*.) Bull. No. 1, Am. Mus. Nat. Hist., p. 16, Keokuk Gr.

- Protocyathus*, Ford, 1878, Am. Jour. Sci. and Arts, 3d ser., vol. 15, p. 124, syn. for *Ethmophyllum*.
- PROTOSPONGIA**, Salter, 1864, Quar. Jour. Geo. Soc., vol. 20, p. 238. [Ety. *protos*, first; *spongia*, sponge.] Skeleton loose, reticulate formed of cruciform spiculae in one plane. Type *P. fenestrata*.
- fenestrata*, Salter, 1864, Quar. Jour. Geo. Soc., vol. 20, p. 238, and Mon. U. S. Geo. Sur., vol. 8, p. 11, Up. Taconic.
- rarus*, see *Ethmophyllum rarum*.
- RAUFFELLA**, Ulrich, 1889, Am. Geol., vol. 3, p. 235. [Ety. proper name.] Hollow cylindrical stems or radially arranged leaves; wall thin, composed of two layers of spicule tissue, inner one porous, outer one composed of large spicules appearing as threads interwoven. Type *R. filosa*.
- filosa*, Ulrich, 1889, Am. Geol., vol. 3, p. 237, Trenton Gr.
- palmipes*, Ulrich, 1889, Am. Geol., vol. 3, p. 238, Trenton Gr.
- RECEPTACULITES**, DeFrance, 1827, Dict. Sci. Nat., tome 45, p. 5. [Ety. *receptaculum*, receptacle; *lithos*, stone.] Subglobular, discoid, or infundibuliform; composed of cylindrical columns, connected at their upper and lower ends by transverse stolons. Type *R. neptunei*.
- arcticus*, Etheridge, 1878, Quar. Jour. Geo. Soc., vol. 34, p. 576, Lower Silurian.
- bursiformis*, Hall, 1883, Rep. St. Geol., pl. 23, fig. 12-14, Schoharie Grit.
- calciferus*, Billings, 1865, Pal. Foss., vol. 1, p. 351, Calcif. Gr.
- canadensis*, Billings, 1863, (Ischadites *canadensis*.) Geo. of Can., p. 309, Anticosti Gr.
- circularis*, Emmons, 1856, Am. Geol., p. 230, Hud. Riv. Gr.
- dactyloides*, see *Cerionites dactyloides*.
- devonicus*, Whitfield, 1882, Ann. N. Y. Acad. Sci., vol. 2, p. 198, Up. Held. Gr.
- eatoni*, Hall, 1863, 16th Rep. N. Y. St. Mus. Nat. Hist., p. 68-226, Schoharie Grit.
- elegantulus*, Billings, 1865, Pal. Foss., vol. 1, p. 360, Calcif. Gr.
- ellipticus*, Walcott, 1885, Monog. U. S. Geo. Sur., vol. 8, p. 67, Chazy Gr.
- elongatus*, Walcott, 1885, Monog. U. S. Geo. Sur., vol. 8, p. 66, Chazy Gr.
- formosus*, Meek & Worthen, 1870, Proc. Acad. Nat. Sci., p. 23, and Geo. Sur. Ill., vol. 6, p. 500, Niagara Gr.
- fungosus*, Hall, 1861, Geo. Rep. Wis., p. 15, Galena Gr.
- globularis*, Hall, 1861, Supp. Geo. Sur. Wis., p. 16, and Geo. Sur. Ill., vol. 3, p. 301, Galena Gr.
- hemisphericus*, Hall, 1861, Geo. Rep. Wis., p. 16, and Geo. Wis., vol. 4, p. 269, Niagara Gr.
- infundibuliformis*, Eaton, 1832, (Coscinopora *infundibuliformis*.) Geo. Text Book, p. 44, Low. Held. Gr.

infundibulum, Hall, 1861, Geo. Rep. Wis., p. 16, Niagara Gr.
 insularis, Billings, 1866, Catal. Sil. Foss. Antic., p. 29, Anticosti Gr.
 iowensis, Owen, 1852, (Selenoides iowensis,) Geo. Sur. Wis., Iowa, and Minn., p. 587, Trenton Gr.
 jonesi, Billings, 1865, Pal. Foss., vol. 1, p. 389, Low. Held. Gr.



FIG. 119.—Receptaculites occidentalis, showing the tubes.

mammillaris, Walcott, 1885, Monog. U. S. Geo. Sur., vol. 8, p. 65, Chazy Gr.
 monticulatus, Hall, 1883, Rep. St. Geol., pl. 23, fig. 3-11, Low. Held. Gr.



FIG. 120.—Receptaculites occidentalis, showing the endorhin, the pores at the angles of the plates, and deeply concave nucleus.

neptunei, DeFrance, 1827, Dict. des. Sci. Nat., vol. 45, p. 5. Not an American species.
 occidentalis, Salter, 1859, Can. Org. Rem., Decade 1, p. 45, Trenton Gr.
 ohioensis, Hall & Whitfield, 1875, Ohio Pal., vol. 2, p. 123, Niagara Gr.
 oweni, Hall, 1861, Geo. Rep. Wis., p. 13, and Geo. Sur. Ill., vol. 3, p. 302, Galena Gr.
 reticulatus, Owen, 1844, (Orbituloides reticulata,) Rep. on Minn. Lands, p. 70, Niagara Gr.

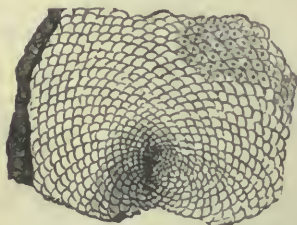


FIG. 121.—Receptaculites occidentalis, showing the nucleus and ectorhin.

sacculus, Hall, 1879, Desc. New Species Foss. from Waldron, Ind., p. 1, and 11th Rep. Geol., and Nat. Hist. Ind., p. 222, Niagara Gr.
 squamifer, Hall, 1859, (Dictyocrinus squamifer,) Pal. N. Y., vol. 3, p. 135, Low. Held. Gr.
 subturbinatus, Hall, 1863, Trans. Alb. Inst., vol. 4, p. 224, Niagara Gr.
 sulcatus, Owen, 1844. This name was pre-occupied by Goldfuss, and the species is now named *R. oweni*.

tessellatus, Winchell & Marcy, 1865, Mem. Bost. Soc. Nat. Hist., vol. 1, p. 85, Niagara Gr.
 RHABDARIA, Billings, Pal. Foss., vol. 1, p. 357. [Ety. *rhabdos*, rod.] Small, cylindrical bodies, with a rough surface and a perforation in the center. Type *R. fragilis*.
 fragilis, Billings, 1865, Pal. Foss., vol. 1, p. 357, Calciferous Gr.
 furcata, Billings, 1865, Pal. Foss., vol. 1, p. 358, Calciferous Gr.
 RHOMBODICTYON, Whitfield, 1886, Bull. Am. Mus. Nat. Hist., vol. 1, p. 347. [Ety. *rhombos*, rhomb; *dictyon*, net.] Globular, discoid, or cyathiform, composed of two or more sets of rods crossing each other at various angles, but not dividing, and leaving rhombic spaces filled with another substance. Type *R. reniforme*.
 discum, Whitfield, 1886, Bull. Am. Mus. Nat. Hist., vol. 1, p. 348, Utica Slate.
 reniforme, Whitfield, 1886, Bull. Am. Nat. Hist., vol. 1, p. 347, Utica Slate.
 reniforme var. rhombiforme, Whitfield, 1886, Bull. Am. Mus. Nat. Hist., vol. 1, p. 348, Utica Slate.
 Rotalia, Lamarek, 1804, Ann. Mus. [Ety. *rota*, wheel.] Not Palæozoic.
 baileyi, see Endothyra baileyi.
 Saccamina, Sars, 1868, Vidensk-Selsk. Forhandl., p. 248. [Ety. diminutive of *sakkos*, a bag.] Not American Palæozoic.
 eriana, Dawson, 1881, Can. Nat., vol. 10, syn. for *Calcisphaera robusta*.
 SACCOSPONGIA, Ulrich, 1879, Am. Geol., vol. 3, p. 242. [Ety. *sakkos*, bag; *spongia*, sponge.] Subcylindrical, with a central cloacal cavity extending through it; walls porous, traversed with tortuous branching canals intercommunicating with each other. Type *S. rudis*.
 danvillensis, Ulrich, 1889, Am. Geol., vol. 3, p. 243, Trenton Gr.
 rudis, Ulrich, 1889, Am. Geol., vol. 3, p. 242, Trenton Gr.
 Scyphia, Oken, 1815. Not American Palæozoic.
 digitata, see *Brachiospongia digitata*.
 stellata, Troost, 1840, not properly defined.
 Selenoides, Owen, 1852, syn. for *Receptaculites*.
 iowensis, see *Receptaculites iowensis*.
 Siphonia, Parkinson, 1820, Organ. Rem. Not American Palæozoic.
 cratera, see *Palæomanon cratera*.
 imbricato-articulata, see *Astylospongia imbricato-articulata*.
 præmorsa, see *Astylospongia præmorsa*.
 Sphenopterium, Meek & Worthen, 1860, syn. for *Palæacis*.
 compressum, see *Palæacis compressus*.
 cuneatum, see *Palæacis cuneiformis*.
 enorme, see *Palæacis enormis*.
 enorme var. depressum, see *Palæacis enormis* var. *depressus*.
 obtusum, see *Palæacis obtusum*.

Spongia, Linnæus. Not American Palæozoic.

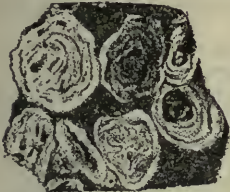


FIG. 122.—*Strephochetus richmondensis*, showing several specimens on a slab.

twine; *ochetos*, canal.] A free calcareous sponge, showing concentric layers composed of minute twining canals. Type *S. ocellatus*.

atratus, Seely, 1885, *Am. Jour. Sci. and Arts.* vol. 32, p. 32, Black Riv. Gr.

brainerdi, Seely, 1885, *Am. Jour. Sci. and Arts.* 3d ser., vol. 32, p. 32, Chazy Gr.

ocellatus, Seely, 1885, *Am. Jour. Sci. and Arts.* vol. 30, p. 357, Chazy Gr.

richmondensis, S. A. Miller, 1882, (*Stromatocerium richmondense*,) *Jour. Cin. Soc. Nat. Hist.*, vol. 5, p. 41, Hud. Riv. Gr.

STREPTOSOLEN, Ulrich & Everett, (in press,) *Geo. Sur. Ill.*, vol. 8, p. 273. [Ety. *streptos*, twisted; *solen*, a channel.] Obconical, pedunculate; central oscula having thin walled tubes extending to the base; oscula surrounded with radiating canals, between which there are vertical ones. Type *S. obconicus*. *obconicus*, Ulrich & Everett, (in press,) *Geo. Sur. Ill.*, vol. 8, p. 274, Trenton Gr.

STREPTOSPONGIA, Ulrich, 1889, *Am. Geo.*, vol. 3, p. 244. [Ety. *streptos*, twisted; *spongia*, sponge.] Massive, composed of intertwining vertical lamellæ, separated by tortuous linear interspaces. Type *S. labyrinthica*. Poorly defined.

labyrinthica, Ulrich, 1889, *Am. Geo.*, vol. 3, p. 244, Hud. Riv. Gr.

Strobilospongia, Beecher, 1889, *Mem. Pea. Mus.*, vol. 2, p. 14, syn. for *Pattersonia aurita*, see *Pattersonia aurita*.

tuberosa, see *Pattersonia tuberosa*.

STROMATOCERIUM, Hall, 1847, *Pal. N. Y.*, vol. 1, p. 48. [Ety. *stroma*, layer; *kerion*, honey-comb.] Hemispherical, composed of numerous concentric vesicular layers, more or less wrinkled, without the pores that characterize *Stromatopora*. Type *S. rugosum*.

richmondense, see *Strephochetus richmondensis*.

rugosum, Hall, 1847, *Pal. N. Y.*, vol. 1, p. 48, Birdseye and Black Riv. Gr.

inciso-lobata, see *Astylospongia incisolobata*.

stellatim-sulcata, see *Astylospongia stellatim-sulcata*.

STREPHOCHETUS, Seely, 1885, *Am. Jour. Sci. and Arts.* 3d ser., vol. 30, p. 355.

[Ety. *strepheo*, I

STROMATOPORA, Goldfuss, 1826, *Petref. Germ.*, p. 22. [Ety. *stroma*, stratum; *poros*, pore.] Dimorphous masses or extended sheets composed of delicate calcareous laminae, in successive layers, separated by minute, vertical pillars, dividing the interval into minute subquadrangular cavities; the whole is perforated by canals irregularly disposed and possessed of exhalant apertures. Type *S. concentrica*.

caespitosa, Winchell, 1866, *Rep. Low. Penin. Mich.*, p. 91, Ham. Gr.
compacta, Billings, 1862, *Pal. Foss.*, vol. 1, p. 55, Black Riv. Gr. There is some doubt about the reference of this species to this genus. Possibly it is a bryozoan.
concentrica, Goldfuss, 1826, *Germ. Petref.*,



FIG. 123.—*Stromatocerium rugosum*.

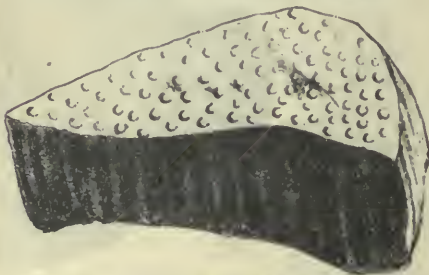
p. 22, and *Pal. N. Y.*, vol. 2, p. 136, Niagara Gr.
constellata, see *Ccenostroma constellatum erratica*, Hall, 1873, 23d *Rep. N. Y. St. Mus. Nat. Hist.*, p. 226, Up. Held. Gr.

expansa, Hall & Whitfield, 1873, 23d *Rep. N. Y. St. Mus. Nat. Hist.*, p. 226, Chemung Gr.
granulata, Nicholson, 1873, *Ann. and Mag. Nat. Hist.*, 4th ser., vol. 12, p. 92, Corniferous Gr.



FIG. 124.—*Stromatopora hindii*. *hindii*, Nicholson, 1874, *Ann. and Mag. Nat. Hist.*, 4th ser., vol. 13, and *Pal. Prov. of Ont.*, p. 13, Niagara Gr.

- incrustans*, see *Caenopora incrustans*.
mammillata, Nicholson, 1873, Ann. and Mag. Nat. Hist., 4th ser., vol. 12, p. 92, Corniferous Gr.
monticulifera, see *Cænostroma monticuliferum*.
nodulata, Nicholson, 1875, Ohio Pal., vol. 2, p. 249, Corniferous Gr.
nulliporoides, Nicholson, 1875, Pal. Prov. Ont., p. 78, Ham. Gr.
nux, Winchell, 1866, Rep. Low. Penin. Mich., p. 91, Ham. Gr.
ostiolata, Nicholson, 1873, Ann. and Mag. Nat. Hist., 4th ser., vol. 12, p. 90, Guelph Gr.
perforata, Nicholson, 1874, Ann. and Mag. Nat. Hist., 4th ser., vol. 13, and Pal. Prov. of Ont., p. 15, Corniferous Gr.
ponderosa, Nicholson, 1875, Ohio Pal., vol. 2, p. 246, Corniferous Gr.
pustulifera, see *Cænostroma pustuliferum*.
pustulosa, Safford. Not defined.
solidula, see *Cænostroma solidulum*.
subcylindrica, James, 1885, Jour. Cin. Soc. Nat. Hist., vol. 7, p. 20, Hud. Riv. Gr. Poorly defined. Not a Stromatopora. None have been found in Lower Silurian rocks.
substriatella, Nicholson, 1875, Ohio Pal., vol. 2, p. 248, Corniferous Gr.
tuberculata, Nicholson, 1873, Ann. and Mag. Nat. Hist., 4th ser., vol. 12, p. 90, Corniferous Gr.
verrucosa, Troost, 1840, 5th Geo. Rep. Tenn., p. 66, Devonian? Not recognized.
- STROTOSPONGIA**, Ulrich & Everett, (in press.) Geo. Sur. Ill., vol. 8, p. 276. [Ety. *strotos*, twisted; *spongia*, sponge.] Funnel-shaped, composed of thin, intricately intertwined vertical leaves, arranged radiately around oscula; cloacal depressions, having apertures of vertical tubes in them; sponge-wall traversed by intertwined canals, having perforated thin walls; spicules minute, three-rayed. Type *S. maculosa*.
maculosa, Ulrich & Everett, (in press.) Geo. Sur. Ill., vol. 8, p. 277, Trenton Gr.
Syringophyllum, Ulrich, (in press.) Geo. Sur. Ill., vol. 8, p. 250. The name was preoccupied by Edwards & Haime.

FIG. 125.—*Syringostroma columnare*.

SYRINGOSTROMA, Nicholson, 1875, Ohio Pal., vol. 2, p. 251. [Ety. *syrinx*, pipe; *stroma*, layer.] Massive, composed of con-

centric laminae, and vertical pillars firmly amalgamated. It is intimately related to Stromatopora. Type *S. columnare*.

columnare, Nicholson, 1875, Ohio Pal., vol. 2, p. 253, Corniferous Gr.

densum, Nicholson, 1875, Ohio Pal., vol. 2, p. 251, Corniferous Gr.

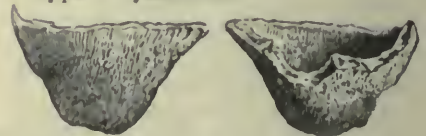
Teatularia paleotrochus, see *Valvulina paleotrochus*.

THAMNODICTYA, Hall, 1884, 35th Rep. N. Y. St. Mus. Nat. Hist. p. 466. [Ety. *thamnos*, shrub; *dictyon*, net.] Fronds tubular below, rapidly expanding and cyathiform or infundibuliform above, with twelve strong, longitudinal ridges dividing the surface into twelve areas. Substance reticulate. Type *T. newberryi*.

newberryi, Hall, 1863, (Dictyophyton newberryi,) 16th Rep. N. Y. St. Mus. Nat. Hist., p. 87, Waverly Gr.

FIG. 126.—*Thamnodictya newberryi*.

TRACHYUM, Billings, 1865, Pal. Foss., vol. 1, p. 211. [Ety. *trachus*, rough, rugged.] Turbinate or cylindrical, with a cup on the upper surface. Type *T. cyathiforme*.

FIG. 127.—*Trachyum cyathiforme*.

cyathiforme, Billings, 1865, Pal. Foss., vol. 1, p. 211, Quebec Gr.

rugosum, Billings, 1865, Pal. Foss., vol. 1, p. 212, Quebec Gr.

TRICHOSPONGIA, Billings, 1865, Pal. Foss., vol. 1, p. 357. [Ety. *trichias*, to show hairs; *spongia*, sponge.] Large, rudely hemispheric, minutely fibrous, and full of elongate cylindrical or acerate spicules, just visible to the naked eye. There are also numerous irregular branching canals. Type *T. sericea*.

sericea, Billings, 1865, Pal. Foss., vol. 1, p. 257, Calciferous Gr.

UPHANTENIA, Vanuxem, 1842, Geo. Rep. 3d Dist. N. Y., p. 183. [Ety. *uphantos*, woven; *tainia*, ribbon.] Composed of ligulate radiating and concentric bands, the reticulations being produced by the substance of the frond, and not by superficial striæ. For many years it was supposed to represent a marine plant. Type *U. chemungensis*.

- chemungensis, Vanuxem, 1842, Geo. Rep. 3d Dist. N. Y., p. 183, Chemung Gr. *dawsoni*, see *Physospongia dawsoni*.
- VALVULINA, D'Orbigny, 1826, Tabl. Method. d. l. Classe d. Cephalopodes. [Ety. *valva*, door; *inus*, implying resemblance.] Free or adherent, spirally trochoid, turbinoid, planoconvex or sub-cylindrical, chambers spirally arranged, sometimes terminating in a rectilinear series. Aperture in the umbilical angle, on the inferior surface, protected by a valvular tongue. Type *V. triangularis*.
- bulloides, Brady, 1876, Monog. Carb. and Perm. Foraminifera, p. 89, Carboniferous.
- decurrens, Brady, 1873, Mem. Geo. Sur. Scotland, pp. 63-95, Carboniferous.
- palæotrochus, Ehrenberg, 1854, (*Textularia palæotrochus*.) Mikrogeologie, Carboniferous.
- plicata, Brady, 1873, Mem. Geo. Sur., Scotland, pp. 66-95, Carboniferous.
- rudis, Brady, 1876, Monog. Carb. and Perm. Foraminifera, p. 90, Carboniferous.
- ZITTELELLA, Ulrich & Everett, (in press,) Geo. Sur. Ill., vol. 8, p. 267. [Ety. proper name.] Pedunculate, attached, variable in shape; upper surface with a shallow, central depression, with thin walled, vertical tubes extending to the base; radiating, inosculating canals, separated by spicular tissue, giving the appearance of vertical fissures. Type *Z. typicalis*. Ulrich & Everett refer *Palæospongia trentonensis* to this genus, so probably this genus is a synonym for *Palæospongia*.
- inosculata, Ulrich & Everett, (in press,) Geo. Sur. Ill., vol. 8, p. 271, Trenton Gr.
- lobata, Ulrich & Everett, (in press,) Geo. Sur. Ill., vol. 8, p. 270, Trenton Gr.
- typicalis, Ulrich & Everett, (in press,) Geo. Sur. Ill., vol. 8, p. 268, Trenton Gr. They have also made the varieties *pistilliformis*, *subrotunda*, and *turbinata*.

SUBKINGDOM CŒLEENTERATA.

THE Cœlenterata (*koilos*, hollow; *entera*, intestines) are divided into three Classes: viz., Anthozoa, Hydrozoa, and Ctenophora; the first two of which include the palæozoic fossils of this Subkingdom. The Anthozoa (*anthos*, flower; *zoon*, animal) are more generally known by the name Polypi (*polys*, many; *pous*, foot). They are all aquatic, usually cylindrical, organized for sedentary life, have no locomotive organs, and are provided with a circle of retractile tentaculæ around the mouth, which is destitute of any masticating apparatus, and they have a central gastric cavity. There are no special organs of sense, and they increase by budding, dividing, and by means of ova.

The skeleton which the polyps secrete is technically called the corallum. The secretions take place at the sides and lower part of the polyp, but not in the disk or stomach. Each septum is secreted between a pair of radiating, fleshy partitions or septa of the polyp, and hence the radiate structure of ordinary corals is an expression of the internal radiate structure of the polyp. The corallum is essentially a skeleton of carbonate of lime, the open spaces in which show the structure of the polyp animal. The bottom of the calyx, or calycle, in the corallum may be made by the meeting of the septa, or by the twisting of them together, with the addition of a point or columella at the center; or the bottom may be a porous or vesicular mass; or it may be solid, because the coral secretions of the polyp may fill up the pores, or because there are formed periodically, as the polyp grows upward, solid horizontal plates across the bottom, called tabulæ.

Wherever a tabula cuts off the connection of the polyp with the coral below, the tissues below the tabula dry and wither, and we have dead coral below the

tabula, and the living polyp above. In this way massive corals are formed; the secretions take place at the top, and the animal cuts itself off from the coral skeleton below. Prof. Dana says:

“It is not more surprising, nor a matter of more difficult comprehension, that a polyp should form structures of stone (carbonate of lime) called coral, than that the quadruped should form its bones, or the mollusk its shell. The processes are similar, and so the result. In each case it is a simple animal secretion; a secretion of stony matter from the aliment which the animal receives, produced by the parts of the animal fitted for this secreting process; and in each, carbonate of lime is a constituent or one of the constituents of the secretion.”

Ordinary corals of the present seas have a hardness a little greater than common marble, or about equal to aragonite, and give a ringing sound when struck with a hammer.

The Anthozoa are divided into three Subclasses, two of which, Zoantharia (*zoon*, animal; *anthos*, flower) and Alcyonaria (*alkuoneion*, a zooplyte, like the kingfisher's nest), occur in palæozoic rocks. The Zoantharia are divided into seven orders, four of which are said to be palæozoic: viz., Perforata, Tabulata, Rugosa, and Tubulosa. To the Perforata the genera *Protarea* and *Pleurodictyum* have been very doubtfully referred, and the *Auloporidæ* have been classed with the Tubulosa. All other palæozoic corals are referred to the Tabulata and Rugosa. The family *Favositidæ* is typical of the Tabulata, and the family *Cyathophyllidæ* of the Rugosa. Authors are not in accord respecting the ordinal relations of all the families, and hence we will simply arrange them alphabetically.

CLASS ANTHOZOA.

SUBCLASS ZOANTHARIA.

FAMILY AULOPORIDÆ.—*Aulopora*, *Romingeria*.

FAMILY CHETETIDÆ.—*Chetetes*, *Dania*, *Ptychonema*.

FAMILY COLUMNARIIDÆ.—*Calapœcia*, *Columnaria*, *Favistella*.

FAMILY CYATHOPHYLLIDÆ.—*Acervularia*, *Aerophyllum*, *Amplexus*, *Anisophyllum*, *Arachnophyllum*, *Astræophyllum*, *Aulacophyllum*, *Aulophyllum*, *Axophyllum*, *Baryphyllum*, *Blothrophyllum*, *Bucanophyllum*, *Campophyllum*, *Chonophyllum*, *Clisiophyllum*, *Coleophyllum*, *Craspedophyllum*, *Crepidophyllum*, *Cyathophyllum*, *Diphyphyllum*, *Duncanella*, *Elasmophyllum*, *Eridophyllum*, *Hadrophyllum*, *Hallia*, *Heliophyllum*, *Heterophrentis*, *Lithostrotion*, *Lophophyllum*, *Omphyma*, *Pachyphyllum*, *Palæophyllum*, *Phillipsastrea*, *Ptychophyllum*, *Pycnostylus*, *Streptelasma*, *Strombodes*, *Stylastrea*, *Trochophyllum*, *Zaphrentis*.

FAMILY CYCLOLITIDÆ.—*Combophyllum*, *Discophyllum*, *Microcylus*, *Paleocyclus*.

FAMILY CYSTIPHYLLIDÆ.—*Cystiphorolites*, *Cystiphyllum*, *Cystostylus*.

FAMILY FAVOSITIDÆ.—*Alveolites*, *Chonostegites*, *Cladopora*, *Cœnites*, *Dendropora*, *Emmonsia*, *Favosites*, *Leptopora*, *Lunatipora*, *Michelinia*, *Pleurodictyum*, *Pachypora*, *Spherolites*, *Striatopora*, *Syringolites*, *Trachypora*, *Vermipora*.

FAMILY HALYSITIDÆ.—*Halysites*.

FAMILY PORITIDÆ.—*Protarea*.

FAMILY SYRINGOPORIDÆ.—Cannapora, Syringopora, Thecostegites.

FAMILY TETRADIIDÆ.—Tetradium.

FAMILY THECIDÆ.—Thecia.

SUBCLASS ALCYONARIA.

FAMILY BOLBOPORITIDÆ.—Bolboporites.

FAMILY HELIOPORIDÆ.—Heliolites, Lyellia, Plasmopora.

FAMILY MONTICULIPORIDÆ.—Dekayella, Dekayia, Diplotrypa, Monotrypa, Monotrypella, Monticulipora, Nebulipora, Nyctopora, Prasopora.

FAMILY STELLIPORIDÆ.—Stellipora.

CLASS HYDROZOA.

This class is represented in palæozoic rocks by carbonaceous horny skeletons, called Graptolites. They are usually flattened, forming a thin film between shaly or slaty layers, and generally, in whatever rocks they occur, they are more or less compressed. Specimens are found in clay nodules and in calcareous clay beds, at Cincinnati and vicinity, which are cylindrical branching bodies, or have subquadrate stipes, covered with a thin, carbonaceous coating. The interior of one species is divided by longitudinal partitions of thin, carbonaceous films, into three departments, one of which is only about half the capacity of either of the other two. The denticulated edges on flattened films become projecting cells on more perfect specimens. The projecting cells may be subcircular or angular, and lead directly to the interior. When the interior substance is absent, and the cells are pressed together, instead of being pressed into the stipe, there is presented a diagrammatic side view of the cells, which furnishes the usual saw or denticulated aspect, but which gives a very imperfect, and frequently a very erroneous, idea of the form of the animal. This was the first Order of organisms to reach a high state of development, and the first to become extinct.

ORDER GRAPTOLIDA.

FAMILY CALLOGRAPTIDÆ.—Acanthograptus, Callograptus, Cyclograptus, Dendrograptus.

FAMILY DICTYONEMIDÆ.—Calyptograptus, Dictyonema, Rhizograptus.

FAMILY GRAPTOLITIDÆ.—Cladograptus, Climacograptus, Clonograptus, Dicanograptus, Didymograptus, Diplograptus, Graptolithus.

FAMILY GLOSSOGRAPTIDÆ.—Glossograptus, Retiograptus.

FAMILY NEMAGRAPTIDÆ.—Nemagraptus.

FAMILY MONOGRAPTIDÆ.—Monograptus.

FAMILY INOCAULIDÆ.—Inocaulus.

FAMILY MEGALOGRAPTIDÆ.—Megalograptus.

FAMILY OLDHAMIIDÆ.—Oldhamia.

FAMILY PHYLLOGRAPTIDÆ.—Phyllograptus.

FAMILY PTILOGRAPTIDÆ.—Ptilograptus.

FAMILY RASTRITIDÆ.—Rastrites.

FAMILY RETIOLITIDÆ.—RETIOLITES.

FAMILY STAUROGRAPTIDÆ.—Staurograptus.

FAMILY THAMNOGRAPTIDÆ.—Bythograptus, Thamnograptus.

FAMILY UNCERTAIN.—Dawsonia.

ACANTHOGRAPTUS, Spencer, 1878, Can. Nat.,

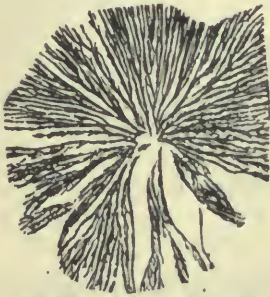


FIG. 128.—*Acanthograptus pulcher*.

Can. Nat., vol. 8, p. 463, and Bull. No. 1, Mus. Univ., St. Mo., p. 31, Niagara Gr. pulcher, Spencer, 1884, Bull. No. 1, Mus. Univ. St. Mo., p. 32, Niagara Gr.

ACERVULARIA, Schweigger, 1820, Handb. der

Naturg., p. 418. [Ety. *acervus*, a heap; considered as a body.] Compound, massive, cells presenting two separated walls, as in *Aulophyllum*; septa well developed between the walls, but much less in the central area; no columella; tabulæ little developed; increasing by gemmation. Type A. *baltica*.

adjunctiva, White, 1880, Proc. U. S. Nat. Mus., vol. 2, p. 255, and Cont. to Pal. No. 6, p. 120, Carboniferous.

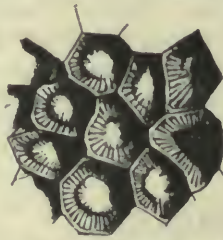


FIG. 129.—*Acervularia clintonensis*.

clintonensis, Nicholson, 1875, Ohio Pal., vol. 2, p. 227, Niagara Gr.

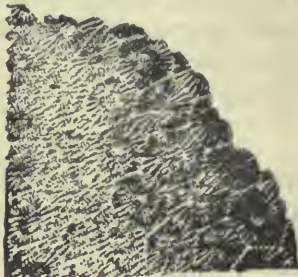


FIG. 130.—*Acervularia davidsoni*.

davidsoni, Edwards & Haime, 1851, Pol. Foss. d. Terr. Pal., p. 418, Up. Held. and Ham. Gr.

inequalis, Hall & Whitfield, 1873, 23d Rep. N. Y. St. Mus. Nat. Hist., p. 233, Chemung Gr.

pentagona, Goldfuss, 1826, (Cyathophyllum pentagonum,) Petref. Germ., p. 60, Devonian.

profunda, Hall, 1858, Geo. Sur. Iowa, p. 477, Ham. Gr.

ACROPHYLLUM, Thomson & Nicholson, 1876, Ann. and Mag. Nat. Hist. 4th ser. vol. 17, p. 455. [Ety. *akros*, summit; *phyllon*, leaf.] Corallum simple, turbinate, or sub-cylindrical, straight, or curved; septa numerous, well-developed, coalescing, and curving as they reach the tabulæ,

forming prominent, tortuous ridges on the central, elevated portion, and becoming complicated with the tabulæ to form the conspicuous, central prominence, which often forms a central axis; fossette reaches from the base of the elevation to the margin of the calyx; exterior usually constricted. Type A. *oneidaense*.

oneidaense, Billings, 1859, (Clisiophyllum oneidaense, Can. Jour., p. 128, Up. Held. Gr.

agaricia, Lamarck, 1801, Syst. des Anim. sans Vert. Not Palæozoic.

swinderniana, see *Thecia swinderniana*.

ALVEOLITES, Lamarck, 1801, Syst. des Anim. sans Vert., p. 375. [Ety. *alveus*, cavity; *lithos*, stone.) Dendroid, massive, or in-crusting; corallites short, prismatic, or cylindrical; walls united; tabulæ complete; mural pores large, usually near the angles of the tubes, few in number; calices oblique, lower lip most prominent; septa absent, or forming tooth-like projections. Type A. *escharoides*.

arctica, Woodward, 1879, Lond. Geo. Mag. n. s., vol 5, Devonian.

billingsi, Nicholson, 1874, Geo. Mag. n. s., vol. 1, p. 55, Up. Held. Gr.

confertus, Nicholson, 1874, Geo. Mag. n. s., vol. 1, p. 54, Up. Held. Gr.



FIG. 131.—*Acrophyllum oneidaense*.

cryptodens, Billings, 1859, Can. Jour., vol. 4, p. 115, Up. Held. Gr.
 distans, Nicholson, 1874, Geo. Mag. n. s., vol. 1, p. 54, Up. Held. Gr.
dubia, see Favosites dubius.
 explanatus, Hall, 1883, Rep. St. Geol., pl. 13, fig. 16, and Pal. N. Y., vol. 6, p. 11, Low. Held. Gr.

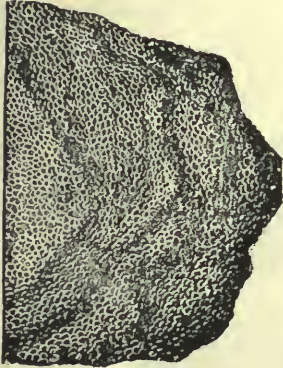


FIG. 132.—Alveolites goldfussi.

Not defined so as to be recognized.

hemisphericus, D'Orbigny, 1850, Prodr. d. Paléont., t. 1, p. 49. Not defined so as to be recognized.
 irregularis, Whitfield, 1878, Ann. Rep. Geo. Sur. Wis., p. 72, and Geo. Wis., vol. 4, p. 251, Hud. Riv. Gr.
 labechi, Edwards & Haime, 1851, Pol. Foss. d. Terr. Pal., p. 257, Anticosti Gr.
 labiosus, Billings, 1859, Can. Jour., vol. 4, p. 114, Up. Held. Gr.
 megastoma, Winchell, 1866, Rep. Low. Penin. Mich., p. 89, Ham. Gr.
 multilamella, Meek, 1877, U. S. Geo. Sur. 40th Parallel, vol. 4, p. 25, Devonian.
 niagarensis, Nicholson & Hinde, 1874, Can. Jour., vol. 14, p. 150, Niagara Gr.
niagarensis, Rominger, see *A. undosus*.
 ramulosus, Nicholson, 1874, Geo. Mag. n. s., vol. 1, p. 55, Up. Held. Gr.
 repens, Fought, 1749, (Millepora repens,) Amden. Acad., vol. 1, p. 99, Niagara Gr.
reticulata, see Favosites reticulatus.
 rockfordensis, Hall & Whitfield, 1873, 23d Rep. N. Y. St. Mus. Nat. Hist., p. 229, Chemung Gr.
 roemeri, Billings, 1860, Can. Jour., vol. 5, p. 255, Ham. Gr.
 selwyni, Nicholson, 1874, Geo. Mag. n. s., vol. 1, p. 15, Up. Held. Gr.
 squamosus, Billings, 1860, Can. Jour., vol. 5, p. 257, Up. Held. Gr.
 strigillatus, Winchell, 1866, Rep. Low. Peninsula Mich., p. 89, Ham. Gr.
 subramosus, Rominger, 1876, Foss. Corals, p. 43, Ham. Gr.
 undosus, S. A. Miller, 1883, Am. Pal. Foss., 2d ed., p. 262, Niagara Gr. Proposed for the species described by Rominger in 1876, in Foss. Corals, p. 40, under the preoccupied name of *A. niagarensis*.

exsul, see Callopora exsul.

fischeri, see Pachypora fischeri.

frondosus, see Pachypora frondosa.
 goldfussi, Billings, 1860, Can. Jour., vol. 5, p. 255, Ham. Gr.

granulosus, James, 1875, Catal. Cin. Foss., p. 2.

vallorum, Meek, 1868, Trans. Chi. Acad. Sci., p. 86, Devonian.

AMPLEXUS, Sowerby, 1814, Mineral Conchology, vol. 1, p. 165. [Ety. *amplexus*, encircling.] Resembles Zaphrentis, except the septa do not extend to the center, they leave the upper surface of the tabulæ exposed in that part; septal fossula highly developed in the upper portion of the corallum; tabulæ well developed; surface usually constricted. Type *A. coralloides*.

annulatus, Whitfield, 1878, Ann. Rep. Geo. Sur. Wis., p. 80, and Geo. Wis., vol. 4, p. 314, Niagara Gr.

cingulatus, Billings, 1862, Pal. Foss., vol. 1, p. 106, Mid. Sil.

coralloides, Sowerby, 1814, Min. Conch., vol. 1, p. 165, Warsaw Gr.

exilis, Billings, 1875, Can. Nat. and Geol., vol. 7, p. 232, Up. Held. Gr.

fieldeni, Etheridge, 1878, Quar. Jour. Geo. Soc., vol. 34, p. 589, Niagara Gr.

fenestratus, Whitfield, 1878, Ann. Rep. Geo. Sur. Wis., p. 80, and Geo. Wis., vol. 4, p. 278, Niagara Gr.

fragilis, White & St. John, 1868, Trans. Chi. Acad. Sci., p. 116, Keokuk Gr.

hamiltoniæ, Hall, 1876, Illust. Dev. Foss., pl. 19, Ham. Gr.

intermittens, Hall, 1876, Illust. Dev. Foss., pl. 32, Ham. Gr.

junctus, Hall, 1882, Foss. Corals Niagara and Up. Held. Groups, p. 11, and 35th Rep. N. Y. St. Mus. Nat. Hist., p. 415, Niagara Gr.

laxatus, Billings, (?) Can. Nat. and Geol., vol. (?) p. (?) Up. Held. Gr.

mirabilis, Billings, 1875, Can. Nat. and Geol., vol. 7, p. 232, Coal Meas.

phragmoceras, Salter, 1852, (Calophyllum phragmoceras)

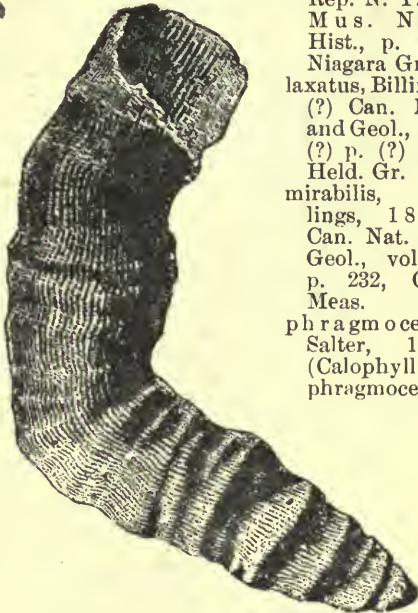


FIG. 133.—Amplexus yandelli

Sutherland's Jour., vol. 2, p. ccxxx, Niagara Gr.
 shumardi, Edwards & Haime, 1851, (Cya-

- thophyllum shumardi,) Pol. Foss. Terr. Pal., p. 370, Niagara Gr.
- uniformis, Hall, 1882, Foss. Corals Niagara & Up. Held. Grs., p. 11, and 35th Rep. N. Y. St. Mus. Nat. Hist., p. 415, Niagara Gr.
- yandelli, Edwards & Haime, 1851, Pol. Foss. d. Terr. Pal., p. 344. Up. Held. Gr. zaphrentiformis, White, 1876, Geo. of Uinta Mountains, p. 107, and Cont. to Pal. No. 6, p. 120, Low. Aubrey Gr.
- ANISOPHYLLUM, Edwards & Haime, 1851, Pol. Foss. d. Terr. Pal., p. 351. [Ety. *anisos*, unequal; *phyllon*, leaf.] Distinguished from *Zaphrentis* by the great development of three primary septa, one of which faces the septal fossula; this fossula extends to the center of the visceral chamber, and there ceases to be distinct from the bottom of the calycle. Type A. agassizi.
- agassizi, Edwards & Haime, 1851, Pol. Foss. d. Terr. Pal., p. 351, Low. Held. Gr. bilamellatum, Hall, 1882, Foss. Corals Niagara and Up. Held. Grs., p. 9, and 35th Rep. N. Y. St. Mus. Nat. Hist., p. 413, Niagara Gr.
- trifurcatum, Hall, 1882, Foss. Corals Niagara and Up. Held. Grs., p. 9, and 12th Rep. Ind. Geol. & Nat. Hist., p. 273, Niagara Gr.



FIG. 134.—*Anisophyllum unilargum*.

- unilargum, Hall, 1882, Foss. Corals Niagara and Up. Held. Grs., p. 8, and 12th Rep. Ind. Geol. & Nat. Hist., p. 272, Niagara Gr.
- Anthophyllum*, Schweigger, 1820, Handb. der Naturg., p. 417, Not a Palæozoic genus.
- denticulatum*, Goldfuss, 1826, Petref. Germ., p. 46, Niagara Gr. Not determined.
- expansum*, Owen, 1840, Rep. on Mineral Lands, p. 69. Not defined so as to be recognized.
- ARACHNOPHYLLUM, Dana, 1848, Zoophytes U. S. Expl. Exped., vol. 8, p. 360. [Ety. *arachne*, spider; *phyllon*, leaf.] Massive, encrusting, having obtusely defined polygonal scars, with a depressed, flattened center, in which the septa meet; septa thin, perforated; buds marginal, structure vesicular, arranged in transverse undulations, corresponding to the form of the cells; no defining walls to the center or between the stars; center marked by a few vertical striæ, resulting from the twisted edges of the septa. Type A. baltica. (*Acervularia baltica* of authors.)
- richardsoni, Salter, 1852, Sutherland's Jour., vol. 2., p. cccxxii, Up. Sil.
- Astræa*, Lamarck, 1816, Hist. Nat. d. Animaux Vert., vol. 2, p. 257. Not a Palæozoic genus.
- gigas*, see *Phillipsastrea gigas*.
- hennahi*, see *Smithia hennahi*.
- helianthoides*, see *Heliophyllum halli*.
- mammillaris*, see *Strombodes mammillaris*.

mammillaris, see *Lithostrotion mammillare*.

rugosa, see *Cyathophyllum rugosum*.

tessellata, Troost. Not defined.

- ASTRÆOPHYLLUM, Nicholson & Hinde, 1874, Can., Jour., vol. 14, p. 152. [Ety. *aster*, star; *phyllon*, leaf.] *Corallum* aggregate; corallites cylindrical and united by numerous mural expansions, which form complete floors; septa meeting in the center, forming a columella; costal radii prolonged over the successive exothecal floors; tabulæ rudimentary or absent (?). Type A. gracile.



FIG. 135.—*Astræophyllum gracile*, greatly enlarged, showing calices, confluent mural expansions, and costal radii.

- gracile*, Nicholson & Hinde, 1874, Can. Jour., vol. 14, p. 153 and Pal. Ontario, p. 57, Niagara Gr.
- Astrocerium*, Hall, 1852, Pal. N. Y., vol. 2, p. 120. [Ety. *aster*, star; *kerion*, honeycomb.] It was supposed to be distinguished from *Favosites* by the presence of twelve or more slender spiniform rays, but it is a synonym. Type A. venustum.
- constrictum*, see *Favosites constrictus*.
- parasiticum*, see *Favosites parasiticus*.
- pyriforme*, see *Favosites pyriformis*.
- venustum*, see *Favosites venustum*.
- AULACOPHYLLUM, Edwards & Haime, 1850, Brit. Foss. Corals, p. lxxvii. [Ety. *aulos*, furrow; *phyllon*, leaf.] Resembles *Hallia*, though the septal fossula is not replaced by a primary septum, but forms a narrow groove at the bottom where the adjoining septa meet. Type A. sulcatum.
- bilaterale, Hall, 1882, Foss. Corals Niagara and Up. Held. Grs., p. 25, and 35th Rep. N. Y. St. Mus. Nat. Hist., p. 429, Up. Held. Gr.
- convergens, Hall, 1882, Foss. Corals Niagara and Up. Held. Grs., p. 22, and 12th Rep. Ind. Geo., p. 281, Up. Held. Gr.
- cruciforme, Hall, 1882, Foss. Corals Niagara and Up. Held. Grs., p. 24, and 12th Rep. Ind. Geo., p. 283, Up. Held. Gr.
- pinnatum, Hall, 1882, Foss. Corals Niagara and Up. Held. Grs., p. 23, and 12th Rep. Ind. Geo., p. 284, Up. Held. Gr.
- poculum, Hall, 1882, Foss. Corals Niagara and Up. Held. Grs., p. 25 and 12th Rep. Ind. Geo., p. 283, Up. Held. Gr.

præciptum, Hall, 1882, Foss. Corals Niagara and Up. Held. Grs., p. 24, and 12th Rep. Ind. Geo., p. 280, Up. Held. Gr. prateriforme, Hall, 1882, Foss. Corals Niagara and Up. Held. Grs., p. 23, and 12th Rep. Ind. Geo., p. 282, Up. Held. Gr.



FIG. 136.—Aulacophyllum princeps.

princeps, Hall, 1882, Foss. Corals Niagara and Up. Held Grs., p. 23, and 12th Rep. Ind. Geo., p. 281, Up. Held. Gr. reflexum, Hall, 1882, Foss. Corals Niagara and Up. Held. Grs., p. 24, and 12th Rep. Ind. Geo., p. 284, Up. Held. Gr. sulcatum, D'Orbigny, 1850, (Caninia sulcata,) Prodr. d. Pal. t. 1, p. 105, and 12th Rep. Ind. Geo., p. 279, Up. Held. Gr. tripinnatum, Hall, 1882, Foss. Corals Niagara and Up. Held. Grs., p. 25, and 12th Rep. Ind. Geo., p. 285, Up. Held. Gr. trisulcatum, Hall, 1882, Foss. Corals Niagara and Up. Held. Grs., p. 25, and 12th Rep. Ind. Geo., p. 279, Up. Held. Gr.

AULOPHYLLUM, Edwards & Haime, 1850, Brit. Foss. Corals, p. lxx. [Ety. *aulos*, pipe; *phyllon*, leaf.] Corallum simple; septa well-developed; mural investments double, the interior dividing the visceral chamber into two parts—one central and columnar, the other external and annular; no columella; tabulæ not well developed. Type A. proliferum. richardsoni, Meek, 1868, Trans. Chi. Acad. Sci., p. 81, Devonian.

AULOPORA, Goldfuss, 1826, Petref. Germ., p. 82. [Ety. *aulos*, pipe; *poros*, pore.] Creeping, increasing by latero-basal gemmation; corallites pyriform, trumpet-shaped, the cavity of each communicating with the one from which it springs; no pores; septa absent or rudimentary. Type A. serpens.

annectans, Clarke, 1885, Bull. 16. U. S. Geo. Sur., p. 63, Genesee shales. aperta, Winchell, 1866, Rep. Low. Penin. Mich., p. 91, Ham. Gr. arachnoidea, Hall, 1847, Pal. N. Y., vol. 1, p. 76, Trenton and Hud. Riv. Gr. canadensis, see Hederella canadensis, conferta, Winchell, 1866, Rep. Low. Penin. Mich., p. 91, and Rominger's Foss. Corals, p. 88, Ham. Gr. cornulites, Hall, 1883, Rep. St. Geo., pl. 2, figs. 21 and 22, Low. Held. Gr. cornuta, see Romingeria cornuta. cyclopora, Winchell, 1866, Rep. Low. Penin. Mich., p. 92, Ham. Gr. elongata, Hall, 1887, Pal. N. Y., vol. 6., p. 5, Low. Held. Gr. erecta, Rominger, 1876, Foss. Corals, p. 88, Ham. Gr. filiformis, see Hederella filiformis. iowensis, Hall & Whitfield, 1873, 23d Rep. N. Y. St. Mus. Nat. Hist., p. 235, Chemung Gr. preciosus, Hall, 1876, 28th Rep. N. Y., St. Mus. Nat. Hist., p. 107, Niagara Gr. repens, Walch, et Knorr, 1775, (Milleporites repens,) Sammlung von Merkw., vol. 3, p. 179, and Sil. Fauna W. Tenn., p. 28, Niagara Gr. saxivada, Hall & Whitfield, 1873, 23d Rep. N. Y. St. Mus. Nat. Hist., p. 235, Chemung Gr. schoharie, Hall, 1874, 26th Rep. N. Y. St. Mus. Nat. Hist., p. 110, Low. Held. Gr. serpens, Goldfuss, 1826, Germ. Petref., p. 82, and Rominger's Foss. Corals, p. 87, Ham. Gr. serpuloides, Winchell, 1866, Rep. Low. Penin. Mich., p. 91, Ham. Gr.

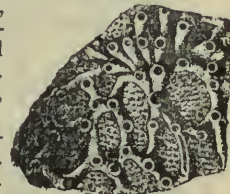


FIG. 137.—Aulopora serpens.

subtenuis, Hall, 1883, Rep. St. Geo., pl. 2, fig. 9-20, Low. Held. Gr. tubiformis, Goldfuss, 1826, Germ. Petref., p. 82, and Murch. Sil. Syst., Up. Held. and Ham. Gr. tubula, Hall, 1883, Rep. St. Geo., pl. 2, fig. 7-8, Low. Held. Gr. umbellifera, see Romingeria umbellifera. vanclovii, Hall, 1883, 12th Rep. Ind. Geo., p. 255, Niagara Gr.

Azinura, Castlenau, syn. for Lithostrotion. canadense, see Lithostrotion canadense.

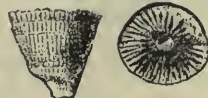


FIG. 138.—Axophyllum rude.

AXOPHYLLUM, Edwards & Haime, 1850, Brit. Foss. Corals, p. lxxii. [Ety. *axon*, axis; *phyllon*, leaf.] Corallum simple, trochoid, and in structure resembling Lithostrotion. Type A. expansum.

infundibulum, Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 525, Coal Meas.

rude, White & St. John, 1868, Trans. Chi. Acad. Sci., p. 115, Coal Meas.

BARYPHYLLUM, Edwards & Haime, 1850, Brit. Foss. Corals, p. lxvi. [Ety. *barys*, heavy; *phyllon*, leaf.] Corallum short; calice superficial; slight septal fossula corresponding to one of the branches of a cross, the other three of which are primary septa; younger septa inclined toward the primary ones. Type *B. verneuilanum*.

arenarium, Meek & Worthen, 1868, Geo. Sur. Ill., vol. 3, p. 409, Onondaga Gr.

fungulus, White, 1878, Proc. Acad. Nat. Sci. Phil., p. 29, Niagara Gr.

verneuilanum, Edwards & Haime, 1851, Pol. Foss. d. Terr. Pal., p. 352, Niagara Gr.

BLOTHROPHYLLUM, Billings, 1859, Can. Jour., vol. 4, p. 130. [Ety. *blothros*, tall-growing; *phyllon*, leaf.] Corallum simple, turbinate, or cylindrical, having the central region occupied by flat, transverse diaphragms; an intermediate area, with strong radiating septa, and an outer area, in which there are imperfect diaphragms, projecting upward, and having on their upper surface rudimentary septa; a thin, complete epitheca, and a septal fossette. Type *B. decorticatum*.

approximatum, Nicholson, 1873, Can. Nat. and Geo., vol. 7, p. 140, Up. Held. Gr.

cæspitosum, Rominger, 1876, Foss. Corals, p. 114, Niagara Gr.

decorticatum, Billings, 1859, Can. Jour., vol. 4, p. 130, Up. Held. Gr.

multalicatum, Hall, 1882, Foss. Corals Niagara and Up. Held. Grs., p. 44, and 35th Rep. N. Y. St. Mus. Nat. Hist., p. 448, Up. Held. Gr.

papulosum, Hall, 1882, Foss. Corals Niagara and Up. Held. Grs., p. 44, and 35th Rep. N. Y. St. Mus. Nat. Hist., p. 448, Up. Held. Gr.

promissum, Hall, 1882, Foss. Corals Niagara and Up. Held. Grs., p. 45, and 12th Rep. Ind. Geo., p. 304, Up. Held. Gr.

sinuosum, Hall, 1882, Foss. Corals Niagara and Up. Held. Grs., p. 45, and 35th Rep. N. Y. St. Mus. Nat. Hist., p. 449, Up. Held. Gr.



FIG. 139.—*Blothrophyllum promissum*.

BOLBOPORITES, Pander, 1830, Beitr. zur Geognosie Russlands, p. 106. [Ety. *bolbos*, bulb; *poros*, pore.]

Small, globular, showing basal attachment; structure dense. The type of the genus is said to be neither a coral nor bryozoan, but to belong to the Echinodermata. The form which Billings referred to the genus is probably a coral.

americanus, Billings, 1859, Can. Nat. and Geo., vol. 4, p. 429, Chazy Gr.

BUCANOPHYLLUM, Ulrich, 1886, Cont. to Am. Pal., p. 31. [Ety. *bukane*, trumpet; *phyllon*, leaf.] Corallum trumpet-shaped, consisting of a long, slender, cylindrical stem, with the upper end abruptly dilated into a cup, which becomes oblique in older specimens; interior of cup with numerous septal striæ, which become obsolete at the bottom. Type *B. gracile*.

gracile, Ulrich, 1886, Cont. to Am. Pal., p. 31, Up. Held. Gr.

BYTHOGRAPTUS, Hall, 1861, Geo. Rep. Wis., p. 18. [Ety. *bythos*, in the deep; *grapho*, I write.] Frond consisting of a central stipe, with closely arranged lateral branches, flexuous or recurved; celluiferous on one side; substance corneous brown or black. Type *B. latus*.

latus, Hall, 1861, Geo. Rep. Wis., p. 19, Trenton Gr.

Calamopora, Goldfuss, syn. for *Favosites basaltica*, see *Favosites basalticus*.

cellulata, Castelnau, 1843. Not recognized.

cristata, see *Favosites cristatus*.

cumberlandica, see *Favosites cumberlandicus*.

favosa, see *Favosites favosus*.

fibrosa, see *Monticulipora fibrosa*.

fibrosa, Roemer, see *Hindia fibrosa*.

forbesi var. *discoidea*, see *Favosites forbesi* var. *discoideus*.

goldfussi, see *Favosites goldfussi*.

gothlandica, see *Favosites gothlandicus*.

heliolitiformis, see *Favosites heliolitiformis*.

hemispherica, see *Favosites hemisphericus*.

infundibuliformis, Goldfuss, identified by D'Archiac and Verneuil. Not an American species.

mackrothi, see *Chetetes mackrothi*.

maxima, see *Favosites maximus*.

minuta, Castelnau. Not recognized.

minutissima, Castelnau. Not recognized.

radians, Castelnau. Not recognized.

tumida, see *Chetetes tumidus*.

verneuili, Castelnau, syn. for *Monticulipora fibrosa*.

winchelli, see *Favosites winchelli*.

CALAPŒCIA, Billings, 1865, Can. Nat. and Geo., 2d ser., vol. 2, p. 425. [Ety. *kalos*,

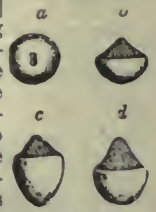


FIG. 140.—*Bolboporites americanus*. a, view of base; b, c, d, side views.

beautiful; *poikilos*, spotted.] Composite, hemispherical or subspherical, corallites slender, tubular, perforated as in Favosites, outside striated by imperfectly developed costæ; septa about 24; tabulæ thin; when corallites are not in contact the space is filled with vesicular tissue.

Type *C. canadensis*.
anticostiensis, Billings, 1866, Catal. Sil. Foss. Antic., p. 32, Hud. Riv. Gr.
canadensis, Billings, 1865, Can. Nat. and Geo., 2d ser., vol. 2, p. 426, Black Riv. Gr.
cribriformis, Nicholson, 1874, (Columpora cribriformis,) Geo. Mag., vol. 1, p. 253, and Pal. Ohio, vol. 2, p. 186, Hud. Riv. Gr.

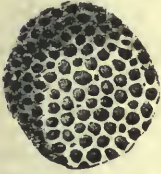


FIG. 141.—*Calapoecia cribriformis*.

huronensis, Billings, 1865, Can. Nat. and Geo., 2d ser., vol. 2, p. 426, Hud. Riv. Gr.
sandalina, Lamarck, 1801, Syst. des Animaux Vert., p. 139. [Ety. *calceola*, a slipper.] Corallum simple, operculated, subtriangular, pyramidal; calice deep; septa narrow; structure dense. Type *C. sandalina*.

americana, Safford, syn. for *C. tennesseensis*.

attenuata, Lyon, 1879, Proc. Acad. Nat. Sci. Phil., p. 45, Niagara Gr. Lindstrom referred this species to his genus *Rhizophyllum*.

corniculum, Lyon, 1879, Proc. Acad. Nat. Sci. Phil., p. 43, Niagara Gr. Syn. (?) for *C. tennesseensis*.

coxi, Lyon, 1879, Proc. Acad. Nat. Sci. Phil., p. 44, Niagara Gr. Syn. (?) for *C. tennesseensis*.



FIG. 142.—*Calceola sandalina*, showing deep callicle.

plicata, Conrad, 1840, Ann. Rep. N. Y., p. 207, Low. Held. Gr.

pusilla, Hall, 1882, Foss. Corals Niagara and Up. Held. Grs., p. 15, and 35th Rep. N. Y. St. Mus. Nat. Hist., p. 419, Niagara Gr.



FIG. 143.—*Calceola sandalina*, operculum.

sandalina, Lamarck. Not American.

tennesseensis, Roemer, 1852, Lethæ Geognost., p. 385, and Sil. Fauna W. Tenn., p. 73, Niagara Gr.

Lindstrom referred this species to his genus *Rhizophyllum*.

CALLOGRAPTUS, Hall, 1865, Can. Org. Rem. Decade 2, p. 133. [Ety. *kallos*, beautiful; *grapho*, I write.] Flabellate fronds, with

numerous slender, bifurcating branches proceeding from a strong stem; branches and divisions celluliferous on one side, striate on the other; sometimes distantly and irregularly united by transverse dissepiments. Type *C. elegans*.

elegans, Hall, 1865, Can. Org. Rem. Decade 2, p. 134, Quebec Gr. or Up. Taconic.

granti, Spencer, 1884, Bull. No. 1, Mus. Univ. St. Mo., p. 21, Niagara Gr.

minutus, Spencer, 1884, Bull. No. 1, Mus. Univ. St. Mo., p. 22, Niagara Gr.

multicaulis, Spencer, 1884, Bull. No. 1, Mus. Univ. St. Mo. p. 22, Niagara Gr.



FIG. 144.—*Callograptus niagarensis*.

niagarensis, Spencer, 1878, Can. Nat., vol. 8, and Bull. No. 1, Mus. Univ. St. Mo., p. 21, Niagara Gr.

salteri, Hall, 1865, Can. Org. Rem. Decade 2, p. 135, Quebec Gr., or Up. Taconic.

Calophyllum, Dana, 1846, Am. Jour. Sci., p. 183, syn. for *Amplexus*.

phragmoceras, see *Amplexus phragmoceras*.

CALYPTOGRAPTUS, Spencer, 1878, Can. Nat., vol. 8, p. 459. [Ety. *kalyptos*, covered; *grapho*, I write.] Cyathiform, bifurcating branches, not connecting laterally; resembles *Dicyonema*. Type *C. cyathiformis*.

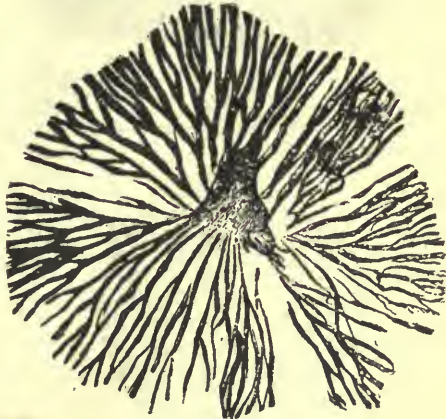


FIG. 145.—*Calyptograptus cyathiformis*.

cyathiformis, Spencer, 1878, Can. Nat., vol. 8, p. 459, Niagara Gr.

subretiformis, Spencer, 1878, Can. Nat. vol. 8, p. 460, Niagara Gr.

CAMPOPHYLLUM, Edwards & Haime, 1850, British Foss. Corals, p. lxxviii. [Ety. *kampto*, I bend; *phyllon*, leaf.] Simple, tall, protected by an epitheca; septa well developed; tabulæ very large and smooth toward the center; interseptal area vesicular. Type *C. flexuosum*.

nanum, Hall & Whitfield, 1873, 23d Rep. N. Y. St. Mus. Nat. Hist., p. 232, Chemung Gr.

texanum, Shumard, 1859, Trans. St. Louis Acad. Sci., vol. 1, p. 388, Permian.

torquium, Owen, 1852, (Cyanophyllum torquium),

Geo. Rep. Wis., Iowa, and Minn., pl. 4, fig. 2, Coal Meas.

Caninia, Michelin, syn. for *Zaphrentis*.

bilateralis, see *Zaphrentis* *bilateralis*.

punctata, D'Orbigny, 1850, Prodr. d. Paléont., t. 1, p. 105. Not defined so as to be recognized.



FIG. 146.—Campophyllum flexuosum. Vertical section $\frac{1}{2}$ diam. showing smooth central tabulæ.

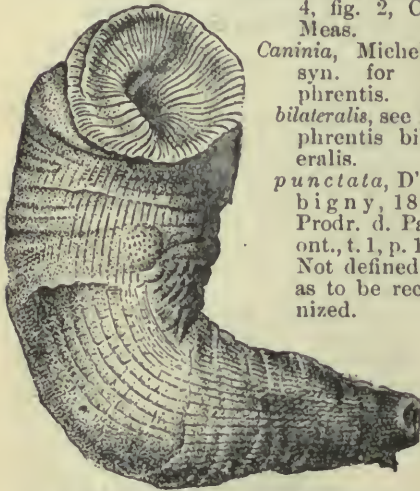


FIG. 147.—Campophyllum torquium.

sulcata, D'Orbigny, 1850, Prodr. d. Paléont., t. 1, p. 105. Not defined so as to be recognized.



FIG. 148.—Campophyllum torquium. Transverse section.

CANNAPORA, Hall, 1852, Pal. N. Y., vol. 2, p. 43. [Ety. *kanna*, reed; *poros*, pore.] Massive, tubular, united externally by

tabulæ; distinguished from *Syringopora*, by the regular transverse external tabulæ and by the internal structure of the corallites. Type *C. junciformis*.

annulata, Nicholson & Hinde, 1874, Can. Jour., p. 154, and Pal. Prov. of Ontario, p. 58, Niagara Gr.

junciformis, Hall, 1852, Pal. N. Y., vol. 2, p. 43, Clinton Gr.

Caryophyllia, Lamarck, 1816. Not Palæozoic. *cornicula*, see *Zaphrentis* *cornicula*.

gigantea, see *Zaphrentis* *gigantea*.

pulmonea, see *Zaphrentis* *pulmonea*.

Catenipora, Lamarck, 1816, syn. for *Halysites*. *melcheli*, Castlenau, syn. for *Halysites* *catenulatus*.

CHETETES, Fischer, 1837, Oryct. du Gouv. Moscou, p. 159. [Ety. *chaite*, hair.]

Corallum conglomerate; corallites very long, basaltiform; calyces polygonal; tabulæ not connected or on the same plane in different corallites; walls amalgamated, imperforate; growth fissiparous. Type *C. radians*.

abruptus, see *Monotrypella* *abrupta*.

æquidistans, Hall, 1881, Bryozoans Up. Held Gr., p. 4, Up. Held. Gr.

approximatus, Nicholson, syn. for *Monticulipora* *dalii*.

arbusculus, see *Monotrypella* *arbuscula*.

arcticus, Haughton, 1857, Jour. Roy. Dub. Soc., vol. 1, Silurian.

atritus, Nicholson, syn. for *Dekayia* *aspera*.

barrandii, see *Monticulipora* *barrandii*.

briareus, see *Monotrypella* *briareus*.

caliculus, see *Aspidopora* *caliculus*.

carbonarius, Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 526, Coal Meas.

cincinnatiensis, see *Monticulipora* *cincinnatiensis*.

clathratulus, James & Nicholson, syn. for *Monticulipora* *pavonia*.

clavacoideus, see *Leptopora* *clavacoidea*.

colliculatus, Hall, 1883, Rep. St. Geo., pl. 8, fig. 1-4, and Pal. N. Y., vol. 6, p. 11, Low. Held. Gr.

columnaris, see *Tetradium* *columnare*.

compressus, see *Peronopora* *compressa*.

consimilis, see *Monotrypella* *consimilis*.

corticans, Nicholson, syn. for *Spatiopora* *tuberculata*.

corticoa, see *Trematopora* *corticoa*.

crassus, Lonsdale, 1845, (Stenopora crassa,) Russ. and Ural Mts., vol. 1, p. 631, Coal Meas.

crebrirama, Hall, 1881, Bryozoans Up. Held. Gr., p. 4, Up. Held. Gr.

dalei, see *Monticulipora* *dalii*.

decipiens, see *Monticulipora* *decipiens*.

delicatulus, see *Monticulipora* *delicatula*.

discoideus, see *Amplexopora* *discoidea*.

egenus, Hall, 1881, Bryozoans Up. Held. Gr., p. 4, Up. Held. Gr.

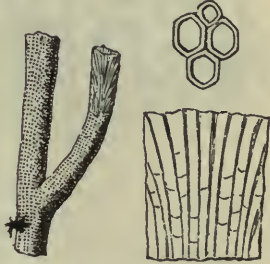
elegans, see *Discotrypa* *elegans*.

exilis, Dawson, 1868, Acad. Geo., p. 287, (Stenopora exilis,) Subcarb.

expansus, Ringueberg, 1886, Bull. Buf. Soc. Nat. Sci., vol. 5, p. 20. Not properly defined.

fibrosus see *Monticulipora fibrosa*.
filiata, see *Monticulipora filiosa*.
fletcheri, Edwards & Haime, as identified in Ohio Pal., vol. 2, p. 197, is *Monticulipora ulrichi*.
frondosus, see *Monticulipora frondosa*.
fruticosus, Hall, 1876, *Illust. Foss.*, pl. 38, Ham. Gr.
fruticosus, Hall, 1883, see *Monotrypella arbuscula*.
furcatus, Hall, 1876, *Illust. Devon. Foss.*, pl. 37, Ham. Gr.
fusiformis, Whitfield, 1878, *Ann. Rep. Geo. Sur. Wis.*, p. 70, and *Geo. Wis.*, vol. 4, p. 248, *Hud. Riv. Gr.* Not a *Chetetes*; probably a *Bryozoan*.
gracilis, see *Batostomella gracilis*.
granuliferus, see *Homotrypella granulifera*.
hamiltonensis, Winchell, 1866, *Rep. Low. Penin. Mich.*, p. 89, Ham. Gr.
helderbergiae, see *Ptychonema helderbergiae*.
humilis, Hall, 1876, *Illust. Devon. Foss.*, pl. 37, Up. Held. Gr.
internascens, Hall, 1881, *Bryozoans Up. Held. Gr.*, p. 4, Up. Held. Gr.
irregularis, see *Monticulipora irregularis*.
jamesi, see *Batostoma jamesi*.
lycoperdon, see *Monticulipora lycoperdon*.
mackrothi, Geinitz, 1846, (*Calamopora mackrothi*), *Grund*, p. 586, Permian, American (?).
mammulatus, see *Monticulipora mammulata*.
microscopica, Winchell, 1866, *Rep. Low. Penin. Mich.*, p. 90, Ham. Gr.
milleporaceus, Edwards & Haime, 1851, *Mon. d. Pol. Foss. d. Terr. Pal.*, p. 272, Coal Meas.
moniliformis, see *Monticulipora moniliformis*.
monticulatus, Hall, 1883, *Rep. St. Geo.*, pl. 8, fig. 5-7, and *Pal. N. Y.*, vol. 6, p. 12, Low. Held. Gr.
muscatinensis, White, 1876, *Proc. Acad. Nat. Sci. Phil.*, p. 27, Devonian.
newberryi, see *Prasopora newberryi*.
nodulosus, see *Callopora nodulosa*.
onealli, see *Callopora onealli*.
ortoni, see *Atactoporella ortoni*.
pavonia, see *Ptilodictya pavonia*.
petehialis, see *Petigopora petehialis*.
petropolitanus, Pander, 1830, *Russ. reiche*, p. 105. Not an American species.
pulchellus, Edwards & Haime, as identified in Ohio Pal., vol. 2, p. 195, is *Monticulipora andrewsi*.
quadrangularis; see *Paleschara quadrangularis*.
quadratus, see *Monotrypella quadrata*.
ramosus, see *Monticulipora ramosa*.
rhombicus, Nicholson, syn. for *Monotrypella quadrata*.
rugosus, see *Monticulipora rugosa*.
rugosus, Edwards & Haime, is a variety of *Monticulipora ramosa*.
sigillarioides, see *Callopora sigillarioides*.

sphaericus, see *Favosites sphaericus*.
spinigerus, Lonsdale, 1845, (*Stenopora spinigera*), *Geo. Russ. and Ural Mts.*, vol. 1, p. 631, Coal Meas.
subglobosus, see *Monticulipora subglobosa*.
subpulchellus, see *Monticulipora subpulchella*.
tabulatus, see *Ptychonema tabulatum*.
tuberculatus, see *Spatiopora tuberculata*.
tumidus, Phillips, 1836, (*Calamopora tumida*), *Geo. Yorkshire*, p. 200, Subcarb.
undulatus, see *Monticulipora undulata*.
venustus, see *Monticulipora venusta*.



CHONOPHYLLUM, FIG. 149.—*Chetetes tumidus*.

Edwards & Haime, 1850, *Brit. Foss. corals*, p. lxix. [Ety. *chonos*, funnel; *phyllon*, leaf.]
 Corallum simple, constituted, principally, by a series of infundibuliform tabulae, superposed and invaginated, upon the surface of which, equally developed septal radii extend from center to circumference; no walls or columella. Type *C. perforiatum*.
belli, Billings, 1865, *Can. Nat. and Geo.* vol. 2, p. 431 Clinton Gr.
capax, Hall, 1882, *Foss. Corals Niagara & Up. Held. Grs.*, p. 6, and 35th Rep. N. Y. St. Mus. Nat. Hist., p. 410, Niagara Gr.
ellipticum, Hall & Whitfield, 1873, 23d Rep. N. Y. St. Mus. Nat. Hist., p. 233, Chemung Gr.
magnificum, Billings, 1860, *Can. Jour.*, vol. 5, p. 264, Up. Held. Gr.
niagarensis, Hall, 1852, (*Conophyllum niagarensis*), *Pal. N. Y.*, vol. 2, p. 114, Niagara Gr.
ponderosum, Rominger, 1876, *Foss. Corals*, p. 117, Ham. Gr.
sedaliense, White, 1880, 12th Rep. U. S. Geo. Sur. Terr., p. 157, Choteau limestone.
vadum, Hall, 1884, 35th Rep. N. Y. St. Mus. Nat. Hist., p. 410, Niagara Gr.
validum, Hall, 1882, *Foss. Corals Niagara and Up. Held. Grs.*, p. 6, and 12th Rep. Geo. Ind., p. 272, Niagara Gr.



FIG. 150.—*Conophyllum niagarensis*.

CHONOSTEGITES, Edwards & Haime, 1851, *Pol. Foss. d. Terr. Pal.*, p. 299. [Ety. *konos*, cone; *stegē*, covering.] Subhemispheric; corallites cylindrical, annulated, connected at the expansions, imperforate at the constrictions; mural pores where the [corallites] are contiguous; tabulae

numerous; septa consisting of short spines; growth by gemmation. Type *C. clappi*.



FIG. 151.—*Chonostegites ordinatus*.

- clappi*, Edwards & Haime, 1851, Pol. Foss. d. Terr. Pal., p. 299, Up. Held. Gr.
- ordinatus*, Billings, 1859, (Haimophylum *ordinatum*), Can. Jour., vol. 4, p. 139, Up. Held. Gr.
- CLADOGRAPTUS**, Geinitz, 1852, (Cladograpus,) Verst. Grauw. Sachs. and Emmons, Am. Geo., p. 107. [Ety. *klados*, twig; *grapho*, I write.] Serrations, or cells, arranged on the outer sides of branching stipes; no axis.
- dissimilaris*, Emmons, 1856, Am. Geo., p. 107, Upper Taconic.
- inequalis*, Emmons, 1856, Am. Geo., p. 107, Upper Taconic.
- CLADOPORA**, Hall, 1852, Pal. N. Y., vol. 2, p. 137. [Ety. *klados*, twig; *poros*, pore.] Ramose or reticulate; branches cylindrical or compressed; terminations terete; corallites radiating from the axis, and opening upon the surface in rounded or subangular expanded mouths; tabule and septal crests usually obsolete, sometimes present; corallites connected by mural pores. Type *C. seriata*.
- alpenensis*, Rominger, 1876, Foss. Corals, p. 51, Ham. Gr.
- aspera*, Rominger, 1876, Foss. Corals, p. 56, Up. Held. Gr.
- cæspitosa*, Hall, 1852, Pal. N. Y., vol. 2, p. 138, Niagara Gr.
- canadensis*, Rominger, 1876, Foss. Corals, p. 49, syn. for *Pachypora frondosa*.
- cervicornis*, Hall, 1852, Pal. N. Y., vol. 2, p. 139, Niagara Gr.
- dichotoma*, Hall, 1858, Geo. Sur. Iowa, p. 478, Ham. Gr.
- expatiata*, Rominger, 1876, Foss. Corals, p. 57, Up. Held. Gr.
- fibrosa*, Hall, 1852, Pal. N. Y., vol. 2, p. 139, Niagara Gr.
- imbricata*, Rominger, 1876, Foss. Corals, p. 56, Up. Held. Gr.
- labiosa*, Billings, 1859, Can. Jour., vol. 4, p. 138, Up. Held. Gr.
- laqueata*, Rominger, 1876, Foss. Corals, p. 46, Niagara Gr.
- lichenoides*, Winchell & Marcy, 1865, Bost. Soc. Nat. Hist., vol. 1, p. 84, Niagara Gr.
- lichenoides*, Rominger, 1876, see *C. winchellana*.
- macrophora*, Hall, 1852, Pal. N. Y., vol. 2, p. 140, Niagara Gr.
- magna*, Hall & Whitfield, 1873, 23d Rep. N. Y. St. Mus. Nat. Hist., p. 230, Up. Held. Gr.
- multi-pora*, Hall, 1852, Pal. N. Y., vol. 2, p. 140, Niagara Gr.
- palmata*, Hall, 1873, 23d Rep. N. Y. St. Mus. Nat. Hist., p. 231, Up. Held. Gr.
- pinguis*, Rominger, 1876, Foss. Corals, p. 53, Up. Held. Gr.
- prolifera*, Hall & Whitfield, 1873, 23d Rep. N. Y. St. Mus. Nat. Hist., p. 230, Up. Held. Gr.
- pulchra*, Rominger, 1876, Foss. Corals, p. 54, Up. Held. Gr.
- reticulata*, Hall, 1852, Pal. N. Y., vol. 2, p. 141, Niagara Gr.
- rimosa*, Rominger, 1876, Foss. Corals, p. 53, Up. Held. Gr.
- robusta*, Rominger, 1876, Foss. Corals, p. 55, Up. Held. and Ham. Gr.
- sarmentosa*, Hall, 1876, Desc. New Spec. Foss., p. 3, and 11th Geo. Sur. Ind., p. 230, Niagara Gr.
- seriata*, Hall, 1852, Pal. N. Y., vol. 2, p. 137, Niagara Gr.
- turgida*, Rominger, 1876, Foss. Corals, p. 49, Up. Held. Gr.
- verticillata*, Winchell & Marcy, 1865, Bost. Soc. Nat. Hist., vol. 1, p. 84, Niagara Gr.
- winchellana*, S. A. Miller, 1883, 2d Ed. Am. Pal. Foss., p. 265, Up. Held. Gr. Proposed for the species described by Rominger under the preoccupied name of *C. lichenoides*, in Foss. Corals, p. 47.
- CLIMACOGRAPTUS**, Hall, 1865, Can. Org. Rem. Decade 2, p. 111. [Ety. *klimax*, ladder; *grapho*, I write.] Simple stipes, with subparallel margins, having a range of cells on each side; axis subquadrate; apertures transversely oval or subquadrate; denticles on the upper side of the apertures. Type *C. bicornis*.
- antennarius*, Hall, 1863, (Graptolithus *antennarius*), Geo. of Can., p. 955, and Can. Org. Rem. Decade 2, p. 112, Quebec Gr.
- bicornis*, Hall, 1847, (Graptolithus *bicornis*), Pal. N. Y., vol. 1, p. 268, Hud. Riv. Gr.
- emmonsii*, Walcott, 1886, Bull. U. S. Geo. Sur. No. 30, p. 93, Upper Taconic.
- parvus*, Hall, 1865, Can. Org. Rem. Decade 2, p. 57, Hud. Riv. Gr. Not defined.
- typicalis*, Hall, 1865, Can. Org. Rem. Decade 2, p. 57, Hud. Riv. Gr.



FIG. 152.—*Cladopora reticulata*.



FIG. 153.—*Climacograptus bicornis*.

CLISIOPHYLLUM, Dana, 1848, Explor. Exped., vol. 8, p. 361. [Ety. *klision*, tent; *phyllon*, leaf.] Simple, branched or aggregate,



FIG. 154.—Clisiophyllum conigerum.

with vertical radiating lamellæ or septa; central area vesicular and forming a conical boss or columella, exterior to which the vesicular plates incline outward and upward; calycle deep. Type *C. danianum*, austini, Salter, 1852, (Strephodes austini,) Sutherland's Jour., vol. 2, p. cccxxx, Devonian. conigerum, Rominger, 1876, (Zaphrentis conigera,) Foss. Corals, p. 40, Up. Held. Gr. danianum, Edwards & Haime, 1854, Pol. Foss. d. Terr. Pal., p. 412, Low. Held. Gr. gabbii, Meek, 1864, Pal. California, vol. 1, p. 8, Carboniferous. oneidaense, see Acrophyllum oneidaense. pluridiale, Nicholson, 1874, Pal. Prov. Ont., p. 21, Up. Held. Gr. tumulus, Salter, 1855, Belcher's Last Arctic Voyage, vol. 2, p. 383, Carb. CLONOGRAPTUS, Hall, 1873, Ann. and Mag. Nat. Hist., 4th ser., vol. 13. [Ety. *klon*, twig; *grapho*, I write.] Composed of numerous slender, regular branching, cylindrical stipes; cells small, forming small denticulations on one side. Type *C. rigidus*. flexilis, Hall, 1858, (Graptolithus flexilis,) Geo. Sur. Can., p. 119, and Can. Org. Rem. Decade 2, p. 103, Quebec Gr. rigidus, Hall, 1857, (Graptolithus rigidus,) Geo. Sur. Can., p. 121, and Can. Org. Rem. Decade 2, p. 105, Quebec Gr. CŒNITES, Eichwald, 1829, Zoologia specialis, vol. 1, p. 186. [Ety. *koinos*, living together.] Corallum incrusting, massive, or ramose; corallites vertical or oblique

to the surface, remote, imbedded in a cœnenchyma; calices irregular, prominent, triangular, quincuncially arranged; lower margin most prominent; interstices increasing by age, and reducing the cavity of the cell-tubes; no septa; taubulæ distinct; mural pores large and few. Type *C. clathrata*.

crassus, Rominger, 1876, (Limaria crassa,) Foss. Corals, p. 45, Niagara Gr. falcatus, Prout, 1859, (Limaria falcata,) Trans. St. Louis Acad. Sci., vol. 1, p. 445, Up. Held. Gr. fruticosus, Steininger, 1834, (Limaria fruticosa,) Bull. Soc. Geo. France, vol. 1, p. 339, and Pal. N. Y., vol. 2, p. 143, Niagara Gr. laminatus, Hall, 1852, (Limaria laminata,) Pal. N. Y., vol. 2, p. 143, Niagara Gr.



FIG. 155.—Coenites lunatus.

lunatus, Nicholson & Hinde, 1874, Can. Jour., p. 149, and Pal. Prov. Ont., p. 55, Niagara Gr. ramulosus, Hall, 1852, (Limaria ramulosa,) Pal. N. Y., vol. 2, p. 142, Niagara Gr.

COLEOPHYLLUM, Hall, 1883, 12th Rep. Geo. Sur. Ind., p. 317.

[Ety. *koleos*, sheath; *phyllon*, leaf.] Corallum simple; substance composed of closely arranged, invaginated tabulæ, more or less oblique to the axis; rays obscure; calices oblique. Type *C. romingeri*.

pyriforme, Hall, 1883, 12th Rep. Geo. Sur. Ind., p. 318, Up. Held. Gr. romingeri, Hall, 1883, 12th Rep. Geo. Sur. Ind., p. 317, Up. Held. Gr.

COLUMNARIA, Goldfuss, 1826, Germ. Petref., p. 72. [Ety. *columnarius*, formed of columns.] Aggregate, corallites polygonal, longitudinally sulcated, but readily separable; no mural pores; tabulæ numerous; septa rudimentary; increase by fission. Type *C. alveolata*.

alveolata, Goldfuss, 1826, Germ. Petref., p. 72, and Pal. N. Y., vol. 1, p. 47, Black Riv. Gr.

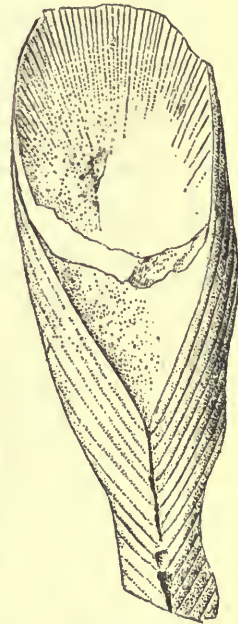


FIG. 156.—Coleophyllum romingeri.

blainvilli, Billings, 1858, Can. Nat. and Geo., vol. 3, and Rep. of Progr. Geo. Sur. Can., p. 166, Hud. Riv. Gr.

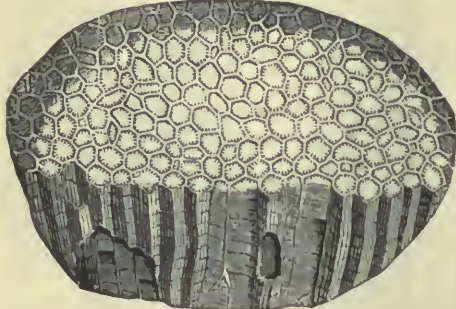


FIG. 157.—*Columnaria alveolata*.

- carterenis, Safford, 1869, Geo. of Tenn., p. 285, Trenton Gr.
 divergens, Troost, 1840, 5th Geo. Rep. Tenn., p. 72, Devonian.
 erratica, Billings, 1858, Can. Nat. and Geo., vol. 3, and Rep. of Progr. Geo. Sur. Can., p. 167, Trenton Gr.
 goldfussi, Billings, 1858, Can. Nat. and Geo., vol. 3, and Rep. of Progr. Geo. Sur. Can., p. 166, Hud. Riv. Gr.
 halli, Nicholson, 1879, Tabulate corals, syn. for *C. alveolata*.
 herzeri, Rominger, 1876, syn. for *Favistella stellata*.
 incerta, Billings, 1859, Can. Nat. and Geo., vol. 4, p. 128, Chazy Gr.
 inequalis, Hall, 1852, Pal. N. Y., vol. 2, p. 223, Coralline limestone.
 intermedia, Eaton, 1832, Geo. Text-book, p. 41. Not recognized.
 mammillaris, Castelnau. Not recognized.
 multiradiata, Castelnau, 1843, Syst. Sil., p. 44. Not recognized. Probably same as *Favistella stellata*.
 parva, Billings, 1859, Can. Nat. and Geo., vol. 4, p. 428, Chazy Gr.
 rigida, Billings, 1858, Can. Nat. and Geo., vol. 3, and Rep. of Progr. Geo. Sur. Can., p. 167, Hud. Riv. Gr.
 sutherlandi, Salter, 1852, Sutherland's Jour., vol. 2, p. cexxxii, Devonian.
 troosti, Castelnau, 1843, Syst. Sil., p. 44, syn. for *Lonsdaleia papillata*.
Columnopora, Nicholson, 1874, London Geo. Mag. N. S., vol. 1, p. 253, and Ohio Pal., vol. 2, p. 186, syn. for *Calapocia cribriformis*, see *Calapocia cribriformis*.
 COMBOPHYLLUM, Edwards & Haimé, 1850, Brit. Foss. Corals, p. lxxvii. [Ety. *kombo*, strip of cloth; *phyllon*, leaf.] Coralium, in form like *Cyclolites*; single septal fossula; septa exsert and regularly radiate. Type *C. osismorum*.
 multiradiatum, Meek, 1868, Trans. Chi. Acad. Sci., p. 84, Devonian.
Conophyllum, Hall, 1852, Pal. N. Y., vol. 2, syn. for *Chonophyllum*.
 niagarensis, see *Chonophyllum niagarensis*.
Constellaria, Dana, 1848, syn. for *Stellipora*.
 constellata, syn. for *Stellipora antheloidea*.
 fischeri, see *Stellipora fischeri*.
 florida, see *Stellipora florida*.
 polystomella, see *Stellipora polystomella*.
 CRASPEDOPHYLLUM, Dybowski, 1873, Beschreibung neuen aus Nordamerika, Stammenden, Devonischen art der Zoantharia rugosa, p. 153. [Ety. *kraspedos*, an edge; *phyllon* leaf.] Probably a syn. for *Heliophyllum*. Type *C. americanum*.
 americanum, Dybowski, 1873, Beschr. n. a. Nord. Stamm. Dev. a. d. Zoanth. rugosa, p. 153, Up. Held. Gr.
 CREPIDOPHYLLUM, Nicholson & Thompson, 1877, Proc. Roy. Soc. Edinburgh, vol. 9, p. 149. [Ety. *krepsis*, horseshoe; *phyllon*, leaf.] Distinguished from *Heliophyllum*, by the central part of the tabulate area being shut off from the rest of the visceral chamber by a secondary investment, in the form of a central pipe, which is crossed, by tabulæ; this pipe is sometimes open or horseshoe-shaped. Type *C. archiaci*.
 archiaci, Billings, 1860, (*Diphyphyllum archiaci*.) Can. Jour., vol. 5, p. 260, Ham. Gr.
 subcaespitosum, Nicholson, 1874, (*Heliophyllum subcaespitosum*.) Lond. Geo. Mag. n. ser., vol. 1, p. 58, Ham. Gr.
 CYATHAXONIA, Michelin, 1846, Icon. Zooph., p. 258. [Ety. *kuathos*, cup; *axones*, a tablet made to turn on its axis.] Simple; calice deep; columella styliform, strong and prominent; septa extending to the columella; the place of one of them occupied, by a deep depression or septal fossula. Type *C. cornu*.
 columellata, Hall, 1882, Foss. Corals Niagara and Up. Held. Gr., and 35th Rep. N. Y. Mus. Nat. Hist., p. 415, Niagara Gr.
 cynodon, Rafinesque & Clifford, 1820, (*Turbinolia cynodon*.) Monog. d. Turbinolides in Ann. d. Phys. d. Brux., t. 5, p. 234, Waverly Gr.
 distorta, Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 526, Coal Meas.
 herzeri, Hall, 1882, Foss. Corals Niagara and Up. Held. Gr., p. 11, and 12th Rep. Ind. Geo., p. 275, Niagara Gr.
 profunda, Edwards & Haimé, 1851, Pol. Foss. d. Terr. Pal., p. 323, Carboniferous.



FIG. 158.
Crepidophyllum subcaespitosum.

prolifera, see *Lophophyllum proliferum wisconsinensis*, Whitfield, 1878, Ann. Geo. Sur. Wis., p. 79, and Geo. Sur. Wis., vol. 4, p. 277, Niagara Gr.



FIG. 159.

Cyathaxonia herzeri.

CYATHOPHYLLUM, Goldfuss, 1826, Petref. Germ., p. 54. [Ety. *kuathos*, cup; *phyllon*, leaf.] Simple or composite; no costæ; septa extending to the center and twisting together, giving the appearance of a columella; tabulæ only in the center of the visceral chamber, the outer area

being filled with vesicular dissepiments; exterior wall provided with an epitheca. Type *C. cæspitosum*.

agglomeratum, Castelnau, 1843. Not recognized.

ammonis, Castelnau, 1843. Not recognized.

anticostiense, Billings, 1862, Pal. Foss., vol. 1, p. 109, Anticosti Gr., Div. 4.

arborescens, Castelnau, 1843, Syst. Sil., p. 48. Not recognized.

arcticum, Meek, 1868, Trans. Chi. Acad. Sci., p. 79, Devonian.

articulatum, Wahlenberg, (Madreporites articulatus,) Nov. Act. Upsal., vol. 8, p. 97, Up. Sil.

artifossa, Hall, 1882, Foss. Corals Niagara and Up. Held. Grs., p. 40, and 12th Rep. Ind. Geo., p. 297, Up. Held. Gr.

atlas, Castelnau, 1843, Syst. Sil., p. 47. Not recognized.

billingsi, Dawson, 1868, Acad. Geol., p. 287. Subcarboniferous.

bullatum, Hall, 1882, Foss. Corals Niagara and Up. Held. Grs., p. 41, and 35th Rep. N. Y. St. Mus. Nat. Hist., p. 445, Up. Held. Gr.

bullulatum, Hall, 1882, Foss. Corals Niagara and Up. Held. Grs., p. 12, and 35th Rep. N. Y. St. Mus. Nat. Hist., p. 412, Niagara Gr.

cæspitosum, Goldfuss, 1826, Petref. Germ., p. 60, Up. Held. Gr.

calyculare, Owen, 1840, Rep. on Mineral Lands, p. 69, Devonian.

canaliculatum, Hall, 1882, Foss. Corals Niagara and Up. Held. Grs., p. 39, and 35th Rep. N. Y. St. Mus. Nat. Hist., p. 443, Up. Held. Gr.

ceratites, Goldfuss. Not American.

coalitum, Rominger, 1876, Foss. Corals, p. 108, Up. Held. Gr.

cohärens, Hall, 1882, Foss. Corals Ni-

agara and Up. Held. Grs., p. 41, and 35th Rep. N. Y. St. Mus. Nat. Hist., p. 445, Up. Held. Gr.

conatum, Hall, 1876, Illust. Dev. Foss., pl. 31, Ham. Gr.

concentricum, Hall, 1882, Foss. Corals Niagara and Up. Held. Gr., p. 42, and 12th Rep. Geo. Sur. Ind., p. 316, Up. Held. Gr.

conicum, Castelnau, 1843, Syst. Sil., p. 48. Not recognized.

corinthium, Owen, 1840, Rep. on Minn. Lands, p. 69, Devonian.

cristatum, Rominger, 1876, Foss. Corals, p. 108, Ham. Gr.

depressum, Hall, 1882, Foss. Corals Niagara and Up. Held. Gr., p. 40, and 12th Rep. Ind. Geol., p. 298, Up. Held. Gr.

dianthus, Goldfuss, 1826, Germ. Petref., p. 54, Onondaga Gr.

dilatatum, Castelnau, 1843, Syst. Sil., p. 48. Not recognized.

distinctum, Castelnau, 1843, Syst. Sil., p. 49. Not recognized.

d'orbigny, Castelnau, 1843, Syst. Sil., p. 49. Not recognized.

eriphyle, Billings, 1862, Pal. Foss., vol. 1, p. 111, Anticosti Gr., Div. 4.

eurone, Billings, 1862, Pal. Foss., vol. 1, p. 110, Anticosti Gr., Div. 4.

excentricum, Goldfuss. Not American.

exfoliatum, Hall, 1882, Foss. Corals Niagara and Up. Held. Grs., p. 39, and 35th Rep. N. Y. St. Mus. Nat. Hist., p. 443, Up. Held. Gr.

flexuosum, Owen, syn. for *Campophyllum torquium*.

galerum, Hall, 1876, Illust. Dev. Foss., pl. 32, Ham. Gr.

geniculatum, Rominger, 1876, Foss. Corals, p. 103, Ham. Gr.

gigas, Yandell & Shumard, syn. for *Zaphrentis gigantea*.

goldfussi, Castelnau, 1843, Syst. Sil., p. 47. Not recognized.

goliath, Castelnau, 1843, Syst. Sil., p. 47. Not recognized.

gracile, Troost, 5th Rep. Tenn., Subcarb. Not recognized.

gradatum, Hall, 1876, Illust. Dev. Foss., pl. 31, Ham. Gr.

helianthoides, Goldfuss, see *Heliophyllum halli*.

houghtoni, Rominger, 1876, Foss. Corals, p. 104, Ham. Gr.

impositum, Hall, 1882, Foss. Corals Niagara and Up. Held. Grs., p. 40, and

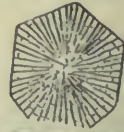


FIG. 160.—*Cyathophyllum cæspitosum*. *b*. transverse section. *c*. vertical section.

12th Rep. Geo. Sur. Ind., p. 299, Up. Held Gr.
 interruptum, Billings, 1862, Pal. Foss., vol. 1, p. 109, Mid. Sil.
 intertrium, Hall, 1884, 35th Rep. N. Y. St. Mus. Nat. Hist., p. 416, Niagara Gr.
 intervessicula, Hall, 1882, Foss. Corals Niagara and Up. Held. Grs., p. 38, and 35th Rep. N. Y. St. Mus. Nat. Hist., p. 442, Up. Held. Gr.
 juvene, Rominger, 1876, Foss. Corals, p. 101, Up. Held. Gr.
 leseuri, Edwards & Haime, 1851, Pol. Foss. d. Terr. Pal., p. 371, Onondaga Gr.
 michelini, Castelneau, 1843, Syst. Sil., p. 48. Not recognized.
 nanum, Hall, 1876, Illust. Dev. Foss., pl. 22, Ham. Gr.
 nepos, Hall, 1876, Illust. Dev. Foss., pl. 22, Ham. Gr.
 nevadense, Meek, 1877, U. S. Geo. Sur. 40th Parallel, vol. 4, p. 60, Carboniferous.
 nymphale, Billings, 1862, Pal. Foss., vol. 1, p. 111, Mid. Sil.
 palmeri, Meek, 1877, U. S. Geo. Sur. 40th Parallel, vol. 4, p. 33, Devonian.
 palum, Hall, 1876, Illust. Dev. Foss., pl. 31, Ham. Gr.
 panicum, Winchell, 1866, Rep. Low Penin. Mich., p. 90, Ham. Gr.
 partitum, Winchell, 1866, Rep. Low Penin. Mich., p. 90, Ham. Gr.
 pasithea, Billings, 1862, Pal. Foss., vol. 1, p. 112, Mid. Sil.
 pelagicum, Billings, 1862, Pal. Foss., vol. 1, p. 108, Anticosti Gr., Div. 2.
 pennanti, Billings, 1862, Pal. Foss., vol. 1, p. 107, Mid. Sil.
 perfovellatum, Hall, 1882, Foss. Corals, Niagara and Up. Held. Gr., p. 42 and 35th Rep. N. Y. St. Mus. Nat. Hist., p. 446, Up. Held. Gr.
 perlamellosum, Hall, 1876, Illust. Devon. Foss., pl. 39, Up. Held. Gr.
 perplicatum, Hall, 1882, Foss. Corals Niagara and Up. Held. Grs., p. 42, and 35th Rep. N. Y. St. Mus. Nat. Hist., p. 447, Up. Held. Gr.
 picthorni, Salter, 1852, (Strephodes picthorni,) Sutherland's Jour., vol. 2, p. ccxxx, Devonian.
 plicatulum, Castelneau, 1843, Syst. Sil., p. 48. Not recognized.
 plicatum, Goldfuss, 1826, Germ. Petref. Not American.
 profundum, see Streptelasma profundum.
 pustulatum, Conrad, 1848. Not properly defined.
 quadrigeminum, Goldfuss. Not American.
 radricula, Rominger, 1876, Foss. Corals, p. 109, Niagara Gr.
 robustum, Hall, 1876, Illust. Devon. Foss., pl. 22, Ham. Gr.
 robustum, Hall, 1882, Foss. Corals Niagara and Up. Held. Grs., p. 43, Up. Held. Gr. The name was preoccupied.
 rollini, Castelneau, 1843, Syst. Sil., p. 49. Not recognized.

rugosum, Hall, 1843, (Astrea rugosa,) Geo. Sur. 4th Dist. N. Y., p. 159, Up. Held. Gr.

scalenum, Hall, 1882, Foss. Corals Niagara and Up. Held. Grs., p. 42, and 35th Rep. N. Y. St. Mus. Nat. Hist., p. 446, Up. Held. Gr.
 scyphus, Rominger, 1876, Foss. Corals, p. 103, Ham. Gr.
 septatum, Hall, 1882, Foss. Corals Niagara and Up. Held. Grs., p. 41, and 35th Rep. N. Y. St. Mus. Nat. Hist., p. 445, Up. Held. Gr.
 shumardi, see Amplexus shumardi.
 solitarium, Billings, 1866, Catal. Sil. Foss. Antic., p. 93, Clinton and Niagara Grs.
 striatulum, Castelneau, Syst. Sil., p. 48. Not recognized.
 subcespitosum, Meek, 1872, 6th Rep. Hayden's Geo. Sur. Terr., p. 470, and U. S. Geo. 40 Parallel, vol. 4, p. 60, Sub-carboniferous.



torquium, see Campophyllum torquium.
 turbinatum, Goldfuss. Not American.
 undulatum et multiplicatum, Owen, 1840, Rep. on Min. Lands. Not binomial.
 validum, Hall, 1876, Illust. Devon. Foss., pl. 39, Up. Held. Gr.
 vanuxemi, Hall, 1859, figured without specific name in 1843, Geo. Rep. 4th Dist. N. Y., Tab. 49, fig. 3, 3a, Ham. Gr.
 vermiculare, Owen, syn. for Campophyllum torquium.
 vesiculatum, Hall, 1882, Foss. Corals Niagara and Up. Held. Grs., p. 41, and 12th Geo. Sur. Ind., p. 297, Up. Held. Gr.
 vesiculosum, see Cystiphyllum vesiculosum.
 vicinum, Castelneau, 1843, Syst. Sil., p. 48. Not recognized.

wahlenbergi, Billings, 1862, Pal. Foss., vol. 1, p. 108, Anticosti Gr., Div. 3.
 zenkeri, Billings, 1860, Can. Jour., vol. 5, p. 262, Up. Held. Gr.

Cyathopora iowensis, Owen, see *Striatopora iowensis*. There is no genus *Cyathopora*, and if Dr. Owen did not intend to refer his species to *Cyathophora*, then he failed to establish a genus, by neglecting to define it.

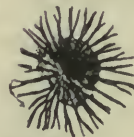


FIG. 162.—Cyclograptus rotadentatus.

CYCLOGRAPTUS, Spencer, 1884, Bull. No. 1, Mus. Univ. St. Mo., p. 42. [Ety. kuklos, disk; grapho, I write.] A circular disk, with stipes radiating from the radicle to the margin and in a free manner beyond. Type *C. rotadentatus*.
 rotadentatus, Spencer, 1884, Bull. No. 1, Mus. Univ. St. Mo., p. 42, Niagara Gr.

Cyclolites, Lamarck, 1801, Syst. Anim. sans Vert., p. 369. Not a Palæozoic genus. *rotuloides*, see Palæocyclus *rotuloides*.

CYSTIPHOROLITES. Recently proposed genus but the reference mislaid. [Ety. *kustis*, a small cavity; *phoros*, bearing; *lithos*, stone.] Corallum compound, formed of superimposed series of cups, which in vertical sections appear as layers of unequal, vesiculose plates, resembling *Cystiphyllum*; layers radiated, margins of cells broad, expanded, and confluent. Type C. major. Proposed instead of *Vesicularia*, Rominger, which was pre-occupied.

major, Rominger, 1876, (*Vesicularia* major,) Foss. Corals, p. 135, Niagara Gr.

minor, Rominger, 1876, (*Vesicularia* minor,) Foss. Corals, p. 136, Niagara Gr.

variolosus, Rominger, 1876, (*Vesicularia* variolosa,) Foss. Corals, p. 136, Niagara Gr.

CYSTIPHYLLUM, Lonsdale, 1839, Murch. Sil. Syst., p. 691. [Ety. *kustis*, cavity; *phylon*, leaf.] Simple, turbinate, or cylindrical, rarely aggregate; interior filled with vesicular tissue; septa rudimentary or absent. Type C. siluriense.

aggregatum, Billings, 1859, Can. Jour., vol. 3, p. 136, Ham. Gr.

americanum, Edwards & Haime, 1851, Pol. Foss. d. Terr. Pal., p. 464, Ham. Gr.

americanum var. arcticum, Meek, 1868, Trans. Chi. Acad. Sci., p. 80, Ham. Gr.

bifurcatum, Hall, 1882, Foss. Corals Niagara and Up. Held. Grs., p. 55, and 35th Rep. N. Y. St. Mus. Nat. Hist., p. 459, Up. Held. Gr.

bipartitum, Hall, 1882, Foss. Corals Niagara and Up. Held. Grs., p. 55, and 35th Rep. N. Y. St. Mus. Nat. Hist., p. 459, Up. Held. Gr.

conifollis, Hall, 1876, Illust. Dev. Foss., pl. 30, Ham. Gr.

corrugatum, Hall, 1876, Illust. Devon. Foss., pl. 29, Ham. Gr.

crateriforme, Hall, 1882, Foss. Corals Niagara and Up. Held. Grs., p. 57, and 35th Rep. N. Y. St. Mus. Nat. Hist., p. 461, Up. Held. Gr.

cylindricum, Lonsdale. Not American.

fruticosum, Nicholson, 1875, Geo. Mag., vol. 2, N. S., p. 32, Corniferous Gr.

grande, Billings, 1859, Can. Jour., vol. 4, p. 138, Corniferous Gr.

granilineatum, Hall, 1882, Foss. Corals Niagara and Up. Held. Grs., p. 14, and 12th Rep. Ind. Geo. p. 274, Niagara Gr.

huronense, Billings, 1866, Catal. Sil. Foss. Antic., p. 92, Clinton and Niagara Grs.

infundibulum, Hall, 1882, Foss. Corals Niagara and Up. Held. Grs., p. 58, and 35th Rep. N. Y. St. Mus. Nat. Hist., p. 462, Up. Held. Gr.

latiradius, Hall, 1882, Foss. Corals Niagara and Up. Held. Grs., p. 57, and 12th Rep. Geo. Sur. Ind., p. 304, Up. Held. Gr.

maritimum, Billings, 1862, Pal. Foss., vol. 1, p. 112, Mid. Sil.

mundulum, Hall & Whitfield, 1873, 23d Rep. N. Y. St. Mus. Nat. Hist., p. 234, Chemung Gr.

muricatum, Hall, 1882 Foss. Corals, Niagara and Up. Held. Grs., p. 56, and 35th Rep. N. Y. St. Mus. Nat. Hist., p. 460, Up. Held. Gr.

nanum, Hall, 1882, Foss. Corals Niagara and Up. Held. Grs., p. 56, and 35th Rep. N. Y. St. Mus. Nat. Hist., p. 460, Up. Held. Gr.

obliquum, Hall, 1882, Foss. Corals Niagara and Up. Held. Grs., p. 58, and 35th Rep. N. Y. St. Mus. Nat. Hist., p. 462, Up. Held. Gr.

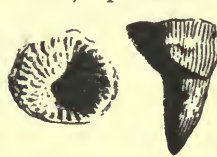


FIG. 163.—*Cystiphyllum* ohioense.

ohioense, Nicholson, 1875, Ohio Pal., vol. 2, p. 234, Corniferous Gr.

pustulatum, Hall, 1882, Foss. Corals, Niagara and Up. Held. Grs., p. 58, and 12th Rep. Geo. Sur. Ind., p. 262, Up. Held. Gr.

quadrangulare, Hall, 1882, Foss. Corals Niagara and Up. Held. Grs., p. 56, and 35th Rep. N. Y. St. Mus. Nat. Hist., p. 460, Up. Held. Gr.

scalatum, Hall, 1882, Foss. Corals Niagara and Up. Held. Grs., p. 59, and 35th Rep. N. Y. St. Mus. Nat. Hist., p. 463, Up. Held. Gr.

senecaense, Billings, 1859, Can. Jour., vol. 4, p. 137, Devonian.

squamosum, Nicholson, 1875, Geo. Mag. N. S., vol. 2, p. 31, Corniferous Gr.

striatura, Hall, 1882, Foss. Corals Niagara and Up. Held. Grs., p. 59, and 35th Rep. N. Y. St. Mus. Nat. Hist., p. 463, Up. Held. Gr.

sulcatum, Billings, 1859, Can. Nat. and Geo., vol. 3, p. 136, Corniferous Gr.

superbum, Nicholson, 1875, Geo. Mag. vol. 2, N. S., p. 33, Ham. Gr.

supraplanum, Hall, 1882, Foss. Corals Ni-



FIG. 164.—*Cystiphyllum* vesiculosum.

supraplanum, Hall, 1882, Foss. Corals Ni-

- agara and Up. Held. Grs., p. 57, and 35th Rep. N. Y. St. Mus. Nat. Hist., p. 461, Up. Held. Gr.
- tenuiradius, Hall, 1882, Foss. Corals Niagara and Up. Held. Grs., p. 56, and 35th Rep. N. Y. St. Mus. Nat. Hist., p. 460, Up. Held. Gr.
- varians, Hall, 1876, Illust. Devon. Foss., pl. 29; Ham. Gr.
- vesiculosum, Goldfuss, 1826, (Cyathophyllum vesiculosum,) Germ. Petref., p. 58, Devonian.
- CYSTOSTYLUS, Whitfield, 1880, Ann. Rep. Geo. Sur. Wis. and Geo. Wis., vol. 4, p. 273. [Ety. *kustis*, cavity; *stylos*, stalk.] Aggregate, cylindrical, corallites in contact or united by transverse filaments; increase by bifurcation, structure cystose as in Cystiphyllum; formed by imperfect transverse plates arranged in circular, funnel-formed order; septa and tabulæ obsolete. Type C. typicus.
- infundibulum, Whitfield, 1878, (Syringopora infundibulum,) Ann. Rep. Geo. Sur. Wis., p. 79, and Geo. Wis., vol. 4, p. 274, Niagara Gr.
- typicus, Whitfield, 1880, Ann. Rep. Geo. Sur. Wis. and Geo. Wis., vol. 4, p. 274, Niagara Gr.
- DANIA, Edwards & Haime, 1849, Comp. Rend., t. 29, p. 261. [Ety. proper name.] Corallum having most of the characters of Chetetes, but with the tabulæ connected through the corallites so as to divide the mass into parallel strata. Type D. huronica.
- huronica, Edwards & Haime, 1849, Comp. Rend., t. 29, p. 261, Up. Sil.
- DAWSONIA, Nicholson, 1873, Ann. Mag. Nat. Hist., 4th ser., vol. 12. [Ety. proper name.] Supposed to be the ovarian vesicles of Graptolites. Type D. campanulata.
- acuminata, Nicholson, 1873, Ann. Mag. Nat. Hist., 4th ser., vol. 12, Quebec Gr.
- campanulata, Nicholson, 1873, Ann. Mag. Nat. Hist., vol. 12, Quebec Gr.
- rotunda, Nicholson, 1873, Ann. Mag. Nat. Hist., vol. 12, Quebec Gr.
- tenuistriata, Nicholson, 1873, Ann. Mag. Nat. Hist., vol. 12, Quebec Gr.
- DEKAYELLA, Ulrich, 1882, Jour. Cin. Soc. Nat. Hist., vol. 5, p. 155. [Ety. diminutive of Dekayia.] Ramose, interstitial cells; spiniform tubuli of two kinds, larger ones arranged as in Dekayia, others more numerous; diaphragms in both sets of tubes. Type D. obscura.
- obscura, Ulrich, 1883, Jour. Cin. Soc. Nat. Hist., vol. 6, p. 89, Hud. Riv. Gr.
- robusta, Foord, 1884, Ann. and Mag. Nat. Hist., 5th ser., vol. 14, p. 341, Hud. Riv. Gr.
- DEKAYIA, Edwards & Haime, 1851, Mon. d. Pol. Foss. d. Terr. Pal., p. 277. [Ety. proper name.] Distinguished from Monticulipora by having little protuberances on the surface between the angles of the corallites. Type D. aspera.
- appressa, Ulrich, 1883, Jour. Cin. Soc. Nat. Hist., vol. 6, p. 152, Hud. Riv. Gr.
- aspera, Edwards & Haime, 1851, Pol. Foss. d. Terr. Pal., p. 278, Hud. Riv. Gr.
- attrita, syn. for D. aspera.
- multispinosa, Ulrich, 1883, Jour. Cin. Soc. Nat. Hist., vol. 6, p. 154, Hud. Riv. Gr.
- paupera, Ulrich, 1883, Jour. Cin. Soc. Nat. Hist., vol. 6, p. 153, Hud. Riv. Gr.
- pelliculata, Ulrich, 1883, Jour. Cin. Soc. Nat. Hist., vol. 6, p. 150, Hud. Riv. Gr.
- trentonensis, Ulrich, 1883, Jour. Cin. Soc. Nat. Hist., vol. 6, p. 151, Trenton Gr.
- DENDROGRAPTUS, Hall, 1865, Can. Org. Rem., Decade 2, p. 126. [Ety. *dendron*, tree, *grapho*, I write.] Simple or aggregate; foot-stalk strong, sometimes with a root-like bulb; ramified above into slightly divergent branches, celluliferous on one side. Type D. hallanus.
- compactus, Walcott, 1879, Utica Slate and related formations, p. 21, Utica Slate.
- dawsoni, Spencer, 1884, Bull. No. 1, Mus. Univ. St. Mo., p. 18, Niagara Gr.
- diffusus, Hall, 1865, Can. Org. Rem., Decade 2, p. 132, Quebec Gr.
- divergens, Hall, 1865, Can. Org. Rem., Decade 2, p. 129, Quebec Gr.
- dubius, n. sp. Proposed instead of D. simplex, Spencer, in Bull. No. 1, Mus. Univ. St. Mo., p. 17, which was preoccupied. Niagara Gr.
- erectus, Hall, 1865, Can. Org. Rem., Decade 2, p. 130, Quebec Gr.
- flexuosus, Hall, 1865, Can. Org. Rem., Decade 2, p. 127, Quebec Gr.
- frondosus, Spencer, 1884, Bull. No. 1, Mus. Univ. St. Mo., p. 18, Niagara Gr.
- fruticosus, Hall, 1865, Can. Org. Rem., Decade 2, p. 131, Quebec Gr.
- gracilis, Hall, 1865, Can. Org. Rem., Decade 2, p. 132, Quebec Gr.
- gracillimus, Lesquereux, 1877, Proc. Am. Phil. Soc. p. 164, (Psilophyton gracillimum,) Hud. Riv. Gr.
- hallanus, Prout, 1851, (Graptolithus hallanus,) Am. Jour. Sci. 2d ser., vol. 11, p. 187, Potsdam sandstone.
- novellus, Hall, 1879, Desc. New Spec. Foss., p. 2, and 11th Rep. Geo. Sur. Ind., p. 225, Niagara Gr.

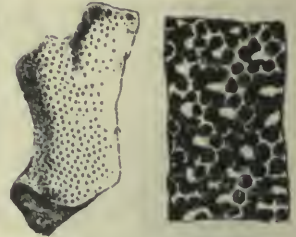


FIG. 165.—*Dekayia aspera*, natural size, and magnified.



FIG. 166.—*Dendrograptus hallanus*.

prægracilis, Spencer, 1884, Bull. No. 1, Mus. Univ. St. Mo., p. 19, Niagara Gr.
primordialis, Matthew, 1885, Trans. Roy. Soc. Can., p. 31, St. John Gr.
ramosus, Spencer, 1884, Bull. No. 1, Mus. Univ. St. Mo., p. 17, Niagara Gr.
simplex, Walcott, 1879, Utica Slate and related formations, p. 20, Utica Slate.
simplex, Spencer, 1884, Bull. No. 1, Mus. Univ. St. Mo., p. 17. The name was preoccupied. See *D. dubius*.
spinusosus, Spencer, 1884, Bull. No. 1, Mus. Univ. St. Mo., p. 19, Niagara Gr.
striatus, Hall, 1865, Can. Org. Rem., Decade 2, p. 129, Quebec Gr.
tenuiramosus, Walcott, 1879, Utica Slate and related formations, p. 21, Utica Slate.

DENDROPORA, Michelin, 1846, Icon. Zooph., p. 187. [Ety. *dendron*, tree; *poros*, pore.] Corallum arborescent, with very delicate, smooth branches; calices distant, and surrounded by a narrow, obtuse margin; septa small, but distinct. Type *D. explicita*.
alternans, Rominger, 1876, Foss. Corals, p. 64, Ham. Gr.
neglecta, Rominger, 1876, Foss. Corals, p. 63, Up. Held. Gr.
ornata, see *Trachypora ornata*.
proboscidualis, Rominger, 1876, Foss. Corals, p. 65, Ham. Gr.
reticulata, Rominger, 1876, Foss. Corals, p. 65, Ham. Gr.

Dichograptus, syn. for *Graptolithus*.

DICRANOGRAPTUS, Hall, 1865, Can. Org. Rem., Decade 2, p. 46. [Ety. *dikranos*, two pointed; *grapho*, I write.] The lower part of the stipe has a row of cells on each side, but above, the stipe bifurcates, and has cells only on the outer side of each bifurcation. Type *D. ramosus*.

divaricatus, Hall, 1859, (*Graptolithus divaricatus*.) Pal. N. Y., vol. 3, p. 513, Hud. Riv. Gr.

furcatus, Hall, 1847, (*Graptolithus furcatus*.) Pal. N. Y., vol. 1, p. 273, Utica Slate.



FIG. 167.—*Dicranograptus ramosus*.

ramosus, Hall, 1847, (*Graptolithus ramosus*.) Pal. N. Y., vol. 1, p. 270, Utica Slate.
sextans, Hall, 1847, (*Graptolithus sextans*.) Pal. N. Y., vol. 1, p. 273, Utica Slate.

DICTYONEMA, Hall, 1852, Pal. N. Y., vol. 2, p. 174.

[Ety. *dictyon*, net; *nema*, thread.] Fronds consisting of flabelliform or funnel-shaped expansions, composed of slender, radiating branches, which frequently bifurcate

as they recede from the base; branches united laterally by transverse dissepiments; exterior striated; interior surface celluliferous or serrate. Type *D. retiforme*.

expansum, Spencer, 1884, Bull. No. 1, Mus. Univ. St. Mo., p. 25, Niagara Gr.
fenestratum, Hall, 1851, in Foster and Whitney's Rep. on Lake Superior Land Dist., p. 223, Up. Held. Gr.
gracile, Hall, 1852, Pal. N. Y., vol. 2, p. 175, Niagara Gr.
grande, Nicholson, 1873, Ann. Mag. Nat. Hist., 4th ser., vol. 12, Quebec Gr.
irregulare, Hall, 1865, Can. Org. Rem., Decade 2, p. 136, Quebec Gr.
murrayi, Hall, 1865, Can. Org. Rem., Decade 2, p. 138, Quebec Gr.
neenah, Hall, 1861, Geo. Rep. Wis., p. 17, Trenton Gr.
pergracile, Hall & Whitfield, 1872, 24th Rep. N. Y. St. Mus. Nat. Hist., p. 181, and Acad. Geo., p. 563, Niagara Gr.
quadrangulare, Hall, 1865, Can. Org. Rem., Decade 2, p. 138, Quebec Gr.



FIG. 168.—*Dictyonema retiforme*.

retiforme, Hall, 1843, (*Gorgonia retiformis*.) Geo. Rep. 4th Dist. N. Y., p. 115, and Pal. N. Y., vol. 2, p. 174, Niagara Gr.

robustum, Hall, 1865, Can. Org. Rem., Decade 2, p. 137, Quebec Gr.

splendens, Billings, 1874, Pal. Foss., vol. 2, p. 12, Gaspé limestone No. 1, Up. Sil.

tenellum, Spencer, 1878, Can. Nat., vol. 8, and Bull. No. 1, Mus. Univ. St. Mo., p. 26, Niagara Gr.

websteri, Dawson, 1860, Can. Nat. and Geo., vol. 5, and Acad. Geo., p. 563, Niagara Gr.

DIDYMOGRAPTUS, McCoy, 1851, Brit. Pal. Foss., p. 3-9. [Ety. *didymos*, double; *grapho*, I write.] Consisting of forked stipes, straight or curved; one celluliferous side. Type *D. murchisoni*.

caduceus, Salter, 1853, (*Graptolithus caduceus*.) Quar. Jour. Geo. Soc., vol. 9, p. 87, Quebec Gr.



FIG. 169.—*Didymograptus geminus*.

geminus, Hisinger, 1840, (*Prionotus geminus*.) Leth Suecia, Supp. 2, p. 5, pl. 38, Quebec Gr.

DIPHYPHYLLUM, Lonsdale, 1845, Russ. and Ural Mts., vol. 1, p. 624. [Ety. *diphya*, division; *phyllon*, leaf.] Corallum simple, composite, increasing by lateral gemmation; corallites tall, cylindrical, connected by epithecal or radiciform expansions, with each other; central area occupied by tabulæ; circumscribed by an inner wall; exterior vesicular zone occupied by septa, which are confined between the outer and inner mural investment; no columella. Type *D. conicum*.

adnatum, Hall, 1882, Foss. Corals Niagara and Up. Held Grs., p. 54, and 12th Rep. Geo. Sur. Ind., p. 303, Up. Held. Gr.

apertum, Hall, 1882, Foss. Corals Niagara and Up. Held. Grs., p. 54, and 12th Rep. Geo. Sur. Ind., p. 303, Up. Held. Gr.

archiaci, see *Crepidophyllum archiaci*.

arundinaceum, Billings, 1859, Can. Jour., vol. 4, p. 134, Corniferous limestone.

breve, Hall, 1882, Foss. Corals Niagara and Up. Held. Grs., p. 53, and 35th Rep. N. Y. St. Mus. Nat. Hist., p. 459, Up. Held. Gr.

cæspitosum, Hall, 1852, (*Diplophyllum cæspitosum*.) Pal. N. Y., vol. 2, p. 116, Niagara Gr.

coralliferum, Hall, 1852, (*Diplophyllum coralliferum*.) Pal. N. Y., vol. 2, p. 322, Coralline limestone.

cylindraceum, Hall, 1882, Foss. Corals Niagara and Up. Held. Grs., p. 54, and 35th Rep. N. Y. St. Mus. Nat. Hist., p. 458, Up. Held. Gr.

fasciculum, Meek, 1877, U. S. Geo. Sur. 40th Parallel, vol. 4, p. 29, Devonian.

gigas, Rominger, 1876, Foss. Corals, p. 125, Niagara Gr.

gracile, McCoy, 1854, Brit. Pal. Foss., p. 88, Up. Held. Gr.

huronicum, Rominger, 1876, Foss. Corals, p. 121, Niagara Gr.

rectiseptatum, Rominger, 1876, Foss. Corals, p. 124, Ham. Gr.

rugosum, Edwards & Haime, 1851, (*Eridophyllum rugosum*.) Pol. Foss. des Terr. Pal., p. 424, Niagara Gr.

simcoense, Billings, 1859, (*Eridophyllum simcoense*.) Can. Jour., vol. 4, p. 131, Up. Held. Gr.

stramineum, Billings, 1859, Can. Jour., vol. 4, p. 135, Corniferous Gr.

strictum, Edwards & Haime, 1851, (*Eri-*

dophyllum strictum.) Poll. Foss. des Terr. Pal., p. 424, Up. Held. Gr.

tumidulum, Hall, 1882, Foss. Corals Niagara and Up. Held. Grs., p. 55, and 12th Rep. Geo. Sur. Ind., p. 303, Up. Held. Gr.



FIG. 170.—*Diplophyllum stramineum*.

vennori, Billings, 1865, (*Eridophyllum vennori*.) Can. Nat. and Geo., 2d ser., vol. 2, p. 431, Clinton Gr.

verneuianum, Edwards & Haime, 1850, (*Eridophyllum verneuianum*.) Brit. Foss. Corals, p. lxxi, and Pol. Foss. des Terr. Pal., p. 424, Up. Held. Gr.

DIPLOGRAPTUS, McCoy, 1854, (*Diplograptus*.) Brit. Pal. Rocks, p. 3. [Ety. *diploos*, duplex; *grapho*, I write.] Stipes simple, flattened, or quadrangular; cellules, in single series, on the two sides of a double central axis; cellules oblique, opening toward the apex; cell denticles prominent, often mucronate. Type *D. foliaceus*.

amplexicaulis, Hall, 1847, (*Graptolithus amplexicaulis*.) Pal. N. Y., vol. 1, p. 79, Trenton Gr.

angustifolius, Hall, 1859, (*Graptolithus angustifolius*.) Pal. N. Y., vol. 3, p. 515, Hud. Riv. Gr.

ciliatus, Emmons, 1856, Am. Geo., p. 105, Up. Taconic.

dissimularis, Emmons, 1856, Am. Geo., p. 105, Up. Taconic.

foliaceus, (?) Murch, 1839, (*Graptolites foliaceus*.) Murch. Sil. Syst., p. 695, Hud. Riv. Gr.

foliosus, Emmons, 1856, Am. Geo., p. 105, Up. Taconic.
 folium, Hisinger, 1837, (Prionotus folium.) Leth. Suec., p. 113, Hud. Riv. Gr.
 hudsonicus, Nicholson, 1875, Pal. Proc. Ont., p. 38, Hud. Riv. Gr.
 hypniformis, White, 1874, (Graptolithus hypniformis.) Rep. Invert. Foss., p. 12, and Geo. Sur. W. 100th Mer., vol. 4, p. 63, Trenton Gr.
 inutilis, Hall, 1865, Can. Org. Rem., Decade 2, p. 111, Quebec Gr.
 laciniatus, Emmons, 1856, Am. Geo., p. 236, Up. Taconic.
 marcidus, Hall, 1859, (Graptolithus marcidus.) Pal. N. Y., vol. 3, p. 514, Hud. Riv. Gr.
 mucronatus, Hall, 1847, (Graptolithus mucronatus.) Pal. N. Y., vol. 1, p. 263, Hud. Riv. Gr.
 obliquus, Emmons, 1856, Am. Geo., p. 106, Up. Taconic.
 peosta, Hall, 1861, (Graptolithus peosta.) Geo. Rep. Wis., p. 17, Trenton Gr.
 pristiniformis, Hall, 1858, (Graptolithus pristiniformis.) Geo. Sur. Can., p. 133, and Can. Org. Rem., Decade 2, p. 110, Quebec Gr.
 pristis, (?) Hisinger, 1837, (Prionotus pristis.) Leth. Suec., p. 114, and Pal. N. Y., vol. 1, p. 265, Hud. Riv. Gr.
 putillus, Hall, 1865, Can. Org. Rem., Decade 2, p. 44, Hud. Riv. Gr.
 rugosus, Emmons, 1856, Am. Geo., p. 105, Up. Taconic.
 rectangularis, McCoy, 1851, Brit. Pal. Rocks, p. 3, Low Sil.
 secalinus, Hall, 1847, (Fucoides secalinus.) Pal. N. Y., vol. 1, p. 267, syn. for D. simplex.
 simplex, Emmons, 1844, (Fucoides simplex.) Taconic system, p. 27, and Pal. N. Y., vol. 1, p. 267, Up. Taconic.
 spinulosus, Hall, 1859, (Graptolithus spinulosus.) Pal. N. Y., vol. 3, p. 517, Hud. Riv. Gr.
 whitfieldi, Hall, 1859, (Graptolithus whitfieldi.) Pal. N. Y., vol. 3, p. 516, Hud. Riv. Gr.
Diphyphyllum, Hall, 1852, Pal. N. Y., vol. 2, p. 115, syn. for *Diphyphyllum*.
cæspitosum, see *Diphyphyllum cæspitosum*.
coralliferum, see *Diphyphyllum coralliferum*.
 DIPLOTRYPA, Nicholson, 1879, Pal. Tab. Corals, p. 292. [Ety. *diploos*, double; *trypa*, hole.] Corallites of two kinds, the larger thin walled, polygonal, tabulæ remote; often aggregated in clusters, (monticules); smaller corallites angular, thin walled, never completely isolating the larger ones; tabulæ numerous. Type *D. petropolitana*.
 infida, Ulrich, 1886, 14th Rep. Geo. Sur. Minn., p. 88, Trenton Gr.
 milleri, Ulrich, 1882, Jour. Cin. Soc. Nat. Hist., vol. 5, p. 245, Niagara Gr.



FIG. 171.
Diplo-
graptus
folium.

regularis, Foord, 1883, *Micropalæontology*, p. 13, Trenton Gr.
 DISCOPHYLLUM, Hall, 1847, Pal. N. Y., vol. 1, p. 277. [Ety. *diskos*, disk; *phyllon*, leaf.] Discoid flattened, rays numerous, proceeding from the center and terminating in a thickened border. Type *D. peltatum*.
 peltatum, Hall, 1847, Pal. N. Y., vol. 1, p. 277, Up. Taconic.
 DUNCANELLA, Nicholson, 1874, Ann. Mag. Nat. Hist., 4th ser., vol. 13, p. 333. [Ety. proper name.] Corallum simple, obconical; calyce deep, circular; rays strong, exsert; epitheca striated vertically; closely allied to *Streptelasma*. Type *D. borealis*.
 borealis, Nicholson, 1874, Ann. Mag. Nat. Hist., 4th ser., vol. 13, p. 333, Niagara Gr.
 ELASMOPHYLLUM, Hall, 1882, Foss. Corals Niagara and Up. Held Grs., p. 38. [Ety. *elasma*, lamellæ; *phyllon*, leaf.] Simple, turbinate, lamellæ extending to the center, twisted or not; interlamellar cysts continuing to the center; no tabulæ. Type *E. attenuatum*.
 attenuatum, Hall, 1882, Foss. Corals Niagara and Up. Held. Grs., p. 38, and 35th Rep. N. Y. St. Mus. Nat. Hist., p. 442, Up. Held. Gr.
 EMMONSIA, Edwards & Haime, 1851, *Monographie des Polyp., Foss. des Terr. Palæoz.*, p. 246. [Ety. proper name.] Distinguished from *Favosites* by the compound character of the diaphragms, but generally regarded as a synonym. Type *E. hemispherica*.
 hemispherica, Troost, 1840, (Calamopora hemispherica,) 5th Rep. Geo. Tenn., p. 72, Up. Held. Gr.
 hemispherica, Yandell & Shumard, 1847, (Favosites hemisphericus,) Contrib. to Geo. of Kv., p. 7. Same species described by Troost.
Eridophyllum, Edwards & Haime, 1850, Brit. Foss. Corals, p. lxxi, syn. for *Diphyphyllum*.
rugosum, see *Diphyphyllum rugosum*.
simcoense, see *Diphyphyllum simcoense*.
strictum, see *Diphyphyllum strictum*.
vennori, see *Diphyphyllum vennori*.
verneuianum, see *Diphyphyllum verneuianum*.
Favastrea, DeBlainville, 1830, Man. d. Actinol, p. 374. Not an American palæozoic genus.
striata, D'Orbigny, 1850, Prodr. d. Paléont., t. 1, p. 48. Not defined so as to be recognized.
Faviphyllum, as used by Hall, 1852, Stans. Exped. to Great Salt Lake, p. 407. Not defined, and founded upon a sili-cified, indeterminate fragment.



FIG. 172.
Duncanella
borealis
magnified.

FAVISTELLA, Hall, 1847, Pal. N. Y., vol. 1, p. 275. [Ety. *favus*, honey-comb; *stella*, star.] Massive, hemispherical, corallites polygonal, increasing by lateral development; walls not separable as in Favosites, nor perforated by pores; tabulæ close; septa of alternately larger and smaller size, the larger reaching the center; twelve or more in each corallite. Type *F. stellata*.

calicina, Nicholson, 1874, Rep. Brit. Ass'n. and Pal. Tab. Corals, p. 197, Hud. Riv. Gr.

favosidea, Hall, 1852, Pal. N. Y., vol. 2, p. 41, Clinton Gr.

franklini, Salter, 1852, Sutherland's Jour., vol. 2, p. ccxxxi, Up. Sil.

reticulata, Salter, 1852, Sutherland's Jour., vol. 2, p. ccxxix, Up. Sil.

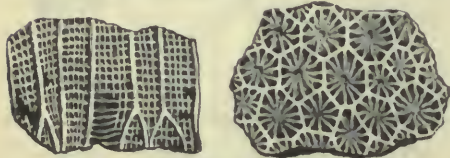


FIG. 173.—*Favistella stellata*.

stellata, Hall, 1847, Pal. N. Y., vol. 1, p. 275, Hud. Riv. Gr.

FAVOSITES, Lamarek, 1812, Cours. de Zool. du Mus. d'Hist. Nat. and Hist. des An. sans Vert., vol. 2, p. 204. [Ety. *favus*, honey-comb.] Massive or branched, composed of numerous more or less polygonal corallites; tabulæ present; septa absent or rudimentary; walls perforated by one or more rows of mural pores, connecting the corallites. Type *F. alveolatus*.

alpenensis, Winchell, 1866, Rep. Low. Penin. Mich., p. 88, Ham. Gr.

alveolaris, DeBlainville, Not American.

arbuscula, Hall, 1876, Illust. Devon. Foss., pl. 36, Ham. Gr.

argus, Hall, 1876, Illust. Dev. Foss., pl. 13, Ham. Gr.

asper, D'Orbigny, 1849, Prodr. de Paléont., t. 1, p. 49, Clinton Gr.

basalticus, Goldfuss, 1826, Germ. Petref., p. 78, (Calamopora basaltica,) Devonian.

billingsi, Rominger, 1876, Foss. Corals, p. 29, Ham. Gr.

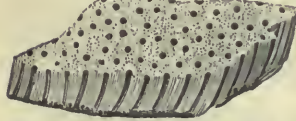


FIG. 174.—*Favosites canadensis*.

canadensis, Billings, 1858, (Fistulipora canadensis,) Can. Nat. and Geol., vol. 4, p. 98, Up. Held. Gr.

capax, Billings, 1866, Catal. Sil. Foss. Antic., p. 6, Hud. Riv. Gr.

cervicornis, DeBlainville, 1830, (Alveolites cervicornis,) Dict., vol. 60, p. 369, Devonian.

chapmani, Nicholson, 1874, Pal. Prov. Ont., p. 52, Up. Held. Gr.

clausus, Rominger, 1876, Foss. Corals, p. 37, Up. Held. and Ham. Gr.

conicus, Hall, 1874, 26th Rep. N. Y. St. Mus. Nat. Hist., p. 112, and Pal. N. Y., vol. 6, p. 9, Low. Held. Gr.

constrictus, Hall, 1852, (Astrocerium constrictum,) Pal. N. Y., vol. 2, p. 123, Niagara Gr.

crustatus, Edwards & Haime, 1851, Pol. Foss. Terr. Palæoz., p. 242, Niagara Gr.

cumberlandicus, Troost, 1840, (Calamopora cumberlandica,) 5th Geo. Rep. Tenn., p. 70, Kaskaskia Gr.

digitatus, Rominger, 1876, Foss. Corals, p. 39, Ham. Gr.

divergens, Winchell, 1862, Proc. Acad. Nat. Sci., p. 112, and Geo. Sur. W. 100th Merid., vol. 4, p. 79, Subcarb.

dubius, DeBlainville, 1830, (Alveolites dubius,) Dict., vol. 60, p. 370, Corniferous Gr.

dumosus, Winchell, 1866, Rep. Low. Penin. Mich., p. 89, Ham. Gr.

emmonsii, Rominger, 1876, Foss. Corals, p. 27, Up. Held. Gr. Syn. (?) for *F. heliolitiformis*.

emmonsii, Hall, 1876, Illust. Dev. Foss., pl. 9. The name was preoccupied.

epidermatus, Rominger, 1862, Am. Jour. Sci. and Arts, vol. 34, p. 396, Corniferous Gr.

epidermatus var. *biloculi*, Hall, 1876, Illust. Dev. Foss., pl. 7, Up. Held. Gr.

epidermatus var. *corticosus*, Hall, 1876, Illust. Dev. Foss., pl. 10, Up. Held. Gr.

excretus, Hall, 1876, 28th Rep. N. Y. St. Mus. Nat. Hist., syn. for *F. spinigerus*.

explanatus, Hall, 1876, Illust. Dev. Foss., pl. 14, Ham. Gr.

favosus, Goldfuss, 1826, Germ. Petref., p. 77, and Pal. N. Y., vol. 2, p. 126, (Calamopora favosa,) Niagara Gr.

flabelliformis, Troost, 1843. Not satisfactorily defined.

forbesi, Edwards & Haime, 1854, Brit. Foss. Corals, p. 258, Niagara Gr.

forbesi var. *discoideus*, Roemer, 1860, (Calamopora forbesi var. discoidea,) Sil. Fauna W. Tenn., p. 19, Niagara Gr.

forbesi var. *occidentalis*, Hall, 1876, 28th Rep. N. Y. St. Mus. Nat. Hist., p. 109, Niagara Gr.

forbesi var. *waldronensis*, Nicholson, 1879, syn. for *F. forbesi* var. *occidentalis*.

goldfussi, Goldfuss, 1826, Germ. Petref., p. 77, and Pal. N. Y., vol. 2, p. 126, (Calamopora goldfussi,) Niagara Gr.

goldfussi, Goldfuss, 1826, Germ. Petref., p. 77, and Pal. N. Y., vol. 2, p. 126, (Calamopora goldfussi,) Niagara Gr.

goldfussi, Goldfuss, 1826, Germ. Petref., p. 77, and Pal. N. Y., vol. 2, p. 126, (Calamopora goldfussi,) Niagara Gr.

goldfussi, Goldfuss, 1826, Germ. Petref., p. 77, and Pal. N. Y., vol. 2, p. 126, (Calamopora goldfussi,) Niagara Gr.

goldfussi, Goldfuss, 1826, Germ. Petref., p. 77, and Pal. N. Y., vol. 2, p. 126, (Calamopora goldfussi,) Niagara Gr.

goldfussi, Goldfuss, 1826, Germ. Petref., p. 77, and Pal. N. Y., vol. 2, p. 126, (Calamopora goldfussi,) Niagara Gr.

goldfussi, Goldfuss, 1826, Germ. Petref., p. 77, and Pal. N. Y., vol. 2, p. 126, (Calamopora goldfussi,) Niagara Gr.

goldfussi, Goldfuss, 1826, Germ. Petref., p. 77, and Pal. N. Y., vol. 2, p. 126, (Calamopora goldfussi,) Niagara Gr.

goldfussi, Goldfuss, 1826, Germ. Petref., p. 77, and Pal. N. Y., vol. 2, p. 126, (Calamopora goldfussi,) Niagara Gr.



FIG. 175.—*Favosites forbesi* var. *occidentalis*.



FIG. 176.—*Favosites goldfussi*.

goldfussi, Castelnau, 1843, (Calamopora goldfussi,) Syst. Sil., p. 47, Up. Sil. goldfussi, D'Orbigny, 1850, Prodr. de Paléont., p. 107, Devonian. The name was preoccupied.

gothlandicus, Lamarck, 1816, Hist. An. sans Vert., vol. 2, p. 206, Up. Held. and Ham. Grs.

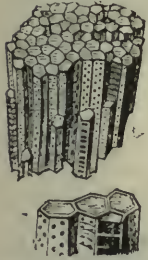


FIG. 177.—Favosites gothlandicus.

hamiltonensis, Rominger, 1876, Foss. Corals, syn. for F. dumosus.

hamiltoniae, Hall, 1876, Illust. Dev. Foss., pl. 34, Ham. Gr.

helderbergiae, Hall, 1874, 26th Rep. N. Y. St. Mus. Nat. Hist., p. 111, and Pal. N. Y., vol. 6, p. 8, Low. Held. Gr.

heliolitiformis, Rominger, 1862, (Calamopora heliolitiformis,) Am. Jour. Sci., vol. 34, 2d series, p. 397, Devonian.

hemisphericus, Troost, 1840, (Calamopora hemispherica,) 5th Geo. Rep. Tenn., p. 72, Up. Held. Gr. Same as Emmonsia hemispherica.

hemisphericus var. distortus, Hall, 1876, Illust. Dev. Foss., pl. 5, Up. Held. Gr.

hemisphericus var. rectus, Hall, 1876, Illust. Dev. Foss., pl. 2C, Up. Held. Gr.

hisingeri, Edwards & Haime, 1851, Pol. Foss. des Terr. Palæoz., p. 240, Niagara Gr.

hispidus, Rominger, 1876, Foss. Corals, p. 23, Niagara Gr.

infundibuliformis, as identified by D'Archiac & Verneuil. Not American.

intertextus, Rominger, 1876, Foss. Corals, p. 38, Ham. Gr.

invaginatus, Nicholson, 1875, Ohio Pal., vol. 2, p. 232, Corniferous Gr.

limitaris, Rominger, 1876, Foss. Corals, p. 36, Corniferous Gr.

lycoperdon, see Monticulipora lycoperdon. mammillaris, Castelnau, 1843. Not recognized.

mancus, Winchell, 1865, Proc. Acad. Nat. Sci., p. 112, Kinderhook Gr.

maximus, Troost, 1840, (Calamopora maxima,) 5th Rep. Geo. Tenn., p. 73, Devonian.

minimus, Hall, 1874, 26th Rep. N. Y. St. Mus. Nat. Hist., p. 113, Low. Held. Gr. niagarensis, Hall, 1852, Pal. N. Y., vol. 2, p. 125, Niagara Gr.

niagarensis var. spinigerus, see F. spinigerus. nitellus, Winchell, 1866, Rep. Low. Pen. Mich., p. 89, Ham. Gr.

obliquus, Rominger, 1876, Foss. Corals, p. 24, Niagara Gr.

occidens, Whitfield, 1878, Ann. Rep. Geo. Sur. Wis., p. 78, and Geo. Wis., vol. 4, p. 313, Niagara Gr.

parasiticus, Hall, 1852, (Astrocerium parasiticum,) Pal. N. Y., vol. 2, p. 122, Niagara Gr. This name was preoccupied by Phillips in his Geol. of Yorkshire.

placenta, Rominger, 1876, Foss. Corals, p. 34, Ham. Gr.

pleurodictyoides, Nicholson, 1875, Ohio Pal., vol. 2, p. 231, Corniferous Gr.

polymorphus, Goldfuss, 1826, Germ. Petref., p. 79, Corniferous Gr.

prolificus, Billings, 1865, Can. Nat. and Geol., 2d ser., vol. 2, p. 429, Hud. Riv. Gr.

proximus, Hall, 1883, Rep. St. Geol., pl. 7, fig. 13-15, and Pal. N. Y., vol. 6, p. 10, Low. Held. Gr.

pyriformis, Hall, 1852, (Astrocerium pyriforme,) Pal. N. Y., vol. 2, p. 123, Niagara Gr.

radiatus, Rominger, 1876, Foss. Corals, p. 33, Ham. Gr.

radiciformis, Rominger, 1876, Foss. Corals, p. 34, Devonian.

reticulatus, DeBlainville, 1840, (Alveolites reticulatus,) Dict., vol. 60, p. 369, Niagara Gr.

sphericus, Hall, 1874, (Chetetes sphericus,) 26th Rep. N. Y. St. Mus. Nat. Hist., p. 111, and Pal. N. Y., vol. 6, p. 9, Low. Held. Gr.

spinigerus, Hall, 1876, (F. niagarensis var. spinigerus,) 28th Rep. N. Y. St. Mus. Nat. Hist., p. 108, Niagara Gr.

spongilla, Rominger, 1876, Foss. Corals, p. 24, syn. for F. spinigerus.

striatus, Say, 1818, Am. Jour. Sci., vol. 1, p. 384, Niagara Gr.

troosti, Edwards & Haime, 1851, Mon. d. Pol. Foss. d. Terr. Pal., p. 238, Devonian.

tuberosus, Rominger, 1876, Foss. Corals, p. 31, Corniferous Gr.

turbinatus, Billings, 1859, Can. Jour., vol. 4, p. 109, Up. Held. & Ham. Gr.

venustus, Hall, 1852, [Astrocerium venustum,) Pal. N. Y., vol. 2, p. 120, Niagara Gr.

verneuili, Castelnau, 1843, syn. for Monticulipora fibrosa.

whitfieldi, White, 1874, Rep. Invert. Foss., syn. for F. divergens.

winchelli, Rominger, 1862, (Calamopora winchelli,) Am. Jour. Sci., vol. 34, 2d ser., p. 397, Devonian.

Favositopora, Kent, 1870, Ann. and Mag. Nat. Hist., 3d ser., vol. 6, p. 384.

palæozoica, Kent, 1870, Ann. and Mag. Nat. Hist., 3d ser., vol. 6, p. 384. Not recognized.

Filicites gracilis, see Plumalina gracilis.

Geoporites americanus, D'Orbigny, 1850. Not defined so as to be recognized.

Glossograptus, Emmons, (Glossograpsus,) 1856, Am. Geo., p. 108. [Ety. glosse, tongue; grapho, I write.] Stipe free; thin, membranaceous, ligulate, extremities rounded, axis distinct. Type G. ciliatus.

ciliatus, Emmons, 1856, Am. Geo., pt. 2, p. 108, Up. Taconic.

setaceus, Emmons, 1856, Am. Geo., pt. 2, p. 236, Up. Taconic.

GRAPTOLITHUS, Linnæus, 1736, Syst. Nat., 1st Ed., but it was not until 1767, in the 12th Ed., that any species were defined. [Ety. *grapho*, I write; *lithos*, stone.] Stipes elongated, slender, flattened, or quadrangular; they may be simple or bifurcating; the cells enter the central canal and open their mouths upward, so as to form denticles on the margins when compressed. Type *G. scalaris*.

abnormis, Hall, 1858, Geo. Sur. Can., p. 117, and Can. Org. Rem., Decade 2, p. 106, Quebec Gr.

alatus, Hall, 1858, Geo. Sur. Can., p. 127, and Can. Org. Rem., Decade 2, p. 93, Quebec Gr.

amplexicaulis, see *Diplograptus amplexicaulis*.

angustifolius, see *Diplograptus angustifolius*.

annectans, Walcott, 1879, Utica Slate and related formations, p. 20, Utica Slate.

antennarius, see *Climacograptus antennarius*.

approximatus, Nicholson, 1873, (*Tetragraptus approximatus*.) Ann. and Mag. Nat. Hist., 4th ser., vol. 12, Quebec Gr.

arcuatus, Hall, 1865, Can. Org. Rem., Decade 2, p. 79, Quebec Gr.

bicornis, see *Climacograptus bicornis*.

bifidus, Hall, 1858, Can. Nat. and Geo., vol. 3, p. 73, Quebec Gr.

bigsbyi, Hall, 1865, Can. Org. Rem., Decade 2, p. 86, Quebec Gr.

bryonoides, Hall, 1858, Geo. Sur. Can., p. 126, and Can. Org. Rem., Decade 2, p. 84, Quebec Gr.

caduceus, see *Didymograptus caduceus*.

clintonensis, Hall, 1843, Geo. Rep. 4th Dist. N. Y., p. 74, and Pal. N. Y., vol. 2, p. 39, Clinton Gr.

constrictus, Hall, 1865, Can. Org. Rem., Decade 2, p. 76, Quebec Gr.

crucifer, Hall, 1858, Geo. Sur. Can., p. 125, and Can. Org. Rem., Decade 2, p. 92, Quebec Gr.

dentatus, Emmons, 1842, Geo. Rep. N. Y., p. 279, Utica Slate.

denticulatus, Hall, 1858, Geo. Sur. Can., p. 132, and Can. Org. Rem., Decade 2, p. 88, Quebec Gr.

divaricatus, Hall, 1859, Pal. N. Y., vol. 3, p. 513, Hud. Riv. Gr. See *Dicranograptus divaricatus*.

divergens, Hall, 1859, Pal. N. Y., vol. 3, p. 509, Hud. Riv. Gr.

ensiformis, see *Retiolites ensiformis*.

extensus, Hall, 1858, Geo. Sur. Can., p. 132, and Can. Org. Rem., Decade 2, p. 80, Quebec Gr.

extenuatus, Hall, 1865, Can. Org. Rem., Decade 2, p. 75, Quebec Gr.

flaccidus, Hall, 1865, Can. Org. Rem., Decade 2, p. 143, Utica Slate.

flexilis, see *Clonograptus flexilis*.

foliaceus, see *Diplograptus foliaceus*.

folium, see *Diplograptus folium*.

fruticosus, Hall, 1858, Geo. Sur. Can., p. 128 and Can. Org. Rem., Decade 2, p. 90, Quebec Gr.

furcatus, see *Dicranograptus furcatus*.

gracilis, Hall, 1847, Pal. N. Y., vol. 1, p. 274, Utica Slate.

hallanus, see *Dendrograptus hallanus*.

headi, Hall, 1858, Geo. Sur. Can., p. 127, and Can. Org. Rem., Decade 2, p. 94, Quebec Gr.

hypniformis, see *Diplograptus hypniformis*.

indentus, Hall, 1858, Geo. Sur. Can., p. 128, and Can. Org. Rem. Decade 2, p. 74, Quebec Gr.

lævis, Hall, 1847, Pal. N. Y., vol. 1, p. 274, Utica Slate.

logani, 1858, Geo. Sur. Can., p. 115, and Can. Org. Rem., Decade 2, p. 100, Quebec Gr.

marcidus, see *Diplograptus marcidus*.

milesii, Hull, 1861, Geo. Sur. Vermont, vol. 1, p. 372, Quebec Gr.

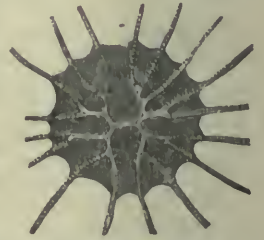


FIG. 178.—Graptolithus logani.

mucronatus, see *Diplograptus mucronatus*.

multifasciatus, Hall, 1859, Pal. N. Y., vol. 3, p. 508, and Can. Org. Rem., Decade 2, p. 10, Hud. Riv. Gr.

nitidus, Hall, 1858, Geo. Sur. Can., p. 129, and Can. Org. Rem., Decade 2, p. 69, Quebec Gr.

octobrachiatus, Hall, 1858, Geo. Sur. Can., p. 122, and Can. Org. Rem., Decade 2, p. 96, Quebec Gr.

octonarius, Hall, 1858, Geo. Sur. Can., p. 124, and Can. Org. Rem., Decade 2, p. 95, Quebec Gr.

patulus, Hall, 1858, Geo. Sur. Can., p. 131, and Can. Org. Rem., Decade 2, p. 71, Quebec Gr.

pennatulus, Hall, 1865, Can. Org. Rem., Decade 2, p. 82, Quebec Gr.

peosta, see *Diplograptus peosta*.

pristis, see *Diplograptus pristis*.

putillus, see *Diplograptus putillus*.

pristiniformis, see *Diplograptus pristiniiformis*.

quadribrachiatus, Hall, 1858, Geo. Sur. Can., p. 125, and Can. Org. Rem., Decade 2, p. 91, Quebec Gr.

quadrimumeronatus, Hall, 1865, Can. Org. Rem., Decade 2, p. 144, Utica Slate.

ramosus, see *Dicranograptus ramosus*.

ramulus, Hall, 1865, Can. Org. Rem., Decade 2, p. 108, Quebec Gr.

ramulus, White. The name was preoccupied. See *G. whitanus*.

richardsoni, Hall, 1865, Can. Org. Rem., Decade 2, p. 107, Quebec Gr.

rigidus, see *Clonograptus rigidus*.

scalaris, Linnæus, as identified by Hall in Pal. N. Y., vol. 1, p. 271, Utica Slate.

secalinus, see *Diplograptus secalinus*.
serratululus, Hall, 1847, Pal. N. Y., vol. 1, p. 274, Utica Slate.
sagittarius, Linnæus, 1767, Syst. Nat., as identified by Hall in Pal. N. Y., vol. 1, p. 272, Utica Slate.
sextans, see *Dicranograptus sextans*.
similis, Hall, 1865, Can. Org. Rem., Decade 2, p. 78, Quebec Gr.
spinulosus, see *Diplograptus spinulosus*.
subtenuis, Hall, 1877, Am. Pal. Foss., p. 244, Hud. Riv. Gr.
tentaculatus, see *Retiograptus tentaculatus*.
tenuis, Hall, 1847, Pal. N. Y., vol. 1, p. 272. The name was preoccupied by Portlock in 1843. See *G. subtenuis*.
venosus, see *Retiolites venosus*.
whitfieldi, see *Diplograptus whitfieldi*.
whitnianus, S. A. Miller, 1883, Am. Pal. Foss., p. 269, Hud. Riv. Gr. Proposed instead of *G. ramulus*, White, 1874, which was preoccupied. See *Geo. Sur. W. 100th Mer.*, vol. 4, p. 62.

HADROPHYLLUM, Edwards & Haime, 1850, Brit. Foss. Corals, p. lxxvii. [Ety. *hadros*, mighty; *phyllon*, leaf.] Corallum short; calice superficial; one very large septal fossula and three small ones representing a cross; radiate arrangement of the septa somewhat irregular. Type *H. orbigny*.
glans, White, 1862, (*Zaphrentis glans*.) Proc. Bost. Soc. Nat. Hist., vol. 9, p. 32, and Cont. to Pal., No. 8, p. 156, Burlington Gr.
orbigny, Edwards & Haime, 1850, Brit. Foss. Corals, p. lxxvii, Up. Held Gr.
Haimenophyllum, Billings, 1859, Can. Jour., vol. 4, p. 139, syn. for *Chonostegites*.
ordinatum, see *Chonostegites ordinatum*.
HALLIA, Edwards & Haime, 1851, Mon. d. Pol. Foss. d. Terr. Pal., p. 353. [Ety. proper name.] Corallum tall, turbinate; septa extending to the center; one large septum occupying the place of the septal fossula, and the neighboring septa directed toward it, so as to assume a pinnate arrangement; no columella. Type *H. insignis*.
divergens, Hall, 1882, Foss. Corals Niagara and Up. Held. Grs., p. 8, and 35th Rep. N. Y. Mus. Nat. Hist., p. 412, Niagara Gr.
divisa, Hall, 1882, Foss. Corals Niagara and Up. Held. Grs., p. 8, and 35th Rep. N. Y. St. Mus. Nat. Hist., p. 412, Niagara Gr.
insignis, Edwards & Haime, 1851, Mon. d. Pol. Foss. d. Terr. Pal., p. 353, Up. Held. Gr.
pluma, Hall, 1882, Foss. Corals Niagara and Up. Held. Grs., p. 8, and 35th Rep. N. Y. St. Mus. Nat. Hist., p. 412, Niagara Gr.



FIG. 179.
Hadrophyllum glans.

scitula, Hall, 1882, Foss. Corals Niagara and Up. Held. Grs., p. 7, and 35th Rep. N. Y. St. Mus. Nat. Hist., p. 411, Niagara Gr.

HALYSITES, Fischer, 1813, Zoognosia, vol. 1, p. 387. [Ety. *halyson*, a small chain.] Corallites long, arranged in single series, united laterally in the form of elliptical expansions, presenting a chain-like arrangement; epitheca thick; septa usually absent or rudimentary, but, in perfect specimens, extending to the center of the visceral chamber; tabulæ horizontal. Type *H. catenulatus*.
agglomeratus, Hall, 1843, (*Catenipora agglomerata*.) Geo. Rep. 4th Dist. N. Y., Tab. Foss. No. 22, fig. 2, and Pal. N. Y., vol. 2, p. 129, Niagara Gr.

catenulatus, Linnæus, 1767, (*Tubipora catenulata*.) Syst. Nat. 12th Ed., p. 1270, Niagara Gr.

catenulatus var. *fieldeni*, Etheridge, 1878, Quar. Jour. Geo. Soc., vol. 34, p. 582, Up. Sil.

catenulatus var. *harti*, Etheridge, 1878, Quar. Jour. Geo. Soc., vol. 34, p. 583, Up. Sil.

catenulatus var. *microporus*, Whitfield, 1882, Geo. Wis., vol. 4, p. 272, Niagara, Gr.

compactus, Rominger, 1876, Foss. Corals, syn. for *H. agglomeratus*.

escharoides, Lamarek, 1816, (*Catenipora escharoides*.) Hist. des Anim. sans Vert., vol. 2, p. 207, Niagara Gr.

gracilis, Hall, 1851, (*Catenipora gracilis*.) Geo. Lake Sup. Land Dist., vol. 2, p. 212, Hud. Riv. Gr.

labyrinthicus, Goldfuss, 1826, (*Catenipora labyrinthica*.) Petref. Germ., p. 71, Niagara Gr.

meandrina, Troost, 1840, (*Catenipora meandrina*.) 5th Geo. Rep. Tenn., Niagara Gr. The definition is too meagre for identification.

parryi, König, 1824, (*Catenipora parryi*.) Supp. to App. of Capt. Parry's Voyage for the Discovery of a North-west Passage, Up. Sil.

sexto-attenuatus, Owen, 1862, Geo. Sur. Ind., p. 362, Niagara Gr.

Harmodites rugosus, D'Orbigny, 1850, Prodr. de Paléont., t. 1, p. 50. Not defined so as to be recognized.

HELIOLITES, Guettard, 1770, Mem. 3, p. 454. [Ety. *helios*, sun; *lithos*, stone.] Corallum spheroidal, hemispherical or ramose; corallites of larger and smaller size, the



FIG. 180.—Halysites catenulatus.

larger ones cylindrical, with twelve in-foldings of the wall or septa, not reaching the center, the smaller ones polygonal, investing the larger ones; walls amalgamated; tabulæ numerous; no columella. Type *H. interstinctus*.

affinis, Billings, 1865, Can. Nat. and Geo., 2d ser., vol. 2, p. 427, Hud. Riv. and Mid. Sil.

elegans, Hall, 1852, Pal. N. Y., vol. 2, p. 130, Niagara Gr.

exiguus, Billings, 1865, Can. Nat. and Geo., 2d ser., vol. 2, p. 428, Mid. Sil.

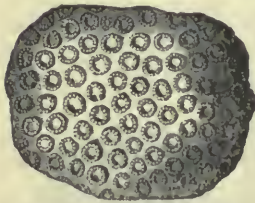


FIG. 181.—*Heliolites interstinctus*.

interstinctus, Linnaeus, 1767, (*Madrepora interstincta*.) Syst. Nat., 12th Ed., p. 1276, Niagara Gr.

macrostylus, Hall, 1852, Pal. N. Y., vol. 2, p. 135, Niagara Gr.

megastoma, McCoy, 1846, Sil. Foss. of Ireland, p. 62, Niagara Gr.

pyriformis, Guettard, 1770, Mem. 3, p. 454, and Pal. N. Y., vol. 2, p. 133, Niagara Gr.

sparsus, Billings, 1865, Can. Nat. and Geo., 2d ser., vol. 2, p. 428, Mid. Sil.

speciosus, Billings, 1865, Can. Nat. and Geo., 2d ser., vol. 2, p. 426, Mid. Sil.

spiniporus, Hall, 1852, Pal. N. Y., vol. 2, p. 131, Niagara Gr.

subtubulatus, McCoy, as identified by Rominger, 1876, Foss. Corals, p. 13, Niagara Gr.

tenuis, Billings, 1865, Can. Nat. and Geo., 2d ser., vol. 2, p. 428, Mid. Sil.

HELIOPHYLLUM, Hall, 1848, in Dana, Zooph., p. 356. [Ety. *helios*, sun; *phyllon*, leaf.]

Corallum simple; septa well developed and producing lateral lamellar prolongations, which extend from the wall toward the center of the visceral chamber, so as to represent ascending arches and to constitute irregular central tabulæ, and which are united toward the circumference by means of vertical dissepiments. Type *H. halli*.

acuminatum, Hall, 1882, Foss. Corals Niagara and Up. Held. Grs., p. 46, and 12th Rep. Ind. Geo., p. 310, Up. Held. Gr.

aequale, Hall, 1882, Foss. Corals Niagara and Up. Held. Grs., p. 47, and 35th Rep. N. Y. St. Mus. Nat. Hist., p. 451, Up. Held. Gr.

aequum, Hall, 1882, Foss. Corals Niagara and Up. Held. Grs., p. 51, and 12th Rep. Ind. Geo., p. 314, Up. Held. Gr.

alternatum, Hall, 1882, Foss. Corals Niagara and Up. Held. Grs., p. 45, and 12th Rep. Ind. Geo., p. 305, Up. Held. Gr.

annulatum, Hall, 1882, Foss. Corals Niagara and Up. Held. Grs., p. 48, and 12th Rep. Ind. Geo., p. 307, Up. Held. Gr.

arachne, Hall, 1876, Illust. Dev. Foss., pl. 24, Ham. Gr.

campaniforme, Hall, 1882, Foss. Corals Niagara and Up. Held. Grs., p. 53, and 35th Rep. N. Y. St. Mus. Nat. Hist., p. 457, Up. Held. Gr.

canadense, Billings, 1859, Can. Jour., vol. 4, p. 125, Up. Held. Gr.

cancellatum, Hall, 1882, Foss. Corals Niagara and Up. Held. Grs., p. 53, and 35th Rep. N. Y. St. Mus. Nat. Hist., p. 457, Up. Held. Gr.

cayugaense, Billings, 1859, Can. Jour., vol. 4, p. 124, Up. Held. Gr.

colbornense, Nicholson, 1875, Can. Nat. and Geo., vol. 7, p. 143, Up. Held. Gr.

colligatum, Billings, 1859, Can. Jour., vol. 4, p. 126, Up. Held. Gr.

compactum, Hall, 1882, Foss. Corals Niagara and Up. Held. Grs., p. 48, and 12th Rep. Ind. Geo., p. 308, Up. Held. Gr.

confluens, Hall, 1876, Illust. Dev. Foss., pl. 26 and 27, Ham. Gr.

degener, Hall, 1876, Illust. Dev. Foss., pl. 25, Ham. Gr.

dentatum, Hall, 1882, Foss. Corals Niagara and Up. Held. Grs., p. 48, and 35th Rep. N. Y. St. Mus. Nat. Hist., p. 452, Up. Held. Gr.

denticulatum, Hall, 1882, Foss. Corals Niagara and Up. Held. Grs., p. 52, and 12th Rep. Ind. Geo., p. 313, Up. Held. Gr.

dentilineatum, Hall, 1882, Foss. Corals Niagara and Up. Held. Grs., p. 13, and 35th Rep. N. Y. St. Mus. Nat. Hist., p. 417, Niagara Gr.

distans, Hall, 1882, Foss. Corals Niagara and Up. Held. Grs., p. 50, and 12th Rep. Ind. Geo., p. 308, Up. Held. Gr.

erienne, Billings, 1859, Can. Jour., vol. 4, p. 124, Corniferous Gr.

exiguum, Billings, 1860, Can. Jour., vol. 5, p. 261, Corniferous Gr.

fasciculatum, Hall, 1882, Foss. Corals Niagara and Up. Held. Grs., p. 48, and 35th Rep. N. Y. St. Mus. Nat. Hist., p. 452, Up. Held. Gr.

fecundum, Hall, 1882, Foss. Corals Niagara and Up. Held. Grs., p. 49, and 12th Rep. Geo. Ind., p. 309, Up. Held. Gr.

fissuratum, Hall, 1882, Foss. Corals Niagara and Up. Held. Grs., p. 53, and 35th Rep. N. Y. St. Mus. Nat. Hist., p. 457, Up. Held. Gr.

gemmatum, Hall, 1882, Foss. Corals Niagara and Up. Held. Grs., p. 49, and 12th Rep. Geo. Ind., p. 310, Up. Held. Gr.

gemmiferum, Hall, 1882, Foss. Corals Niagara and Up. Held. Grs., p. 13, and 35th Rep. N. Y. St. Mus. Nat. Hist., p. 417, Niagara Gr.

halli, Edwards & Haime, 1850, Brit. Foss. Corals, p. 235, Ham. Gr.



FIG. 182.—*Heliophyllum halli*.

halli var. obconicum, Hall, 1876, *Illustr. Dev. Foss.*, pl. 25, Ham. Gr.
 halli var. reflexum, Hall, 1876, *Illustr. Dev. Foss.*, pl. 23, Ham. Gr.
 imbricatum, Hall, 1882, *Foss. Corals Niagara and Up. Held. Grs.*, p. 46, and 35th Rep. N. Y. St. Mus. Nat. Hist., p. 450, Up. Held. Gr.
 Mus. Nat. Hist., p. 450, Up. Held. Gr.
 incrassatum, Hall, 1882, *Foss. Corals Niagara and Up. Held. Grs.*, p. 46, and 12th Rep. Geo. Ind., p. 309, Up. Held. Gr.
 infundibulum, Hall, 1883, 12th Rep. Geo. Ind., p. 305, Up. Held. Gr.
 invaginatatum, Hall, 1882, *Foss. Corals Niagara and Up. Held. Grs.*, p. 47, and 12th Rep. Geo. Ind., p. 306, Up. Held. Gr.
 irregulare, Hall, 1876, *Illustr. Dev. Foss.*, pl. 24, Ham. Gr.
 laterierescens, Hall, 1882, *Foss. Corals Niagara and Up. Held. Grs.*, p. 49, and 12th Rep. Geo. Ind., p. 314, Up. Held. Gr.
 lineolatum, Hall, 1882, *Foss. Corals Niagara and Up. Held. Grs.*, p. 50, and 35th Rep. N. Y. St. Mus. Nat. Hist., p. 454, Up. Held. Gr.
 mitella, Hall, 1882, *Foss. Corals Niagara and Up. Held. Grs.*, p. 14, and 35th Rep. N. Y. St. Mus. Nat. Hist., p. 418, Niagara Gr.
 nettlerothi, Hall, 1882, *Foss. Corals Niagara and Up. Held. Grs.*, p. 51, and 12th Rep. Geo. Ind., p. 312, Up. Held. Gr.
 pocillatum, Hall, 1884, *Foss. Corals Niagara and Up. Held. Grs.*, p. 50, and 35th Rep. N. Y. St. Mus. Nat. Hist., p. 454, Up. Held. Gr.
 pravum, Hall, 1882, *Foss. Corals Niagara and Up. Held. Grs.*, p. 13, and 12th Rep. Geo. Ind., p. 274, Niagara Gr.
 proliferum, Nicholson, 1874, *Rep. Pal. Ont. Can.*, p. 27, Up. Held. Gr.
 proliferum, Hall, 1876, *Illustr. Dev. Foss.*, pl. 26, is probably a syn. for *H. proliferum*, Nicholson.
 puteatum, Hall, 1882, *Foss. Corals Niagara and Up. Held. Grs.*, p. 14, and 35th Rep. N. Y. St. Mus. Nat. Hist., p. 418, Niagara Gr.
 scyphulus, Hall, 1882, *Foss. Corals Niagara and Up. Held. Grs.*, p. 51, and 12th Rep. Geo. Ind., p. 306, Up. Held. Gr.
 sordidum, Hall, 1882, *Foss. Corals Niagara and Up. Held. Grs.*, p. 52, and 12th Rep. Geo. Ind., p. 311, Up. Held. Gr.
subcaespitosum, see *Crepidophyllum subcaespitosum*.
 tenuimurale, Hall, 1882, *Foss. Corals Niagara and Up. Held. Grs.*, p. 51, and 12th Rep. Geo. Ind., p. 307, Up. Held. Gr.

tenuiseptatum, Billings, 1859, *Can. Jour.*, vol. 4, p. 126, Ham. Gr.

venatum, Hall, 1882, *Foss. Corals Niagara and Up. Held. Grs.*, p. 46, and 35th Rep. N. Y. St. Mus. Nat. Hist., p. 450, Up. Held. Gr.

verticale, Hall, 1882, *Foss. Corals Niagara and Up. Held. Grs.*, p. 47, and 35th Rep. N. Y. St. Mus. Nat. Hist., p. 451, Up. Held. Gr.

HETEROPHRENTIS, Billings, 1875, *Can. Nat. and Geo.*, vol. 7, p. 235. [Ety. *heteros*, irregular; *phren*, midriff or lamella.] Corallum simple, turbinate, calice large, septal fossette well-defined, bottom smooth or with a pseudo-columnella, septa, below the calice, sharp edged; often with their inner edges twisted together, usually rounded on approaching the margin; apparently only a single transverse diaphragm, which forms the floor of the cup. Type *H. spatiosa*.
compta, Billings, 1875, *Can. Nat. and Geo.*, vol. 7, p. 236, Corniferous Gr.
excellens, Billings, 1875, *Can. Nat. and Geo.*, vol. 7, p. 236, Corniferous Gr.
prolifera, Billings, 1875, *Can. Nat. and Geo.*, vol. 7, p. 236, Corniferous Gr.
spatiosa, Billings, 1858, (*Zaphrentis spatiosa*.) *Can. Nat. and Geo.*, vol. 3, p. 430, Onondaga and Corniferous Gr.

Heterotrypa, Nicholson, 1879, *Pal. Tab. Cor.*, p. 291. Proposed as a subgenus of *Monticulipora*, making *M. mammulata* the type which is the type of *Monticulipora*. This is a violation of the elementary principles of nomenclature.

Houghtonia, syn. for *Calapœcia*.

huronica, see *Calapœcia huronica*.

INOCALIS, Hall, 1852, *Pal. N. Y.*, vol. 2, p. 176. [Ety. *inos*, small sprouts; *kaulos*, stem.] Expanded, bifurcating, fenestrate, and usually indicated by simple black rays connected by small cross bars. Type *I. plumulosus*.

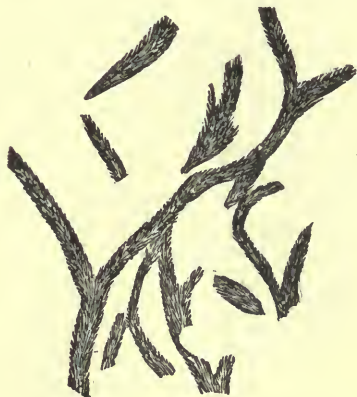


FIG. 183.—*Inocaulis plumulosus*.

anastomica, Ringuëberg, 1888, *Proc. Acad. Nat. Sci. Phil.*, p. 131, Niagara Gr.

- arbuscula, Ulrich, 1879, Jour. Cin. Soc. Nat. Hist., vol. 2, p. 28, Hud. Riv. Gr. bellus, Hall & Whitfield, 1875, Ohio Pal., vol. 2, p. 122, Niagara Gr.
- cervicornis, Spencer, 1884, Bull. No. 1, Mus. Univ. St. Mo., p. 37, Niagara Gr.
- diffusus, Spencer, 1884, Bull. No. 1, Mus. Univ. St. Mo., p. 36, Niagara Gr.
- divaricatus, Hall, 1879, Desc. New sp. Foss., p. 2, and 11th Rep. Geo. Ind., p. 225, Niagara Gr.
- phycoides, Spencer, 1884, Bull. No. 1, Mus. Univ. St. Mo., p. 38, Niagara Gr.
- plumulosus, Hall, 1851, Pal. N. Y., vol. 2, p. 176, Niagara Gr.
- problematicus, Spencer, 1878, Can. Nat., vol. 8, and Bull. No. 1, Mus. Univ. St. Mo., p. 36, Niagara Gr.
- ramulosus, Spencer, 1884, Bull. No. 1, Mus. Univ. St. Mo., p. 38, Niagara Gr.
- walkeri, Spencer, 1884, Bull. No. 1, Mus. Univ. St. Mo., p. 35, Niagara Gr.
- Lamellopora*, Owen, 1840, Rep. on Minn. Lands, p. 70. Very poorly defined, but a syn. for *Stromatopora*.
- infundibularia*, Owen, 1840, Rep. on Minn. Lands, p. 70. A species of *Stromatopora*, poorly defined.
- LEPTOPORA, Winchell, 1863, Proc. Acad. Nat. Sci. Phil., p. 2. [Ety. *leptos*, shallow; *poros*, cell.] Discoidal, cells shallow; walls vertically striated; interior vesicular; cups elevated in the center, and displaying radial septa. Type *H. typus*.
- typus*, Winchell, 1863, Proc. Acad. Nat. Sci. Phil., p. 3, Marshall Gr.
- winchelli*, White, 1879, Bull. U. S. Sur., vol. 5, p. 211, and Cont. to Pal. No. 6, p. 121, Carboniferous.
- Limaria*, Steininger, 1834, Bull. Soc. Geo. France, vol. 1, p. 339. The name was preoccupied by Link in 1807, and by Rafinesque in 1815. See *Cœnites*.
- crassa*, see *Cœnites crassus*.
- falcata*, see *Cœnites falcatus*.
- fruticosa*, see *Cœnites fruticosus*.
- laminata*, see *Cœnites laminatus*.



FIG. 184. — Lithostrotion basaltiforme.

[Ety. *lithos*, stone; *strotion*, little rafter.] Corallum composite, astreiform; corallites loosely approximated, and circu-

ramulosa, see *Cœnites ramulosus*.

LINDSTROMIA, Nicholson & Thompson, 1877, Proc. Roy. Soc. Edinb., vol. 9, p. 149. [Ety. proper name.] Type *L. columnaris*.

columnaris, Nicholson & Thompson, 1877, Proc. Roy. Soc. Edinb., vol. 9, p. 149, Devonian.

Limipora rotunda, Troost, not defined.

LITHOSTROTION, Lhwyd, 1869, Lithophyl. Britann. Ichnographia, Epistola 5, tab. xxiii.

lar or intimately united, and polygonal; septa numerous; calices unequal; structure as in *Clisiophyllum*. Type *L. basaltiforme*.

californiense, Meek, 1864, Pal. California, vol. 1, p. 6. Carb.

canadense, Castelnau, 1843, (*Axinura canadensis*), Syst. Sil., p. 49, St. Louis Gr.

harmodites, Edwards & Haime, 1851, Mon. d. Pol. Foss. d. Terr. Pal., p. 440, Carboniferous.

junceum, Fleming, 1828, (*Caryophyllæa juncea*), Brit. Anim., p. 509, Subcarb.

mammillare, Castelnau, 1843, (*As-trea mammillaris*), Syst. Sil., p. 50, syn. for *L. canadense*.

microstylum, White, 1880, 12th Rep. U. S. Geo. Sur. Terr., p. 153, Kinderhook or Waverly Gr.

pictoense, Billings, 1868, Acad. Geo., p. 285, Carb.

proliferum, Hall, 1858, Geo. Rep. Iowa, p. 668, St. Louis Gr.

stokesi, Edwards & Haime, 1851, Mon. d. Pol. Foss. d. Terr., Pal., p. 440, Carboniferous.

whitneyi, Meek, 1875, Wheeler's Sur. W. 100 Mer., vol. 4, p. 103, Coal Meas.

LONSDALLIA, McCoy, 1849, Ann. & Mag. Nat. Hist. 2d ser., vol. 3, p. 10. [Ety. proper name.] Corallum aggregate; corallites circular, not laterally united; septa and tabule numerous; visceral chamber separated into two zones, the outer one



FIG. 188. — Lonsdalla floriformis, typical of the genus.

papillata, Fischer, 1837, (*Cyathophyllum papillatum*), Oryct. de Moscou., p. 155, Carboniferous. American. (?)

LOPHOPHYLLUM, Edwards & Haime, 1850, Brit. Foss. Corals, p. lxvi. [Ety. *lophos*, ridge; *phyllon*, leaf.] Corallum resembling *Zaphrentis*, excepting that a cres-



FIG. 185. — Lithostrotion canadense.

composed of curved vesicular plates extending upward and outward; walls rugose and striated; reproduction by circular germs arising from the outer zone. Type *L. duplicata*.

centiform columella occupies the center of the calice, and is in continuity by one of its ends with a small septum placed in the middle of the septal fossula, and by the other end with the opposite primary septum. Type *L. konincki*.

calceola, see *Zaphrentis calceola*.

expansum, White, 1876, Proc. Acad. Nat. Sci. Phil., p. 27, and Cont. to. Pal., No. 6. p. 157, Keokuk Gr.

proliferum, McClesney, 1860, (*Cyathaxonia proliferum*), New Pal. Foss., p. 75, and Pal. E. Neb., p. 144, Coal Meas.



FIG. 187.—*LO-LUNATIPORA*, Winchell, 1866, phophyllum Rep. Low. Penin. Mich. proliferum. p. 89. [Ety. *lunatus*, crescent-formed; *poros*, pore.] Massive or with corallites consolidated; corallites long, curving outward from an imaginary axis; walls double; tabulæ present; no mural pores. Type *L. michiganensis michiganensis*, Winchell, 1866, Rep. Low. Penin. Mich., p. 89, Ham. Gr.

LYELLIA, Edwards & Haime, 1851, Mon. Pol. Foss. Terr. Pal., p. 226. [Ety. proper name.] Corallum massive; corallites cylindrical; walls thick, costulated, free toward their terminations, and united by vesicular cœnenchyma; septa 12; tabulæ irregular. Type *L. americana*.

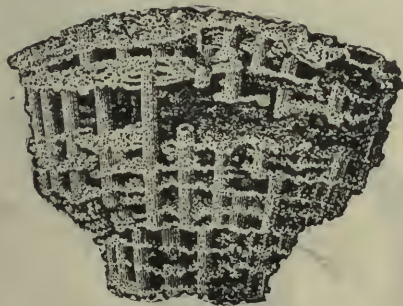


FIG. 188.—*Lyellia americana*.

americana, Edwards & Haime, 1851, Mon. Pol. Foss. Terr. Pal., p. 226, Up. Held. Gr. *decipiens*, Rominger, 1876, Foss. Corals, p. 17, Niagara Gr. *glabra*, Owen, 1840, (*Sarcinula glabra*), Rep. on Minn. Lands, p. 70, Niagara Gr.

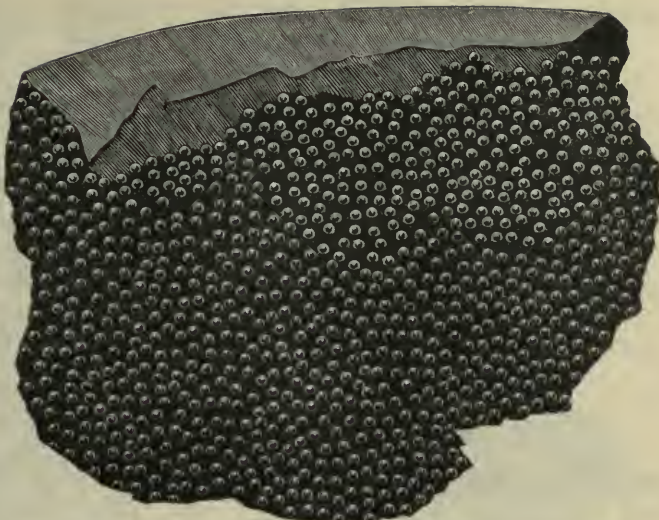


FIG. 189.—*Megalograptus welchi*. Cylindrical part of the body depressed, showing cells.

papillata, Rominger, 1876, Foss. Corals, p. 16, Niagara Gr. *parviturba*, Rominger, 1876, Pal. Foss. Corals, p. 17, Niagara Gr.

Madrepora repens, Troost. Not satisfactorily defined.

MEGALOGRAPTUS, S. A. Miller, 1874, Cin. Quar. Jour. Sci., vol. 1, p. 343.

[Ety. *megalos*, large; *grapho*, I write.]

Very large cylindrical, bearing fronds with spinous processes, and covered with cellular openings. Type

M. welchi, S. A. Miller, 1874, Cin. Quar. Jour. Sci., vol. 1, p. 343, Hud. Riv. Gr.



FIG. 190.—*Megalograptus welchi*. Frond, showing cells and spinous processes.

MICHELINIA, DeKoninck, 1842, Descries Anim. Foss. Belg., p. 29. [Ety. proper name.] Corallum composite, forming hemispherical, depressed, or pyriform masses of prismatic or subcylindrical corallites; mural pores; tabulæ; tubes having striæ or ridges; epitheca concentrically wrinkled, with root-like prolongations. Type *M. favosa*.



FIG. 191.—*Megalograptus welchii*. Frond, showing cells and spinous processes.

convexa, D'Orbigny, 1850, Prodr. de Paléont., t. 1, p. 107, Onondaga and Corniferous Grs.



FIG. 192.—*Michelinia eugeneæ*.

dividua, Hall, 1876, Illust. Dev. Foss., pl. 18, Ham. Gr.

eugeneæ, White, 1884, 13th Rep. Geo. Ind., p. 119, Coal Meas.

expansa, White, 1880, 12th Rep. U. S. Geo. Sur. Terr., p. 158, Waverly Gr.

favositoidea, Billings, 1858, Rep. of Progr. Can. Geo. Sur., p. 175, Up. Held. Gr.

insignis, Rominger, 1876, Foss. Corals, p. 75, Up. Held. and Ham. Gr.

intermittens, Billings, 1859, Can. Nat. and Geo. Sur., vol. 4, p. 113, Cogniferous Gr.

lenticularis, Hall, 1874, 26th Rep. N. Y. St. Mus. Nat. Hist., p. 113, Low. Held. Gr.

placenta, White, 1880, 12th Rep. U. S. Geo. Sur. Terr., p. 157, Waverly Gr.

stylopora, Eaton, 1832, (*Astrea stylopora*), Geo. Text book, p. 40, and Illust. Dev. Foss., pl. 18, Ham. Gr.

trochiscus, Rominger, 1876, Pal. Foss., p. 76, syn. for *Pleurodictyum americanum*.

MICROCYCLUS, Meek & Worthen, 1868, Geo. Sur. Ill., vol. 3, p. 420. [Ety. *mikros*, small; *kuklos*, circle.] Corallum free or with a minute central point of attachment, discoidal; no columella; calice shallow, with a single fossula; septa short, radiating regularly, or those nearest the fossette converging a little

toward its sides; epitheca well developed. Type *M. discus*. *discus*, Meek & Worthen, 1868, Geo. Sur. Ill., vol. 3, p. 420, Ham. Gr.

Millepora repens, see *Alveolites repens*.

MONOGRAPTUS, Emmons, 1856, (*Monograpsus*), Am. Geo., p. 106. [Ety. *monos*, one; *grapho*, I write.] Serrations confined to one edge of the stipe; axis none. Type *M. elegans*.

convolutus var. *coppingeri*, Etheridge, 1878, Quar. Jour. Geo. Soc., vol. 34, p. 577, Silurian.

elegans, Emmons, 1856, Am. Geo., p. 106, Up. Taconic.

rectus, Emmons, 1856, Am. Geo., p. 107, Up. Taconic.

MONOTRYPA, Nicholson, 1879, Pal. Tab. Corals, p. 320. [Ety. *monos*, one; *trupa*, hole.] Corallites of two kinds; the larger aggregated into elusters (monticules); the smaller occupying the space between the monticules; both larger and smaller thin-walled, polygonal tabulæ remote. Type *M. undulata*. This was proposed as a subgenus for *Monticulipora*; upon microscopical examination and upon such a state of facts, I prefer, at present, to leave the species under the genus *Monticulipora*.

(?) *spinulosa*, Hall, 1887, Pal. N. Y., vol. 1, p. 67, Low. Held. Gr.

MONOTRYPELLA, Ulrich, 1882, Jour. Cin. Soc. Nat. Hist., vol. 5, p. 153. [Ety. *monotrypa*; and *illus*, diminutive.] Rамose, smooth or tuberculated, cells of one kind only; walls thin, in the axial region, and thicker toward the periphery; diaphragms straight; no spiniform tubuli. Type *M. equalis*.

abrupta, Hall, 1879, (*Chetetes abruptus*), 32d Rep. N. Y. St. Mus. Nat. Hist., p. 148, Low. Held. Gr.

equalis, Ulrich, 1882, Jour. Cin. Soc. Nat. Hist., vol. 5, p. 247, Hud. Riv. Gr.

arbuscula, Hall, 1887, Pal. N. Y., vol. 6, p. 12, Low. Held. Gr.

briareus, Nicholson, 1875, (*Chetetes briareus*), Ohio Pal., vol. 2, p. 202, Utica Slate.

consimilis, Hall, 1876, (*Chetetes consimilis*), 28th Rep. N. Y. St. Mus. Nat. Hist., p. 110, Niagara Gr.

densa, Hall, 1874, (*Trematopora densa*), 26th Rep. N. Y. St. Mus. Nat. Hist., p. 105, Low. Held. Gr.

quadrata, natural size and magnified.

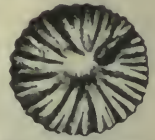


FIG. 194.—*Microcyclus discus*.

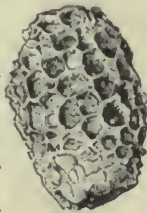


FIG. 193.—*Michelinia eugeneæ*. Another specimen, with larger corallites.

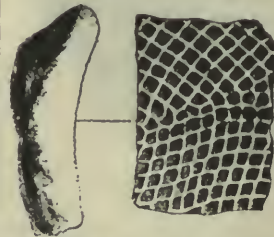


FIG. 195.—*Monotrypella quadrata*, natural size and magnified.

quadrata, Rominger, 1866, (Chetetes quadratus,) Proc. Acad. Nat. Sci. Phil., p. 3, and Ohio Pal., vol. 2, p. 201, under the name of Chetetes rhombicus, Hud. Riv. Gr.
 subquadrata, Ulrich, 1882, Jour. Cin. Soc. Nat. Hist., vol. 5, p. 249, Hud. Riv. Gr.
MONTICULIPORA, D'Orbigny, 1850, Prodr. de Paléont., t. 1, p. 25. [Ety. *monticulus*, hillock; *poros*, pore.] Corallum of every form and shape; corallites usually of two kinds, one minute; tabulæ numerous; walls separable, thickened toward the mouths of the tubes; corallites often aggregated, upon the surface, in numerous monticules; no septa; no mural pores; increase by gemmation. Lindstrom, Ulrich, and others, class this genus with the Bryozoa, while Nicholson, Edwards & Haime, and others, class it with the Polypi, where it seems to belong. Type *M. mammulata*.
adherens, Billings, 1859, (Stenopora adherens,) Can. Nat. and Geo., vol. 4, p. 427, Chazy Gr.
andrewsi, Nicholson, 1881, Struct. and Affin. of Montic., p. 128, Hud. Riv. Gr. Ulrich refers it to Callopora.
barrandi, Nicholson, 1874, (Chetetes barrandi,) Quar. Jour. Geo. Soc., vol. 30, and Pal. of Ontario, p. 60, Ham. Gr.
bulbosa, Billings, 1865, (Stenopora bulbosa,) Can. Nat. and Geo., 2d ser., vol. 2, p. 429, Mid. Sil.
calceolus, Miller & Dyer, 1878, Jour. Cin. Soc. Nat. Hist., vol. 1, p. 26, Hud. Riv. Gr.
cincinnatiensis, James, 1875, (Chetetes cincinnatiensis,) Int. Catal. Cin. Foss., p. 2, and Nicholson, Struct. and Affin. Montic., p. 226, Hud. Riv. Gr.
compressa, Ulrich, 1882, (Peronopora compressa) Jour. Cin. Soc. Nat. Hist., vol. 5, p. 244, Hud. Riv. Gr.
consimilis, Ulrich, 1882, Jour. Cin. Soc. Nat. Hist., vol. 5, p. 238, Hud. Riv. Gr.
dalii, Edwards & Haime, 1851, (Chetetes dalii,) Pol. Foss. d. Terr. Pal., p. 266, Hud. Riv. Gr. Ulrich refers it to Callopora.
dawsoni, Nicholson, 1881, Struct. and Affin. Montic., p. 141, Hud. Riv. Gr.
decepiens, Rominger, 1866, (Chetetes decepiens,) Proc. Acad. Nat. Sci. Phil., p. 3, Hud. Riv. Gr.

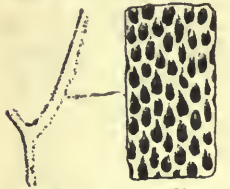


FIG. 196.—Monticulipora delicatula.

delicatula, Nicholson, 1874, (Chetetes delicatulus) Quar. Jour. Geo. Soc., vol. 30, and Ohio Pal., vol. 2, p. 199, Hud. Riv. Gr. Probably a Bryozoum and not a Monticulipora.

fibrosa, Goldfuss, 1826, (Calamapora fibrosa,) Germ. Petref., p. 82, Hud. Riv. and Clinton Grs.
filiasa, D'Orbigny, 1850, Prodr. d. Pal., t. 1, p. 25, and Edwards & Haime, Pol. Foss. d. Terr. Pal., p. 266, Hud. Riv. Gr.
frondosa, D'Orbigny, 1850, Prodr. d. Pal., t. 1, p. 25, and Ohio Pal., vol. 2, p. 208, Hud. Riv. Gr.
gracilis, see Batostomella gracilis.
grandis, Ulrich, 1886, 14th Rep. Geo. Sur. Minn., p. 78, Trenton Gr.
implicata, see Batostoma implicata.
irregularis, Ulrich, 1879, (Chetetes irregularis,) Jour. Cin. Soc. Nat. Hist., vol. 2, p. 129, Hud. Riv. Gr.
lævis, Ulrich, 1882, Jour. Cin. Soc. Nat. Hist., vol. 5, p. 236, Hud. Riv. Gr.
lycoperdon, Say, 1847, (Favosites lycoperdon,) Hall, Pal. N. Y., vol. 1, p. 64, Trenton Gr.
mammulata, D'Orbigny, 1850, Prodr. de Paléont., t. 1, p. 25, and Ohio Pal., vol. 2, p. 207, Hud. Riv. Gr.
molesta, Nicholson, 1881, Struct. and Affin. of Montic., p. 224, Hud. Riv. Gr.
moniliformis, Nicholson, 1874, (Chetetes moniliformis,) Geo. Mag., vol. 1, p. 57, and Pal. of Ont., p. 60, Ham. Gr.
monticula, White, 1876, Proc. Acad. Nat. Sci. Phil., p. 27, Devonian.
multituberculata, Whitfield, 1878, Ann. Rep. Geo. Sur. Wis., p. 71, and Geo. Wis., vol. 4, p. 250, Hud. Riv. Gr.
parasitica, Ulrich, 1882, Jour. Cin. Soc. Nat. Hist., vol. 5, p. 238, Hud. Riv. Gr.
patulus, Billings, 1859, (Stenopora patula,) Can. Nat. and Geo., vol. 4, p. 427, Chazy Gr.
pavonia, see Ptilodictya pavonia.
petasiformis, Nicholson, 1881, Struct. and Affin. of Montic., p. 190, Hud. Riv. Gr.
punctata, Whitfield, 1878, Ann. Rep. Geo. Sur. Wis., p. 71, and Geo. Wis., vol. 4, p. 249, Hud. Riv. Gr.



FIG. 197.—Monticulipora lycoperdon.

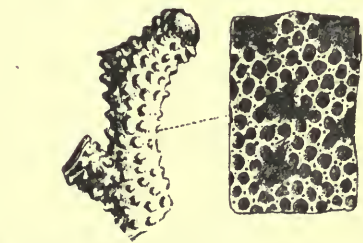


FIG. 198.—Monticulipora ramosa, natural size and magnified.

ramosa, D'Orbigny, 1850, Prodr. d. Pal., t. 1, p. 25, and Edwards & Haime, Pol. Foss. de Terr. Pal., p. 266, and Ohio Pal.,

- vol. 2, under the name of *Chetetes dalii*, Hud. Riv. Gr. Ulrich refers it to *Callopora*.
- rectangularis*, Whitfield, 1878, Ann. Rep. Geo. Sur. Wis., p. 70, and Geo. Wis., vol. 4, p. 249, Hud. Riv. Gr.
- rugosa*, Hall, 1847, (*Chetetes rugosus*), Pal. N. Y., vol. 1, p. 67, Trenton Gr.
- rugosa*, Edwards & Haime, 1851, Pol. Foss. de Terr. Pal., is merely a variety or form of *M. ramosa*, and associated with it in the Hud. Riv. Gr.
- selwyni*, see *Prasopora selwyni*.
- selwyni* var. *hospitalis*, see *Prasopora selwyni* var. *hospitalis*.
- solitaria*, Ulrich, 1883, (*Heterotrypa solitaria*), Jour. Cin. Soc. Nat. Hist., vol. 6, p. 88, Hud. Riv. Gr.
- subglobosa*, Ulrich, 1879, (*Chetetes subglobosus*), Jour. Cin. Soc. Nat. Hist., vol. 2, p. 129, Hud. Riv. Gr.
- subpulchella*, Nicholson, 1875, (*Chetetes subpulchellus*), Ohio Pal., vol. 2, p. 196, Hud. Riv. Gr.
- trentonensis*, Nicholson, 1881, Struct. and Affin. Montic., p. 149, Trenton Gr.
- tuberculata*, see *Spatiopora tuberculata*.
- ulrichi*, Nicholson, 1881, Struct. and Affin. Montic., p. 131, Hud. Riv. Gr.
- undulata*, Nicholson, 1875, (*Chetetes undulatus*), Pal. of Ont., p. 10, and Struct. and Affin. Montic., p. 170, Trenton and Hud. Riv. Gr.
- uniformis*, Ulrich, 1882, (*Peronopora uniformis*), Jour. Cin. Soc. Nat. Hist., vol. 5, p. 244, Hud. Riv. Gr.
- vaupelli*, Ulrich, 1883, (*Heterotrypa vaupelli*), Jour. Cin. Soc. Nat. Hist., vol. 6, p. 85, Hud. Riv. Gr.
- venusta*, Ulrich, 1878, (*Chetetes venustus*), Jour. Cin. Soc. Nat. Hist., vol. 1, p. 93, Utica Slate.
- westoni*, Foord, 1883, Cont. to Micro-Pal., p. 7, Trenton Gr.
- wetherbyi*, Ulrich, 1882, Jour. Cin. Soc. Nat. History, vol. 5, p. 239, Trenton Gr.
- whiteavesi*, Nicholson, 1879, Pal. Tab. Corals, p. 316, and Struct. and Affin. of Montic., p. 160, Trenton Gr.
- NEBULIPORA**, McCoy, 1850, Ann. and Mag. Nat. Hist., 2d ser., vol. 6, p. 284. [Ety. *nebula*, thick mist; *poros*, pore.] Incrusting or forming lenticular masses, with a concentrically wrinkled epitheca below, composed of small prismatic corallites perpendicular to the upper surface, with clusters of rather larger size, all in contact; tabule at regular distances; no septa. Type *N. explanata*.
- papillata*, McCoy, 1850, Ann. and Mag. Nat. Hist., vol. 6, p. 284, Hudson Riv. Gr.
- NEMAGRAPTUS**, Emmons, (*Nemagrapsus*) 1856, Am. Geo., pt. 2, p. 109. The termination *graptus* is preferred because *grapsus* is used in the nomenclature of crustacea. [Ety. *nema*, thread; *grapho*, I write.] Axis elongated and thread-like, simple or com-
- pound branches, round at the base, and flattened at the extremities; cells arranged on the flattened part of the axis instead of the margin. Type *N. elegans*.
- capillaris*, Emmons, 1856, Am. Geo., pt. 2, p. 109, Up. Taconic.
- elegans*, Emmons, 1856, Am. Geo., pt. 2, p. 109, Up. Taconic.
- NYCTOPORA**, Nicholson, 1879, Pal. Tab. Corals, p. 182. [Ety. *nyktos*, night; *poros*, pore.] Corallum composite, massive; corallites polygonal, in contact; walls thin, amalgamated; mural pores numerous, small; septa, in the form of marginal vertical ridges; 10 to 15 in each corallite; tabulæ numerous, complete, horizontal. Type *N. billingsi*.
- billingsi*, Nicholson, 1879, Pal. Tab. Corals, p. 184, Trenton Gr.
- OLDHAMIA**, Forbes, 1850, Dub. Geo. Jour. [Ety. proper name.] Strong stems, with branches arranged in whorls; substance corneous; cellules undetermined. Type *O. antiqua*.
- antiqua*, Forbes, 1850, Dublin Geo. Jour., Potsdam Gr.
- fruticosa*, Hall, 1865, Can. Org. Rem. Decade 2, p. 50, Trenton Gr.
- OMPHYMA**, Rafinesque, 1820, Ann. des Sci. Phys. d. Bruxelles, vol. 5, p. 234. [Ety. *omphax*, precious stone.] Simple, turbinate, wall with rudimentary epitheca, producing radiciform appendages; septa numerous, equally developed and divided into four groups by an equal number of shallow fossulæ; tabulæ smooth toward the center. Type *O. turbinata*.
- congregata*, Billings, 1866, Catal. Sil. Foss. Antic., p. 93, Clinton and Niagara Gr.
- drummondi*, Billings, 1866, Catal. Sil. Foss. Antic., p. 93, Clinton and Niagara Grs.
- stokesi*, Edwards & Haime, 1851, (*Ptychophyllum stokesi*), Polyp. Foss. Pal., p. 407, and Geo. Wis., vol. 4, p. 279, Niagara Gr.
- verrucosa*, Rafinesque & Clifford, 1820, Monog. d. Turbinolides in Ann. d. Phys. d. Brux., t. 5, p. 235, Niagara Gr.
- PACHYPHYLLUM**, Edwards & Haime, 1850, Brit. Foss. Corals, p. lxxviii. [Ety. *pachys*, thick; *phyllon*, leaf.] Corallum composite, increasing by lateral gemmation; corallites united by the development of the costæ and exotheca; tabulæ abundant. Type *P. bouchardi*.

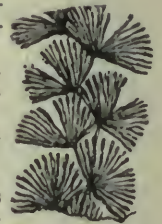


FIG. 199.—*Oldhamia antiqua*.



FIG. 200.—*Omphyma turbinata*.

solitarium, Hall & Whitfield, 1873, 23d Rep. N. Y. St. Mus. Nat. Hist., p. 232, Chemung Gr.



FIG. 201.—Pachyphyllum woodmani.

woodmani, White, 1870, (Smithia woodmani,) Geo. Sur. Iowa, vol. 1, p. 188, Chemung Gr.

PACHYFORA, Lindstrom, 1873, Ofversigt af K. Vetensk Akad. Forhandl., p. 14. [Ety. *pachys*, thick; *poros*, pore.] Dendroid or frondescing; corallites polygonal or subcylindrical, walls thickened toward their mouths, by concentric layers of sclerenchyma; calices annular, oblique, or semilunar; septa obsolete or mere spiniform projections; tabulæ complete, remote; mural pores few, irregular, and often large. Type *P. lamellicornis*.

fischeri, Billings, 1860, (Alveolites fischeri,) Can. Jour. n. s., vol. 5, p. 256, Up. Held. Gr.



FIG. 202.—Pachypora frondosa.

frondosa, Nicholson, 1874, (Alveolites frondosus,) Geo. Mag., vol. 1, p. 15, and Rep. Pal. Ontario, p. 57, Ham. Gr. ornata, Rominger, 1876, (Dendropora ornata,) Pal. Foss. Corals, p. 62, Ham. Gr.

PALÆOCYCLUS, Edwards & Haime, 1849, Comptus rendus, t. 29, p. 71. [Ety. *palaos*, ancient; *kuklos*, circle.] Corallum circular; fossula deep, broad, circular; septa thick, not numerous or cemented together. Type *P. porpita*.

kirbyi, Meek, 1868, Trans. Chi. Sci., p. 85, Devonian.

rotuloides, Hall, 1852, (Cyclolites rotuloides,) Pal. N. Y., vol. 2, p. 42, Clinton Gr.

PALEOPHYLLUM, Billings, 1858, Rep. of Prog. Geo. Sur. Can., p. 168. [Ety. *palaos*, ancient; *phyllon*, leaf.] Fascicu-

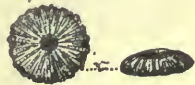


FIG. 203.—Palæocyclus rotuloides.

late or aggregate; corallites surrounded by a thick wall; septa extending the whole length; tabulæ absent or rudimentary; increase by lateral budding. Distinguished from Streptelasma by forming aggregate masses. Type *P. rugosum*.

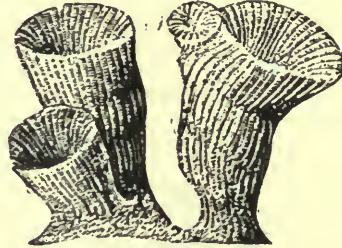


FIG. 204.—Palæophyllum divaricans.

divaricans, Nicholson, 1875, Pal. Ohio, vol. 2, p. 220, Hud. Riv. Gr. rugosum, Billings, 1858, Rep. of Progr. Can. Geo. Sur., p. 168, Trenton Gr.

Palæotrochis, Emmons, 1856, Geo. Rep. Midland counties of North Carolina. Two species were mentioned, *P. major* and *P. minor*, both of which are supposed to be concretions, and therefore inorganic.

Peronopora, Nicholson, syn. for Monticulipora.

PETRAIA, Munster, 1839, Beitrage zur Petrefaktenkunde, vol. 1, p. 42. [Ety. *petraios*, that grows among rocks.] Simple, turbinate; septa of one or two sizes, the larger extending from the walls to the center, where they are more or less twisted; no tabulæ or connecting vesicular plates. Type *P. decussata*. Streptelasma is by some regarded as a synonym, by others as a subgenus, and by others as quite distinct. The forms in this country which have been referred to Petraia are all, probably, Streptelasma, and for that reason I have so referred them.

angulata, see Streptelasma angulatum.

aperta, see Streptelasma apertum.

fanningana, see Streptelasma fanninganum.

forresteri, Honeyman, 1868, Acadian Geology, p. 594. A catalogue name.

latuscula, see Streptelasma latuscula.

logani, see Streptelasma logani.

minganensis, see Archæocyathus minganensis.

ottawensis, see Streptelasma ottawense.

pulchella, see Streptelasma pulchellum.

pygmaea, see Streptelasma pygmæum.

rustica, see Streptelasma rusticum.

selecta, see Streptelasma selectum.

waynensis, see Streptelasma waynense.

PHILLIPASTREA, D'Orbigny, 1849, Note Sur. des Polyptiers Fossiles, p. 12. [Ety. proper name; *aster*, star.] Composite, resembling Strombodes, but differing in the septa of neighboring corallites

being confluent, and consequently the calices are not definitely circumscribed; no exterior walls; interior mural investment well characterized; center of tabulæ presenting a columellar tubercle. Type *P. hennabi*.

affinis, Billings, 1874, Pal. Foss., vol. 2, p. 11, Gaspe limestone No. 8, Devonian.

gigas, Owen, 1840, (*Astræa gigas*.) Rep. on Mineral lands, p. 70, Devonian.

hennabi, Lonsdale, 1840, (*Astræa hennabi*.) Geol. Trans., vol. 5, p. 697, Devonian.

johanni, Hall & Whitfield, 1873, (*Smithia johanni*.) 23d, Rep. N. Y. St. Mus. Nat. Hist., p. 234, Chemung Gr.

mammillaris, see *Strombodes mammillaris*.

multiradiata, Hall & Whitfield, 1873, (*Smithia multiradiata*.) 23d Rep. N. Y. St. Mus. Nat. Hist., p. 234, Chemung Gr.

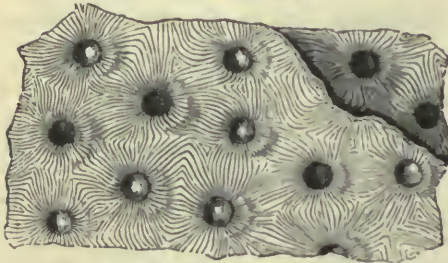


FIG. 205.—*Phyllipastrea verneuli*.

verneuli, Edwards & Haime, 1851, Polypters Foss. des Terr. Pal., p. 447, Ham. Gr.

verrilli, Meek, 1868, (*Smithia verrilli*.) Trans. Chi. Acad. Sci., p. 83, Devonian.

yandelli, Rominger, 1876, Foss. Corals, p. 130, Up. Held. Gr. Not well defined.

PHYLLOGRAPTUS, Hall, 1858, Rep. of Progr. Can. Geo. Sur. p. 135. [Ety. *phylon*, leaf; *grapho*, I write.]

Frond consisting of simple or compound foliiform stipes, which are celluliferous on the two opposite sides, the margins having a mucronate extension from each cellule; supported on a slender radicle, or combined in groups. Type *P. typus*.

angustifolius, Hall, 1858, Rep. of Progr. Can. Geo. Sur., p. 139, and Dec. 2, Org. Rem., p. 125, Quebec Gr.

anna, Hall, 1865, Can. Org. Rem., Decade 2, p. 124, Quebec Gr.

dubius, Spencer, 1884, Bull. No. 1, Mus. Univ. St. Mo., p. 15, Niagara Gr.

illicifolius, Hall, 1858, Rep. of Progr. Can. Geo. Sur., p. 139, and Dec. 2, Org. Rem., p. 121, Quebec Gr.

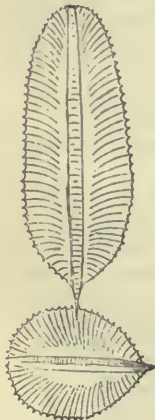


FIG. 206.—*Phyllograptus typus*.

loringi, White, 1874, Rep. Invertebrate Foss., p. 9, and Geo. Sur. W. 100th Mer., vol. 4, p. 51, Quebec Gr.

similis, Hall, 1858, Can. Nat. and Geo., vol., 4, syn. for *Graptolithus bigsbyi*.

typus, Hall, 1858, Rep. of Progr. Can. Geo. Sur., p. 137, and Dec. 2, Org. Rem., p. 118, Quebec Gr.

PLASMOPORA, Edwards & Haime, 1849, Comptes rend., t. 29, p. 262. [Ety. *plasma*, cast; *poros*, pore.] Free, sub-hemispheric; basal epitheca, con-

centrically folded; calices immersed; septa rudimentary; tabulæ horizontal; walls thin; cœnenchyma composed of vertical radiate laminae united by smaller horizontal plates. Type *P. petaliformis*.

foliis, Ed-

wards &

Haime,

1851, Mon.

Pol. Foss. de Terr. Pal., p. 220, Ni-

agara Gr.

PLEURODICTYUM, Goldfuss, 1826, Petref. Germ., vol. 1, p. 209. [Ety. *pleura*, side; *dictyon*, net. Corallum discoidal, upper surface convex; corallites diverging from the center of the base, polygonal or subcylindrical; walls thick; mural pores irregular; tabulæ not numerous, but sometimes inosculating; septa rudimentary, in the form of marginal ridges. There is usually a vermiform body at the central part of the base. Type *P. problematicum*.

americanum, Roemer, 1876, Lethæ Palæozoica, pl. 33, figs. 2a and 2b. Ham. Gr.

problematicum, Goldfuss, 1826, Petref. Germ., vol. 1, p. 113, Onondaga Gr.

Polydylasma, Hall, 1852, Pal. N. Y., vol. 2, syn. for *Zaphrentis*.

turbinatum, see *Zaphrentis turbinatum*.

Porites, Lamarck, 1816, Hist. des Anim. sans Vert., t. 2, p. 267. Not an American Palæozoic genus.

FIG. 207.—*Plasmapora foliis*. Natural size, and magnified.

FIG. 208.—*Pleurodictyum problematicum*. Under side, showing serpulalike body.



- astriformis*, Owen, 1840, Rep. on Mineral lands, Devonian. This may be the same species subsequently described as *Pachyphyllum woodmani*.
- pyriformis*, as identified by d'Archiac & Verneuil, not American.
- vetustus*, see *Protarea vetusta*.
- PRASOPORA, Nicholson & Etheridge, 1877, Ann. and Mag. Nat. Hist., 4th ser., vol. 20, p. 38. [Ety. *prason*, sea-plant; *poros*, pore.] Corallum compound, concavoconvex or hemispheric; corallites radiating from a wrinkled basal epitheca; larger and smaller corallites intermingled throughout the colony; no monticules; corallites thin-walled, prismatic; large ones with an exterior zone of vesicular tabulæ surrounding a vacant central tube, which may be crossed by an occasional tabula; smaller ones arranged in a zone around the larger ones, and crossed by numerous, close-set, complete, horizontal tabulæ. Type *P. gravæ*.
- affinis*, Foord, 1883, Cont. to Micropalæontology, p. 12, Trenton Gr.
- conoidea*, Ulrich, 1886, 14th Rep. Geo. Sur. Minn., p. 87, Trenton Gr.
- contigua*, Ulrich, 1886, 14th Rep. Geo. Sur. Minn., p. 87, Trenton Gr.
- newberryi*, Nicholson, 1875, (Chetetes *newberryi*), Ohio Pal., vol. 2, p. 212, Hud. Riv. Gr.
- nodosa*, Ulrich, 1882, Jour. Cin. Soc. Nat. Hist., vol. 5, p. 245, Hud. Riv. Gr.
- oculata*, Foord, 1883, Cont. to Micropalæontology, p. 11, Trenton Gr.
- selwyni*, Nicholson, 1881, (Monticulipora *selwyni*), Struct. and Affin. of Montic., p. 206, Trenton Gr.
- selwyni* var. *hospitalis*, Nicholson, 1881, (Monticulipora *selwyni* var. *hospitalis*), Struct. and Affin. of Montic., p. 206, Hud. Riv. Gr.
- simulatrix*, Ulrich, 1886, 14th Rep. Geo. Sur. Minn., p. 85, Trenton Gr.
- Prionotus*, Nilsson, 1835, Leth. Suec. *folium*, see *Diplograptus folium*.
- pristis*, see *Diplograptus pristis*.
- PROTAREA, Edwards & Haime, 1851, Pol. Foss. des Terr. Pal., p. 208. [Ety.

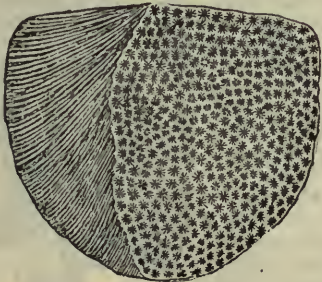


FIG. 209.—*Protarea vetusta*, on *Strophomena alternata*.

protos, first; *araios*, porous.] Thin, incrusting; calices equal, hexagonal,

- shallow; septa 12, extending but slightly into the visceral chamber; walls thick. Type *P. vetusta*.
- vetusta*, Hall, 1847, (*Porites vetustus*), Pal. N. Y., vol. 1, p. 71, Trenton & Hud. Riv. Grs.
- verneuili*, Edwards & Haime, 1851, Pol. Foss. des Terr. Pal., p. 209, Silurian. (?)
- PROTOGRAPTUS, Matthew, 1885, Trans. Roy. Soc. Can., p. 31. [Ety. *protos*, first; *grapho*, I write.] Stipes thin, flat, elongate, dichotomously branched; having a central axis, and being alate on each side; pores arranged along the axis of the stipe; axis and margin of the stipe connected by delicate nervules. Type *P. alatus*.
- alatus*, Matthew, 1885, Trans. Roy. Soc. Can., p. 32, St. John Gr.

- PTILOGRAPTUS, Hall, 1865, Can. Org. Rem., Decade 2, p. 139. (Ety. *ptilon*, feather; *grapho*, I write.) Plant-like, rooted, simple or branching; branches plumose, pinnules alternate on opposite sides; celluliferous on one face only; branches cylindrical or flattened. Type *P. plumosus*.
- foliaceus*, Spencer, 1873, Can. Nat., vol. 8, and Bull. No. 1, Mus. Univ. St. Mo., p. 41, Niagara Gr.
- geinitzanus*, Hall, 1865, Can. Org. Rem., Decade 2, p. 140, Quebec Gr.
- plumosus*, Hall, 1865, Can. Org. Rem., Decade 2, p. 140, Quebec Gr.



FIG. 210.—*Ptilograptus foliaceus*.

- PTYCHONEMA*, Hall, 1887, Pal. N. Y., vol. 6, p. xiv. [Ety. *ptyche*, wrinkle; *nema*, thread.] Massive or ramose, composed of thin-walled, strongly corrugated cells, which are apparently without diaphragms. Type *P. tabulatum*.
- helderbergiæ*, Hall, 1874, (Chetetes *helderbergiæ*), 26th Rep. N. Y. St. Mus. Nat. Hist., p. 110, Low. Held. Gr.
- tabulatum*, Hall, 1876, (Chetetes *tabulatum*), Illus. Dev. Foss., pl. 37, and figs. 16-19, and Pal. N. Y., vol. 6, p. 14, Up. Held. Gr.
- PTYCHOPHYLLUM, Lonsdale, 1839, Sil. Syst., p. 691, and E. & H. Brit. Foss. Corals, p. lxxix. [Ety. *ptyche*, ridge; *phyllon*, leaf.] Corallum simple, having infundibuliform tabulæ superposed and invaginated; septa strongly twisted toward the center, of the tabulæ so as to constitute a spurious columella. Type *P. stokesi*.
- canadense*, Billings, 1862, Pal. Foss., vol. 1, p. 107, Mid. Sil. Anticosti Gr., Division 4.
- floriforme*, Hall, 1882, Foss. Corals Niagara and Up. Held. Grs., p. 5, and 35th Rep. N. Y. St. Mus. Nat. Hist., p. 409, Niagara Gr.

fulcratum, Hall, 1882, Foss. Corals Niagara and Up. Held. Grs., p. 6, and 35th Rep. N. Y. St. Mus. Nat. Hist., p. 410, Niagara Gr. infundibilum, Meek, 1877, U. S. Geo. Sur. 40th Parallel, vol. 4, p. 28, Devonian.

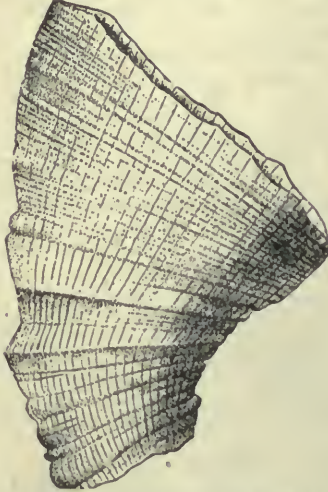


FIG. 211.—*Ptychophyllum knappi*.

knappi, Hall, 1883, 12th Rep. Geo. Ind., p. 278, Up. Held. Gr.
stokesi, Edwards & Haime, 1851, Brit. Foss. Corals, p. lxxix, Niagara Gr.
striatum, Hall, 1882, Foss. Corals Niagara and Up. Held. Grs., p. 22, and 35th Rep. N. Y. St. Mus. Nat. Hist., p. 426, Up. Held. Gr.
versiforme, Hall, 1882, Foss. Corals Niagara and Up. Held. Grs., p. 22, and 35th Rep. N. Y. St. Mus. Nat. Hist., p. 426, Up. Held. Gr.
PYCNOSTYLUS, Whiteaves, 1884, Pal. Foss., vol. 3, p. 2. [Ety. *puknos*, dense; *stylos*, column.] Corallum aggregate; corallites slender, divided by calicular gemmation, at distant intervals, into sets of three or more ascending flexuous branches; structure similar to *Amplexus*, but tabulæ horizontal and not embracing. Type *P. guelphensis*.
elegans, Whiteaves, 1884, Pal. Foss., vol. 3, p. 4, Guelph Gr.
guelphensis, Whiteaves, 1884, Pal. Foss., vol. 3, p. 3, Guelph Gr.



FIG. 212.—*Pycnostylus guelphensis*; two branches are broken off at C, C.

proposed Romingeria. *niagarensis*, see *Romingeria niagarensis*.

Quenstedtia, Rominger, 1876, Foss. Corals, p. 71. Being preoccupied, Nicholson

RASTRITES, Barrande, 1850, Graptolites de Boheme, p. 64. [Sig. a rake.] Small, almost linear, very long, stipe slightly curved; interior canal connecting the cellules, which are on the convex side and isolated from each other.

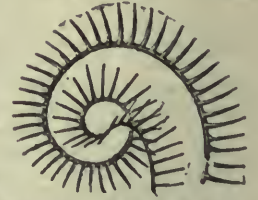


FIG. 213.—*Rastrites peregrinus*.

Type *R. peregrinus*.
barrandi, Hall, 1859, Pal. N. Y., vol. 3, p. 521, Hud. Riv. Gr.
RETIOGRAPTUS, Hall, 1865, Dec. 2, Org. Rem., p. 115. [Ety. *rete*, net; *grapho*, I write.] Frond simple or compound; stipes numerous arranged bilaterally on an axis, elongate, oval or lanceolate with longitudinal axis and reticulate structure; margins with mucronate points. Type *R. tentaculatus*.
barrandi, Hall, 1860, 13th Rep. N. Y. St. Mus. Nat. Hist., p. 61, Hud. Riv. Gr.
eucharis, Hall, 1865, Can. Org. Rem., Decade 2, p. 146, Utica Slate.
geinitzanus, Hall, 1859, Pal. N. Y., vol. 3, p. 518, Hud. Riv. Gr.
tentaculatus, Hall, 1858, (Graptolithus tentaculatus,) Rep. of Prog. Can. Geo. Sur., p. 134, and Dec. 2, Org. Rem., p. 116, Quebec Gr.

RETIOLITES, Barrande, 1850, Graptolites de Boheme, p. 68. [Ety. *rete*, net; *lithos*, stone.] Stipes thin, flat, elongate, triangular, composed of two series of cellules symmetrically arranged, in regard to the axis; orifices on the sides of the triangle. Type *R. geinitzanus*.



FIG. 214.—*Retiolites venosus*.

ensiformis, Hall, 1858, (Graptolithus ensiformis,) Rep. of Prog. Can. Geo. Sur., p. 133, and Decade 2, Org. Rem., p. 114, Quebec Gr.
venosus, Hall, 1852, (Graptolithus venosus,) Pal. N. Y., vol. 2, p. 40, Clinton Gr.

RHIZOGRAPTUS, Spencer, 1878, Can. Nat., vol. 8, p. 460. [Ety. *rhiza*, root; *grapho*, I write.] Cyathiform, bifurcating branches with dichotomous terminations and more or less reticulate; stem terminating in a bulb. Type *R. bulbosus*.

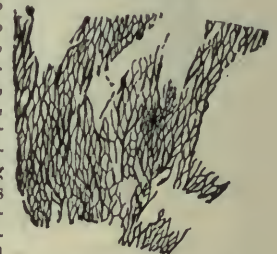


FIG. 215.—*Rhizograptus bulbosus*.

bulbosus, Spencer, 1878, Can. Nat., vol. 8, p. 460, and Bull. No. 1, Mus. Univ. St. Mo., p. 30, Niagara Gr.

ROMINGERIA, Nicholson, 1879, Tab. Corals, p. 114. [Ety. proper name.] Corallum lax, spreading; corallites cylindrical, annulated, multiplying by lateral gemmation, and typically producing new tubes, in umbellate whorls or verticils, at short intervals; where the walls are in contact with the visceral chambers they are connected by mural pores; tabulæ complete, remote; septa represented by vertical rows of spinules. It resembles Aulopora, but is only attached basally, and is therefore free throughout the greater part of its extent. Type R. umbellifera.

cornuta, Billings, 1859, (Aulopora cornuta,) Can. Jour., vol. 4, p. 119, Up. Held. and Ham. Grs.

niagarensis, Rominger, 1876, (Quenstedtia niagarensis,) Foss. Corals, p. 72, Niagara Gr.

umbellifera, Billings, 1859, (Aulopora umbellifera,) Can. Jour., vol. 4, p. 119, Up. Held. Gr.

Sarcinula, Lamarck, 1816, Hist. des Animaux Vert., t. 2, p. 222. Not an American Palaeozoic genus.

glabra, Owen, 1840, Rep. on Mineral Lands. See Lyellia glabra.

(?) *obsoleta*, Hall, 1857, Geol. Lake Sup. Land Dist., vol. 2, Hud. Riv. Gr. Not recognized.

ramosa, Eaton, 1832, Geo. Text Book, p. 41. Not properly defined.

Smithia, Edwards & Haime, 1851, Pol. Foss. des Terr. Pal. The name was preoccupied for a genus in botany, and is a syn. for Phillipsastrea.

johanni, see Phillipsastrea johanni.

multiradiata, see Phillipsastrea multiradiata.

woodmani, see Pachyphyllum woodmani. verrilli, see Phillipsastrea verrilli.

SPHEROLITES, Hinde, 1875, Proc. Geo. Soc. Lond., vol. 31, p. 514. [Ety. from the spheroidal form.] Type S. nicholsoni. nicholsoni, Hinde, 1875, Proc. Geo. Soc. Lond., vol. 31, p. 514, Low. Held. Gr.

STAUROGRAPTUS, Emmons, 1856, (Staurograptus,) Am. Geo., pt. 2, p. 108. [Ety. *stauros*, cross; *grapho*, I write.] Disk free, cruciform, arms four dichotomous, cells terminal, substance membranaceous. Type S. dichotomus.



FIG. 216. — Staurograptus dichotomus.

dichotomus, Emmons, 1856, Am. Geo., p. 109, Up. Taconic.

STELLIPORA, Hall, 1847, Pal. N. Y., vol. 1, p. 79. [Ety. *stella*, star; *poros*, pore.]

Corallum dendroid or incrusting; corallites dimorphic; apertures subcircular; no septa; tabulæ abundant; surface covered with conspicuous star-shaped elevations and depressions. Type S. antheloidea.

antheloidea, Hall, 1847, Pal. N. Y., vol. 1, p. 79, Trenton and Hud. Riv. Grs.

fischeri, Ulrich, 1883, (Constellaria fischeri.) Jour. Cin. Soc. Nat. Hist., vol. 6, p. 270, Hud. Riv. Gr.

florida, Ulrich, 1882, (Constellaria florida,) Jour. Cin. Soc. Nat. Hist., vol. 2, p. 257, Hud. Riv. Gr.

limitaris, Ulrich, 1879, Jour. Cin. Soc. Nat. Hist., vol. 2, p. 126, Hud. Riv. Gr. Syn. (?) for S. polystomella.

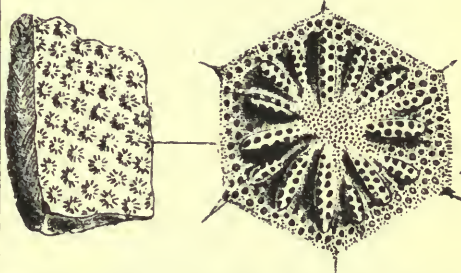


FIG. 217.—Stellipora polystomella, natural size and magnified star.

polystomella, Nicholson, 1873, (Constellaria polystomella,) Ohio Pal., vol. 2, p. 215, Hud. Riv. Gr.

STENOPORA, Lonsdale, 1844, App. to Darwin's Volcanic Islands, p. 161, and Geo. Russ. and Ural Mts., vol. 1, p. 631. [Ety. *stenos*, narrow; *poros*, pore.]

Corallum very similar to Chetetes, but having small styliform processes at the angles of the calices, as understood by Edwards & Haime. Nicholson defines the genus, and restricts it to specimens from Australia and Van Diemen's Land, which, as in the type, have constricted corallites and minute mural pores. Type S. ovata.

bulbosa, see Monticulipora bulbosa.

adherens, see Monticulipora adherens.

crassa, see Chetetes crassus.

fibrosa, see Monticulipora fibrosa.

exilis, Dawson, 1868, Acad. Geo., p. 287, Subcarboniferous.

huronensis, see Tetradium huronense.

libana, Safford, 1869, Geo. of Tenn. Not defined.

patula, see Monticulipora patula.

spinigera, see Chetetes spinigerus.



FIG. 218.—Stenopora exilis.

- Strephodes*, McCoy, 1849, syn. for *Cyathophyllum*.
austini, see *Clisiophyllum austini*.
pickthorni, see *Cyathophyllum pickthorni*.
- STREPTELASMA, Hall, 1847, Pal., N. Y., vol. 1, p. 17. [Ety. *streptos*, twisted; *elasma*, lamella.] Turbinate, gradually or abruptly expanding; cup deep; lamellæ or septa longitudinal, spirally twisted toward the center; no tabulæ or fosse. Type *S. expansum*.
- æquidistans*, Hall, 1882, Foss. Corals Niagara and Up. Held. Grs., p. 20, and 35th Rep. N. Y. St. Mus. Nat. Hist., p. 424, Up. Held. Gr.
- ampliatum*, Hall, 1882, Foss. Corals Niagara and Up. Held. Grs., p. 19, and 35th Rep. N. Y. St. Mus. Nat. Hist., p. 423, Up. Held. Gr.
- angulatum*, Billings, 1862, (*Petraia angulata*.) Pal. Foss., vol. 1, p. 103, Hud. Riv. Gr.
- apertum*, Billings, 1862, (*Petraia aperta*.) Pal. Foss., vol. 1, p. 102, Black Riv. Gr.
- calyculus*, Hall, 1852, Pal. N. Y., vol. 2, p. 111, Niagara Gr.
- coarctatum*, Hall, 1882, Foss. Corals Niagara and Up. Held. Grs.; p. 21, and 12th Rep. Geo. Sur. Ind., p. 275, Up. Held. Gr.
- conspicuum*, Hall, 1882, Foss. Corals Niagara and Up. Held. Grs., p. 19, and 35th Rep. N. Y. St. Mus. Nat. Hist., p. 423, Up. Held. Gr.
- conulus*, Rominger, 1876, Foss. Corals, p. 144, Niagara Gr.
- corniculum*, Hall, 1847, Pal. N. Y., vol. 1, p. 69, Trenton and Hud. Riv. Grs.
- crassum*, Hall, 1847, Pal. N. Y., vol. 1, p. 70, Trenton Gr.
- crateriforme*, Hall, 1882, Foss. Corals Niagara and Up. Held. Grs., p. 20, and 35th Rep. N. Y. St. Mus. Nat. Hist., p. 424, Up. Held. Gr.
- dissimile*, Hall, 1882, Foss. Corals Niagara and Up. Held. Grs., p. 17, and 35th Rep. N. Y. St. Mus. Nat. Hist., p. 421, Up. Held. Gr.



FIG. 219.—*Streptelasma inflatum*, transverse section.

expansum, Hall, 1847, Pal. N. Y., vol. 1, p. 17, Chazy Gr.

- extans*, Hall, 1882, Foss. Corals Niagara and Up. Held. Grs., p. 5, and 35th Rep. N. Y. St. Mus. Nat. Hist., p. 409, Niagara Gr.
- fanningana*, Safford, 1869, (*Petraia fanningana*.) Geo. Tenn., p. 320, Low. Held. Gr.
- fossula*, Hall, 1882, Foss. Corals Niagara and Up. Held. Grs., p. 19, and 35th Rep. N. Y. St. Mus. Nat. Hist., p. 423, Up. Held. Gr.
- inflatum*, Hall, 1882, Foss. Corals Niagara and Up. Held. Grs., p. 18, and 12th Rep. Geo. Ind., p. 276, Up. Held. Gr.
- involutum*, Hall, 1882, Foss. Corals Niagara and Up. Held. Grs., p. 20, and 35th Rep. N. Y. St. Mus. Nat. Hist., p. 424, Up. Held. Gr.
- lamellatum*, Hall, 1882, Foss. Corals Niagara and Up. Held. Grs., p. 17, and 35th Rep. N. Y. St. Mus. Nat. Hist., p. 421, Up. Held. Gr.
- laterarium*, Hall, 1882, Foss. Corals Niagara and Up. Held. Grs., p. 18, and 35th Rep. N. Y. St. Mus. Nat. Hist., p. 422, Corniferous limestone.
- latuscula*, Billings, 1862, (*Petraia latuscula*.) Pal., Foss., vol. 1, p. 104, Mid. Sil. Anticosti, Div. 4.
- limitaire*, Hall, 1882, Foss. Corals Niagara and Up. Held. Grs., p. 5, and 35th Rep. N. Y. St. Mus. Nat. Hist., p. 409, Niagara Gr.
- logani*, Nicholson, 1875, (*Petraia logani*.) Can. Nat., vol. 7, p. 143, Up. Held. Gr.
- mammiferum*, Hall, 1882, Foss. Corals Niagara and Up. Held. Grs., p. 21, and 35th Rep. N. Y. St. Mus. Nat. Hist., p. 425, Up. Held. Gr.
- minimum*, Hall, 1876, 28th Rep. N. Y. St. Mus. Nat. Hist., p. 106, syn. for *Duncanella borealis*.
- multilamellosum*, Hall, 1847, Pal. N. Y., vol. 1, p. 70, Trenton Gr.
- ottawensis*, Billings, 1865, (*Petraia ottawensis*.) Can. Nat. and Geo., 2d ser., vol. 2, Trenton Gr.
- papillatum*, Hall, 1882, Foss. Corals Niagara and Up. Held. Grs., p. 21, and 12th Rep. Geo. Ind., p. 276, Up. Held. Gr.
- parvulum*, Hall, 1847, Pal. N. Y., vol. 1, p. 71, Trenton Gr.
- patulum*, Rominger, 1876, Foss. Corals, p. 143, Niagara Gr.
- profundum*, Conrad, 1843, Proc. Acad. Nat. Sci. Phil., p. 335, (*Cyathophyllum profundum*.) and Hall, 1847, Pal. N. Y., vol. 1, p. 49, Birdseye, Black Riv. and Trenton Grs.
- pulchellum*, Billings, 1865, (*Petraia pulchella*.) Can. Nat. and Geo., 2d ser., vol. 2, p. 424, Mid. Sil.
- pygmæum*, Billings, 1862, (*Petraia pygmæa*.) Pal. Foss., vol. 1, p. 103, Mid. Sil. Anticosti, Div. 4.
- radicans*, Hall, 1876, 28th Rep. N. Y. St. Mus. Nat. Hist., p. 106, Niagara Gr.

rectum, Hall, 1843, (Strombodes rectus,) Geo. Rep. 4th Dist. N. Y., p. 200, and Illust. Dev. Foss., pl. 19, Ham. Gr.



FIG. 220. Strep-telasma rectum.

rusticum, Billings, 1858, (Petraia rustica,) Rep. of Progr. Geo. Sur. Can., p. 168, Hud. Riv. Gr. selectum, Billings, 1865, (Petraia selecta,) Can. Nat. and Geo., 2d ser., vol. 2, p. 429, Mid. Sil.

simplex, Hall, 1882, Foss. Corals Niagara and Up. Held. Grs., p. 18, and 12th Rep. Geo. Ind., p. 277, Up. Held. Gr.

spongiaxis, Rominger, 1876, Foss. Corals, p. 144, Niagara Gr. strictum, Hall, 1874, 26th Rep. N. Y. St. Mus. Nat. Hist., p. 114, Low. Held. Gr. tenue, Hall, 1882, Foss. Corals Niagara and Up. Held. Grs., p. 17, and 12th Rep. Geo. Ind., p. 278, Up. Held. Gr. unguia, Hall, 1876, Illust. Dev. Foss., pl. 19, Ham. Gr.

waynensis, Safford, 1869, (Petraia waynensis,) Geo. of Tenn., p. 314, Low. Held. Gr.

STRIATOPORA, Hall, 1852, Pal. N. Y., vol. 2, p. 156. [Ety. striatus, striated; poros, pore.] Ramose; corallites thick-walled, angular, conical; cells opening upon the surface in expanded, angular, cup-like depressions, which are longitudinally striated, and between the striae the bands may bear spinules; tabulae and mural pores common. Type *S. flexuosa*. carbonaria, White, 1862, Proc. Bost. Soc. Nat. Hist., vol. 9, Burlington Gr.

cavernosa, Rominger, 1876, Foss. Corals, p. 60, Corniferus Gr.

flexuosa, Hall, 1852, Pal. N. Y., vol. 2, p. 156, Niagara Gr.

formosa, Billings, 1860, Can. Jour., vol. 5, p. 254, Up. Held. Gr.

huronensis, Rominger, 1876, Foss. Corals, p. 58, Niagara Gr.

iowensis, Owen, 1840, (Cyathopora iowensis,) Rep. on Min. Lands of Iowa, etc., p. 69, Ham. Gr.

issa, Hall, 1874, 26th Rep. N. Y. St. Mus. Nat. Hist., p. 114, Low. Held. Gr.

limbata, Eaton, 1832, (Madrepora limbata,) Geo. Text Book, p. 30, and Illust. Dev. Foss., pl. 33, Ham. Gr.

linnaeana, Billings, 1860, Can. Jour., vol. 5, p. 253, Ham. Gr.

missouriensis, Meek & Worthen, 1868, Geo. Sur. Ill., vol. 3, p. 369, Low. Held. Gr.

rugosa, Hall, 1858, Geo. of Iowa, p. 479, syn. for *S. iowensis*.



FIG. 221.—Striatopora linnaeana.

STROMBODES, Schweigger, 1820, Handb. der Naturg., p. 418. [Ety. strombos, twisting.]

Composite, increasing by calicular gemmation; corallites constituted principally by a series of superposed, invaginated, infundibuliform tabulae, united by ascending trabaculae, so as to form a columnar mass; calices pentagonal, well circumscribed, and completely covered with the septal radii; outer walls not well developed, and inner mural investment rudimentary. Type *S. pentagonus*.

alpenensis, Rominger, 1876, Foss. Corals, p. 133, Ham. Gr. Is this a syn. for *S. mammillaris*?

diffluens, Edwards & Haime, 1851, Pol. Fos. des Terr. Pal., p. 431, Anticosti Gr. distortus, Hall, 1843, Geo. Rep. 4th Dist. N. Y., p. 209, Ham. Gr. Too imperfectly described for recognition. Probably a *Heliophyllum*.

eximius, Billings, 1866, Catal. Sil. Foss. Antic., p. 93, Clinton and Niagara Grs. gracilis, Billings, 1862, Pal. Foss., vol. 1, p. 113, Mid. Sil.

helianthoides, (?) *Heliophyllum halli*. mammillaris, Owen, 1840, (Astrea mammillaris,) Rep. on Min. Lands, p. 70, and Rominger, in Pal. Foss., p. 133, Niagara Gr.

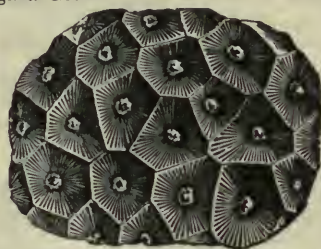


FIG. 222.—Strombodes pentagonus.

pentagonus, Goldfuss, 1826, Germ. Petref. p. 62, Niagara Gr.

pygmaeus, Rominger, 1876, Foss. Corals, p. 132, Niagara Gr.

(?) *rectus*, see *Streptelasma rectum*.

separatus, Ulrich, 1886, Cont. to Am. Pal., p. 32, Niagara Gr.

simplex, see *Zaphrentis simplex*.

striatus, D'Orbigny, 1850, Prodr. de Paléont., p. 48 Niagara Gr.

STYLASTREA, Lonsdale, 1845, Geo. and Pal. of Russia, and Ural Mts., p. 621. [Ety. sty'os, pillar; aster, star.] Composite, large; corallites prismatic; easily separable; walls thick, striated longitudinally, and wrinkled transversely; within the walls there is a narrow, vesicular, perithecal zone, and within it a lamelliferous area; septa numerous, not reaching the center; tabulae abundant. Type *S. inconferta*.

anna, Whitfield, 1882, Ann. N. Y. Acad. Sci., vol. 2, p. 199, Up. Held. Gr.

SYRINGOLITES, Hinde, 1879, Geo. Mag., vol. 6, p. 244. [Ety. syrinx, pipe; lithos, stone.] Composite; large with basal epitheca; corallites polygonal, thin-

- walled, with mural pores, and a cylindrical tube in the center of each corallite. Type *S. huronensis*.
- huronensis*, Hinde, 1879, *Geo. Mag.*, vol. 6, p. 246, Niagara Gr.
- SYRINGOPORA**, Goldfuss, 1826, *Germ. Petref.*, p. 75. [Ety. *syrix*, pipe; *poros*, pore.] Corallum aggregating, at first creeping after the manner of *Aulopora*, then sending up numerous vertical, cylindrical corallites, usually flexuous, subparallel, and connected laterally by more or less transverse processes; septa rudimentary; tabulæ close set, infundibuliform; epitheca well developed. Type *S. reticulata*.
- alectiformis*, Winchell, 1866, *Rep. Low. Penin. Mich.*, p. 90, Ham. Gr.
- annulata*, Rominger, 1876, *Foss. Corals*, p. 81, Niagara Gr.
- aulopora*, Salter, 1855, *Belcher's Last of the Arctic Voyages*, vol. 2, p. 385, Carboniferous.
- cleviana*, Edwards & Haime, 1851, *Pol. Foss. d. Terr. Pal.*, p. 295, Corniferous Gr.
- compacta*, Billings, 1858, *Can. Nat. and Geo.*, vol. 3, p. 422, Up. Sil.
- crassata*, Winchell, 1866, *Rep. Low. Penin. Mich.*, p. 90, Ham. Gr.
- dalmani*, Billings, 1858, *Can. Nat. and Geo.*, vol. 3, p. 423, Up. Sil.
- debilis*, Billings, 1858, *Can. Nat. and Geo.*, vol. 3, p. 423, Up. Sil.
- elegans*, Billings, 1858, *Can. Nat. and Geo.*, vol. 3, p. 425, Corniferous Gr.
- fenestrata*, Winchell, 1866, *Rep. Low. Penin. Mich.*, p. 90, Ham. Gr.
- fibrata*, Rominger, 1876, *Foss. Corals*, p. 82, Niagara Gr.
- harveyi*, White, 1862, *Proc. Bost. Soc. Nat. Hist.*, vol. 9, p. 32, Waverly or Kinderhook Gr.
- hisingeri*, Billings, 1859, *Can. Nat. and Geo.*, vol. 4, p. 116, Corniferous Gr.
- infundibulum*, see *Cystostylus infundibulum*.
- intermedia*, Nicholson, 1874, *Rep. Pal. Prov. Ont. Can.*, p. 126, Ham. Gr.
- laxata*, Billings, 1859, *Can. Jour.*, vol. 4, p. 118, Corniferous Gr.
- maclurii*, Billings, 1860, *Can. Jour.*, vol. 5, p. 258, Corniferous Gr.
- multitenuata*, McChesney, 1860, *New Pal. Foss.*, p. 75, and *Pal. E. Neb.*, p. 144, Coal Meas.
- multicaulis*, Hall, 1852, *Pal. N. Y.*, vol. 2, p. 119, Niagara Gr.
- nobilis*, Billings, 1859, *Can. Nat. and Geo.*, vol. 4, p. 118, Up. Held. Gr.
- parallela*, Etheridge, 1878, *Quar. Jour. Soc. Geol.*, vol. 34, p. 583, Up. Sil.
- perelegans*, Billings, 1859, *Can. Jour.*, vol. 4, p. 117, Up. Held. Gr.
- retiformis*, Billings, 1858, *Can. Nat. and Geo.*, vol. 3, p. 424, Up. Sil.



FIG. 223.—*Syringopora maclurii*.

- reticulata*, Goldfuss, 1826, *Petref. Germ.*, p. 76, Devonian.
- tabulata*, Edwards & Haime, 1851, *Pol. Foss. des Terr. Pal.*, p. 288, Up. Held. Gr.
- tenella*, Rominger, 1876, *Foss. Corals*, p. 81, Niagara Gr.
- tubiporoides*, Yandell & Shumard, 1847, *Cont. to Geo. of Ky.*, p. 8, Corniferous Gr.
- tubiporoides*, Billings, see *S. maclurii*.
- verneuli*, Edwards & Haime, 1851, *Polyp. Foss. de Terr. Pal.*, p. 289, Corniferous Gr.
- verticillata*, Goldfuss, 1826, *Petref. Germ.*, p. 76, Niagara Gr.
- TETRADIDIUM**, Dana, 1848, Wilkes, *Expl. Exped. Zooph.*, vol. 8, p. 701. [Ety. *tetra*, four.] Aggregate, massive, sub-hemispheric; corallites long, prismatic, in close contact; septa few, not reaching the center of the visceral chamber (typically four); tabulæ numerous, complete; calices generally petaloid; no mural pores; increase by fission. Type *T. fibratum*.



FIG. 224.—*Tetradiidium fibratum*.

- columnare*, Hall, 1847, (*Chetetes columnaris*) *Pal. N. Y.*, vol. 1, p. 68, Trenton Gr.
- fibratum*, Safford, 1856, *Am. Jour. Sci.*, vol. 22, p. 237, Hud. Riv. Gr.
- fibratum* var. *aperturnum*, Safford, 1856, *Am. Jour. Sci.*, vol. 22, p. 237, Hud. Riv. Gr.
- fibratum* var. *minus*, Safford, 1856, *Am. Jour. Sci.*, vol. 22, p. 238, Hud. Riv. Gr.
- huronense*, Billings, 1865, (*Stenopora huronensis*) *Pal. Foss.*, vol. 1, p. 185, Hud. Riv. Gr.
- peachi* var. *canadense*, Foord, 1883, *Cont. to Micro. Pal.*, p. 24, Trenton Gr.
- Tetradiidium*, Salter, 1863, *Quar. Jour. Geo. Soc.*, vol. 19. [Ety. *tetra*, four; *grapho*, I write.] This genus is not regarded with much favor. *Graptolithus bryonoides* is made the typical species. *G. quadribrachiatus* is also placed in it.



FIG. 225.—*Tetradiidium fibratum*. Corallites scattered through the rock.

approximatus, see *Graptolithus approximatus*.

THAMNOGRAPTUS, Hall, 1859, Pal. N. Y., vol. 3, p. 519. [Ety. *thamnus*, shrub; *grapho*, I write.] Fronds consisting of straight or flexuous stipes, with alternating or widely diverging branches; branches long, simple, or ramose, in the same manner as the stipe; the main stipe and branches are marked by a central longitudinal, depressed line, indicating the axis. Type *T. typus*.

anna, Hall, 1865, Can. Org. Rem., Decade 2, p. 141, Quebec Gr.

bartonensis, Spencer, 1878, Can. Nat., vol. 8, and Bull. No. 1, Mus. St. Univ. Mo., p. 39, Niagara Gr.

capillaris, Hall, 1859, Pal. N. Y., vol. 3, p. 520, Hud. Riv. Gr.

multiformis, Spencer, 1884, Bull. No. 1, Mus. Univ. St. Mo., p. 40, Niagara Gr.

typus; Hall, 1859, Pal. N. Y., vol. 3, p. 519, Hud. Riv. Gr.



FIG. 226.—*Thamnograptus typus*.

THECIA, Edwards & Haime, 1849, Comptes rend., t. 29, p. 263. [Ety. *theke*, sheath.] Corallum massive, with an abundant, compact, spurious cœnenchyma, produced by the septa becoming cemented together laterally; septal system highly developed; tabulæ numerous; calices shallow, with a small deep fossula. Type *T. swindernana*.

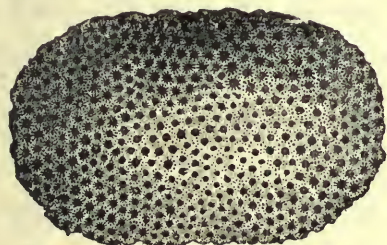


FIG. 227.—*Thecia major*.

major, Rominger, 1876, Foss. Corals, p. 67, Niagara Gr.

minor, Rominger, 1876, Foss. Corals, p. 68, Niagara Gr.

ramosa, Rominger, 1876, Foss. Corals, p. 69, Up. Held. Gr.

swindernana, Goldfuss, 1829, (Agaricia *swindernana*.) Petref. Germ., p. 109, Niagara Gr.

THECOSTEGITES, Edwards & Haime, 1849, Comptes rend., t. 29, p. 261. [Ety. *theke*, sheath; *stegē*, covering.] Corallites cylindrical, short and united by short mural expansions situated at

various heights: tabulæ horizontal. Type *T. bouchardi*.

bouchardi, Michelin, 1845, (Harmodites *bouchardi*.) Icon. Zooph., p. 185. This species was described from France, and is probably not American.



FIG. 228.—*Thecostegites hemisphericus*, natural size and magnified.

hemisphericus, Roemer, 1860, Sil. Fauna W. Tenn., p. 25, Niagara Gr.

TRACHYPORA, Edwards & Haime, 1851, Pol. Foss. d. Terr. Pal., p. 305. [Ety. *trachys*, rough; *poros*, pore.] Dendroid; calices slightly salient; no septa; cœnenchyma abundant, solid, and surface marked by strong, irregular, vermicular, subechinulated striæ. Type *T. davidsoni*.

austini, Worthen, (in press,) Geo. Sur. Ill., vol. 8, p. 81, Coal Meas.

elegantula, Billings, 1860, Can. Jour., vol. 5, p. 254, Ham. Gr.

ornata, Rominger, 1876, (Dendropora *ornata*.) Foss. Corals, p. 62, Ham. Gr.



FIG. 229.—*Trachypora elegantula*. Portion of two corallites—a longitudinal section and a corallite enlarged.

TROCHOPHYLLUM, Edwards & Haime, 1851, Mon. d. Pol. Foss. de Terr. Pal., p. 356.

[Ety. *trochos*, wheel; *phyllon*, leaf.] Simple, trochoid; calice shallow; septa thick, not denticulate, extending almost to the center of the visceral chamber, where a small tabula is visible; fossula rudimentary and occupied by a small septum. Type *T. verneuianum*.

verneuianum, Edwards & Haime, 1851, Mon. d. Pol. Foss. d. Terr. Pal., p. 357, Subcarboniferous.

Tubipora, Linnæus, 1758, Syst. Nat., 10th Ed., p. 789. Not American Palæozoic.

lamellosa, Owen, 1840, Rep. on Min. Lands, p. 78. Not defined. Probably a *Syringopora*.

VERMIPORA, Hall, 1874, 26th Rep. N. Y. St. Mus. Nat. Hist., p. 109. [Ety. *vermis*, worm; *poros*, pore.] Ramose; corallites cylindrical, close, increasing by lateral gemmation, and projecting at the surface; tabulæ remote; no mural pores connecting corallites. Type *V. serpuloides*.

- fasciculata, Rominger, 1876, Foss. Corals, p. 70, Ham. Gr.
- niagarensis, Rominger, 1876, Foss. Corals, p. 70, Niagara Gr.
- robusta, Hall, 1883, Rep. St. Geo., pl. 2, figs. 32, 33, Low. Held. Gr.
- serpuloides, Hall, 1874, 26th Rep. N. Y. St. Mus. Nat. Hist., p. 110, Low. Held. Gr.
- tortuosa, Hall, 1883, Rep. St. Geo., pl. 2, fig. 23, Low. Held. Gr.
- Vesicularia*, Rominger, 1876, Foss. Corals, p. 135. This name was preoccupied among the Bryozoa. See *Cystiphorolites*.
- major*, see *Cystiphorolites major*.
- minor*, see *Cystiphorolites minor*.
- variolosa*, see *Cystiphorolites variolosus*.
- ZAPHRENTIS, Rafinesque, 1820, Ann. des Sci. Phys. Brux., vol. 5, p. 234. [Ety. za, very; phrentis, diaphragm.] Simple, turbinate; lamellæ simple, alternate, extending from the epitheca to the center of the visceral chamber; tabulæ well developed, extending from wall to wall, and deflected downward around the periphery; no columella; calice deep, with a single strongly developed fossula occupying the place of one of the lamellæ. Type *Z. phrygia*.
- acuta, White & Whitfield, 1862, Proc. Bost. Soc. Nat. Hist., vol. 8, p. 306, Waverly or Choteau Gr.
- affinis, Billings, 1865, Can. Nat. and Geo., 2d ser., vol. 2, p. 430, Hud. Riv. Gr.
- ampla, Hall, 1876, Illust. Dev. Foss., pl. 21, Ham. Gr.
- annulata, Hall, 1882, Foss. Corals Niagara and Up. Held. Grs., p. 33, and 35th Rep. N. Y. St. Mus. Nat. Hist., p. 437, Up. Held. Gr.
- bellistriata, Billings, 1865, Can. Nat. and Geo., 2d ser., vol. 2, p. 430, Hud. Riv. Gr.
- biggsbyi, Billings, 1866, Catal. Sil. Foss. Antic., p. 92, Clinton and Niagara Grs.
- bilateralis, Hall, 1852, (*Caninia bilateralis*), Pal. N. Y., vol. 2, p. 41, Clinton and Niagara Grs.
- calcariformis, Hall, 1882, Foss. Corals Niagara and Up. Held. Grs., p. 33, and 12th Geo. Ind., p. 293, Up. Held. Gr.
- calceola, White & Whitfield, 1862, (*Lophophyllum calceola*.) Proc. Bost. Soc. Nat. Hist., vol. 8, p. 305, and 1880, Cont. to Pal. No. 6, p. 156, Waverly or Choteau Gr.
- canadensis, Billings, 1862, Pal. Foss., vol. 1, p. 105, Hud. Riv. Gr.
- cannonensis, Winchell, 1869, Geo. of Tenn., p. 442, Waverly or Kinderhook Gr.
- carniata, Worthen, (in press.) Geo. Sur. Ill., vol. 8, p. 75, Keokuk Gr.
- cassedayi, M. Edwards, 1860, Hist. d. Corallaires, t. 3, Warsaw Gr.
- celator, Hall, 1876, 28th Rep. N. Y. St. Mus. Nat. Hist., p. 107, Niagara Gr.
- centralis, Edwards & Haime, 1851, Mon. d. Pol. Foss. d. Terr. Pal., p. 328, Up. Held. Gr.
- chesterensis, Worthen, (in press.) Geo. Sur. Ill., vol. 8, p. 73, Kaskaskia Gr.
- cinctosa, Billings, 1866, Catal. Sil. Foss. Antic., p. 92, Clinton and Niagara Grs.
- cingulosa, Billings, 1874, Pal. Foss., vol. 2, p. 10, Gaspé limestone No. 8, Devonian.
- clappi*, syn. for *Z. gigantea*.
- cliffordana, Edwards & Haime, 1851, Mon. d. Pol. Foss. d. Terr. Pal., p. 329, Sub-carboniferous.
- colletti, Hall, 1882, Foss. Corals Niagara and Up. Held. Grs., p. 28, and 12th Rep. Geo. Ind., p. 315, Up. Held. Gr.
- complanata, Hall, 1882, Foss. Corals Niagara and Up. Held. Grs., p. 26, and 35th Rep. N. Y. St. Mus. Nat. Hist., p. 430, Up. Held. Gr.
- compressa, M. Edwards, 1860, Hist. d. Corallaires, t. 3, Warsaw Gr.
- compressa*, see *Z. davisana*.
- concava, Hall, 1882, Foss. Corals Niagara and Up. Held. Grs., p. 35, and 12th Rep. Geo. Ind., p. 291, Up. Held. Gr.
- conigera*, see *Clisiophyllum conigerum*.
- constricta, Hall, 1882, Foss. Corals Niagara and Up. Held. Grs., p. 33, and 35th Rep. N. Y. St. Mus. Nat. Hist., p. 437, Up. Held. Gr.
- contorta, Hall, 1882, Foss. Corals Niagara and Up. Held. Grs., p. 37, and 35th Rep. N. Y. St. Mus. Nat. Hist., p. 441, Up. Held. Gr.
- convoluta, Hall, 1882, Foss. Corals Niagara and Up. Held. Grs., p. 37, and 12th Rep. Geo. Ind. p. 294, Up. Held. Gr.
- cornicula, Lesneur, 1820, (*Caryophyllia cornicula*.) Mem. du Mus., vol. 6, p. 297, Up. Held. Gr.
- corrugata, Hall, 1882, Foss. Corals Niagara and Up. Held. Grs., p. 27, and 35th Rep. N. Y. St. Mus. Nat. Hist., p. 431, Schoharie Gr.
- corticata, Billings, 1874, Pal. Foss., vol. 2, p. 9, Low. Devonian.
- cristulata, Hall, 1882, Foss. Corals Niagara and Up. Held. Grs., p. 10, and 35th Rep. N. Y. St. Mus. Nat. Hist., p. 414, Niagara Gr.
- cruciformis, Hall, 1883, 12th Rep. Geo. Ind., p. 315, Up. Held. Gr.
- curvata, Hall, 1882, Foss. Corals Niagara and Up. Held. Grs., p. 35, and 35th Rep. N. Y. St. Mus. Nat. Hist., p. 439, Up. Held. Gr.
- cyathiformis, Hall, 1882, Foss. Corals Niagara and Up. Held. Grs., p. 27, and 12th Rep. Geo. Ind., p. 290, Up. Held. Gr.
- cylindraceas, Worthen, (in press.) Geo. Sur. Ill., vol. 8, p. 78, Kaskaskia Gr.
- cystica, Winchell, 1866, Rep. Low. Penin. Mich., p. 90, Ham. Gr.
- dalei, Edwards & Haime, 1851, Mon. d. Pol. Foss. d. Terr. Pal., p. 329, Warsaw Gr.

- davisana*, n. sp. Up. Held. Gr. Proposed instead of *Z. compressa* of Rominger, 1876, Foss. Corals, p. 151, pl. 53, which was preoccupied.
- deformis*, Hall, 1883, 12th Rep. Geo. Ind., p. 290, Up. Held. Gr.
- denticulata*, Eichwald, 1857. Probably not American.
- desori*, Edwards & Haime, 1851, Mon. d. Pol. Foss. d. Terr. Pal., p. 333, Low. Held. Gr.
- duplicata*, Hall, 1882, Foss. Corals Niagara and Up. Held. Grs., p. 32, and 12th Rep. Geo. Ind., p. 293, Up. Held. Gr.
- edwardsi*, Nicholson, 1875, Ohio Pal., vol. 2, p. 235, Up. Held. Gr.
- egeria*, Billings, 1875, Can. Nat. and Geo., vol. 7, p. 234, Up. Held. Gr.
- elegans*, Hall, 1882, Foss. Corals Niagara and Up. Held. Grs., p. 37, and 12th Rep. Geo. Ind., p. 287, Up. Held. Gr.
- elliptica*, White, 1862, Proc. Bost. Soc. Nat. Hist., vol. 9, p. 31, and 1880, Cont. to Pal., No. 6, p. 155, Burlington Gr.
- eriphyle*, Billings, 1875, Can. Nat. and Geo. vol. 7, p. 233, Up. Held. Gr.
- excentrica*, Meek, 1873, Haydens, 6th Rep. U. S. Geo. Sur. Terr., p. 495, and Geo. Sur. W. 100th Mer., vol. 4, p. 101, Coal Meas.
- fastigata*, Hall, 1882, Foss. Corals Niagara and Up. Held. Grs., p. 30, and 35th Rep. N. Y. St. Mus. Nat. Hist., p. 434, Up. Held. Gr.
- fenestrata*, Nicholson, 1875, Can. Nat. and Geo., vol. 7, p. 138, Up. Held. Gr.
- foliata*, Hall, 1882, Foss. Corals Niagara and Up. Held. Grs., p. 34, and 12th Rep. Geo. Ind., p. 286, Up. Held. Gr.
- frequentata*, Hall, 1882, Foss. Corals Niagara and Up. Held. Grs., p. 31, and 35th Rep. N. Y. St. Mus. Nat. Hist., p. 435, Up. Held. Gr.
- fusiformis*, Hall, 1882, Foss. Corals Niagara and Up. Held. Grs., p. 29, and 12th Rep. Geo. Ind., p. 296, Up. Held. Gr.
- genitiva*, Billings, 1875, Can. Nat. and Geo., vol. 7, p. 235, Up. Held. Gr.
- gibsoni*, White, 1884, 13th Rep. Geo. Ind., p. 117, Coal Meas.
- gigantea*, Lesueur, 1820, Mem. du Mus., vol. 6, Up. Held. Gr.
- glans*, see *Hadrophyllum glans*.
- gravis*, Hall, 1882, Foss. Corals Niagara and Up. Held. Grs., p. 36, and 35th Rep. N. Y. St. Mus. Nat. Hist., p. 440, Up. Held. Gr.
- gregaria*, Rominger, 1876, Foss. Corals, p. 149, Niagara Gr.
- halli*, Edwards & Haime, 1851, Mon. d. Pol. Foss. d. Terr. Pal., p. 341, Ham. Gr.
- haysi*, Meek, 1865, Am. Jour. Sci. and Arts, 2d ser., vol. 40, p. 32, Low. Held. Gr.
- hecuba*, Billings, 1875, Can. Nat. and Geo., vol. 7, p. 234, Up. Held. Gr.
- herzeri*, Hall, 1882, Foss. Corals Niagara and Up. Held. Grs., p. 35, and 12th Rep. Geo. Ind., p. 292, Up. Held. Gr.
- ida*, Winchell, 1865, Proc. Acad. Nat. Sci. Phil., p. 117, Waverly or Kinderhook Gr.
- illinoisensis*, Worthen, (in press.) Geo. Sur. Ill. vol. 8, p. 77, Keokuk Gr.
- inaequalis*, Hall, 1882, Foss. Corals Niagara and Up. Held. Grs., syn. for *Palaeophyllum divaricans*.
- inclinata*, Hall, 1882, Foss. Corals Niagara and Up. Held. Grs., p. 34, syn. for *Cyathophyllum angustatum*.
- incondita*, Billings, 1874, Pal. Foss., vol. 2, p. 7, Devonian.
- invenusta*, Billings, 1875, Can. Nat. vol. 7, p. 233, Up. Held. Gr.
- irregularis*, Hall, 1882, Foss. Corals Niagara and Up. Held. Grs., p. 34, and 35th Rep. N. Y. St. Mus. Nat. Hist., p. 438, Up. Held. Gr.
- knappi*, Hall, 1882, Foss. Corals Niagara and Up. Held. Grs., p. 34, and 35th Rep. N. Y. St. Mus. Nat. Hist., p. 438, Up. Held. Gr.
- lanceolata*, Worthen, (in press.) Geo. Sur. Ill., vol. 8, p. 76, Warsaw Gr.
- latisinus*, Hall, 1882, Foss. Corals Niagara and Up. Held. Grs., p. 10, and 35th Rep. N. Y. St. Mus. Nat. Hist., p. 414, Niagara Gr.
- macfarlani*, Meek, 1868, Trans. Chi. Acad. Sci., p. 83, Devonian.
- marcoui*, Edwards & Haime, 1851, Mon. d. Pol. Foss. d. Terr. Pal., p. 337, Niagara Gr.
- minas*, Dawson, 1868, Acad. Geo., p. 286, Subcarboniferous.
- multilamella*, Hall, 1852, Stans. Ex. to Gt. Salt Lake, p. 408, Coal Meas.
- multilamellata*, Nicholson, 1875, Ohio Pal., vol. 2, p. 236. The name was preoccupied, and the definition is very imperfect.
- nitida*, Hall, 1882, Foss. Corals Niagara and Up. Held. Grs., p. 31, and 12th Rep. Geo. Ind., p. 288, Up. Held. Gr.
- nodulosa*, Rominger, 1876, Foss. Corals, p. 148, Corniferous Gr.
- offleyensis*, Etheridge, 1878, Quar. Jour. Geo. Soc., vol. 34, p. 588, Up. Sil.
- ovalis*, Hall, 1882, Foss. Corals Niagara and Up. Held. Grs., p. 29, and 12th Rep. Geo. Ind., p. 294, Up. Held. Gr.
- ovibus*, Salter, 1855, Belcher's Last of the Arctic Voyages, vol. 2, p. 382, Carboniferous.
- parasitica*, Worthen, (in press.) Geo. Sur. Ill., vol. 8, p. 79, Kinderhook Gr.
- patens*, Billings, 1865, Can. Nat. and Geo. 2d ser., vol. 2, p. 430, Mid. Sil.
- pellaensis*, Worthen, (in press.) Geo. Sur. Ill., vol. 8, p. 74, St. Louis Gr.
- planima*, Hall, 1882, Foss. Corals Niagara and Up. Held. Grs., p. 29, and 12th Rep. Geo. Ind., p. 292, Up. Held. Gr.
- ponderosa*, Hall, 1882, Foss. Corals Niagara and Up. Held. Grs., p. 27, and 12th Rep. Geo. Ind., p. 238, Up. Held. Gr.

pressula, Hall, 1882, Foss. Corals Niagara and Up. Held. Grs., p. 10, and 35th Rep. N. Y. St. Mus. Nat. Hist., p. 414, Niagara Gr.

profunda, Hall, 1882, Foss. Corals Niagara and Up. Held. Grs., p. 31, and 12th Rep. Geo. Ind., p. 287, Up. Held. Gr.

prolifera, Billings, 1858, Can. Jour. N. S., vol. 4, p. 121, Up. Held. and Ham. Grs.

prona, M. Edwards, 1860, Hist. d. Corallaires, t. 3, Warsaw Gr.

pulmonea, Lesueur, 1820, (Caryophyllia pulmonea,) Mem. du. Mus., vol. 6, Carboniferous.

racinensis, Whitfield, 1880, Ann. Rep. Geo. Sur. Wis. and Geo. Wis., vol. 4, p. 277, Niagara Gr.

rafinesquii, Edwards & Haime, 1851, Mon. d. Pol. Foss. d. Terr. Pal., p. 329, Up. Held. Gr.

recta, Meek, 1868, Trans. Chi. Acad. Sci., p. 82, Devonian.

reversa, Worthen, (in press,) Geo. Sur. Ill., vol. 8, p. 78, Warsaw Gr.

rigida, Hall, 1882, Foss. Corals Niagara and Up. Held. Grs., p. 9, and 35th Rep. N. Y. St. Mus. Nat. Hist., p. 413, Niagara Gr.

roemeri, Edwards & Haime, 1851, Mon. d. Pol. Foss. d. Terr. Pal., p. 341, Delthyris Shale, Low. Held. Gr.

rugatula, Billings, 1874, Pal. Foss., vol. 2, p. 8, Gaspé limestone No. 1, Up. Sil.

sentosa, Hall, 1882, Foss. Corals Niagara and Up. Held. Grs., p. 32, and 35th Rep. N. Y. St. Mus. Nat. Hist., p. 436, Up. Held. Gr.

simplex, Hall, 1843, (Strombodes simplex,) Geo. Rep. 4th Dist. N. Y., p. 200, and Illust. Dev. Foss., pl. 21, Ham. Gr.

solida, Hall & Whitfield, 1873, 23d Rep. N. Y. St. Mus. Nat. Hist., p. 231, Chemung Gr.

spatiosa, see *Heterophrentis spatiosa*.

spergenensis, Worthen, (in press,) Geo. Sur. Ill., vol. 8, p. 77, Warsaw Gr.

spinulifera, Hall, 1858, Geo. Sur. Iowa, p. 650, Warsaw Gr.

spinulosa, Edwards & Haime, 1851, Pol. Foss. d. Terr. Pal., p. 334, Kaskaskia Gr.

spissa, Hall, 1882, Foss. Corals Niagara and Up. Held. Grs., p. 30, and 12th Rep. Geo. Ind., p. 289, Corniferous limestone.

stansburyi, Hall, 1852, Stans. Ex. to Gt. Salt Lake, p. 408, Coal Meas.

stokesi, Edwards & Haime, 1851, Pol. Foss. d. Terr. Pal., p. 330, Niagara Gr.

subcompressa, Hall, 1882, Foss. Corals Niagara and Up. Held. Grs., p. 28, and 12th Rep. Geo. Ind., p. 286, Up. Held. Gr.

subrecta, Billings, 1875, Can. Nat. and Geo., vol. 7, p. 235, Up. Held. Gr.

subvada, Hall, 1882, Foss. Corals Niagara and Up. Held. Grs., p. 11, and 35th Rep. N. Y. St. Mus. Nat. Hist., p. 415, Niagara Gr.

subvesicularis, Hall, 1882, Foss. Corals Niagara and Up. Held. Grs., p. 10, and 35th Rep. N. Y. St. Mus. Nat. Hist., p. 414, Niagara Gr.

tabulata, Hall, 1882, Foss. Corals Niagara and Up. Held. Grs., p. 27, and 35th Rep. N. Y. St. Mus. Nat. Hist., p. 431, Up. Held. Gr.

terebrata, Hall, 1883, 12th Rep. Geo. Ind., p. 316, Up. Held. Gr.

torta, Hall, 1882, Foss. Corals Niagara and Up. Held. Grs., p. 30, and 12th Rep. Geo. Ind., p. 285, Up. Held. Gr.

transversa, Hall, 1882, Foss. Corals Niagara and Up. Held. Grs., p. 36, and 35th Rep. N. Y. St. Mus. Nat. Hist., p. 440, Up. Held. Gr.

transversensis, Winchell, 1866, Rep. Low. Penin. Mich., p. 90, Ham. Gr.

trisuturata, Hall, 1882, Foss. Corals Niagara and Up. Held. Grs., p. 30, and 12th Rep. Geo. Ind., p. 289, Up. Held. Gr.

turbinata, Hall, 1852, (Polydylasma turbinatum,) Pal. N. Y., vol. 2, p. 112, Niagara Gr.

ulrichi, Worthen, (in press,) Geo. Sur. Ill., vol. 8, p. 76, Warsaw Gr.

umbonata, Rominger, 1876, Foss. Corals, p. 146, Ham. Gr.

undata, Hall, 1883, 12th Rep. Geo. Ind., p. 291, Up. Held. Gr.

ungula, Rominger, 1876, Foss. Corals, p. 151, Up. Held. Gr.

varsoviensis, Worthen, (in press,) Geo. Sur. Ill., vol. 8, p. 78, Keokuk Gr.

venusta, Hall, 1882, Foss. Corals Niagara and Up. Held. Grs., p. 38, and 35th Rep. N. Y. St. Mus. Nat. Hist., p. 442, Up. Held. Gr.

FIG. 230.—*Zaphrentis wortheni*.

wortheni, Nicholson, 1875, Ohio Pal., vol. 2, p. 235, Corniferous Gr.

SUBKINGDOM ECHINODERMATA.

THIS Subkingdom is represented, in the Palæozoic rocks, by the Classes Crinoidea, Stellerida, and Echinida.

The word "Crinoidea" was first used in 1821, by J. S. Miller, who published a book entitled "A Natural History of the Crinoidea." He used it as a family name, but later investigations raised it to the rank of a Class. The Palæozoic Orders, into which the Class is divided, are Palæocrinoidea, Blastoidea, Cystoidea, Lichenocrinoidea, Agelacrinoidea, Cyclocystoidea and Myelodactyloidea. The Stellerida are represented by the Orders Asteroidea and Ophiuroidea, and the Echinida by the Order Perischoechinida.

The fossils consist of plates, variously arranged and connected, all of which are composed of peculiar crystalline lime. The principal parts of the Palæocrinoidea are the calyx or body, arms, pinnules, column, and base or root. The Agelacrinoidea and Lichenocrinoidea were attached, by one side, to some foreign substance. The Cyclocystoidea were free or attached in like manner. Whether the Myelodactyloidea were free or attached to other bodies is unknown. Some of the Cystoidea were sessile, others possessed columns tapering to a point, and others had bases or roots for attachment. The Blastoidea possessed columns, but whether or not any of them attached by bases or roots is unknown. All Palæocrinoidea had columns, but some did not have bases or roots. The Orders bearing pinnules are the Blastoidea, Palæocrinoidea, and part of the Cystoidea.

Prof. Wachsmuth has claimed the construction of the vault affords good characters for the separation of the Palæocrinoidea into families, and has distinguished three plans upon which the summit is constructed, viz.:

1. The summit composed of a more or less pliable, sometimes perhaps squamous integument, yielding to motion, in the body and arms.
2. The summit composed of solid plates, with a porous ventral sac, located posteriorly, on the disk, and closed at the top. Anal opening rarely observed, but, probably, lateral.
3. The summit composed of heavy immovable plates, closely joining and forming a dome arching the entire oral side. Anal opening directly through the wall of the dome or at the extremity of a tube, the so-called proboscis.

Without underestimating his work, a single illustration will show that families can not always be distinguished by the construction of the vault; for in the family Heterocrinidæ, there is no resemblance between the vaults of Ectenocrinus, Heterocrinus, Iocrinus, and Ohiocrinus. Ectenocrinus has no tube or proboscis, Ohiocrinus has a large spiral tube, and Iocrinus has a long cylindrical one, extending beyond the ends of the arms and flowing pinnules.

We believe the separation of the Palæocrinoidea into families must be based upon the construction of the calyx and vault, but chiefly upon the former. Probably no family should be made to include genera, some of which have subradials

and others do not. It is therefore of the first importance to ascertain whether the crinoid has one or two circles of plates below the radials. Those having only one circle have been called monocyclic, and those having two circles dicyclic. The circle at the base is composed of what we call the "basal plates," and the second circle, whenever it has an existence, is composed of "subradial plates." In this we follow Billings, Meek, Agassiz, and most other standard authors. Carpenter and Wachsmuth call the "subradials" the "basals" in all cases where they occur, and the lower plates "underbasals;" but where there are no "subradials," they follow the well-established nomenclature in calling the first circle of plates "basals."

The presence or absence of regular interradians, it seems, should always be regarded as of family importance.

The number of basal plates should also be regarded as of family importance. If not in all cases, then in connection with the general structure of the calyx and vault the families will be sufficiently well-defined. Those characters upon which genera are founded, when combined, in certain associations will form families; and under this head several important families have been created.

Generic characters, as a matter of course, are to a certain extent included in the family characters; but the form and construction of the column is of generic importance. The general form of the calyx and vault, and the number of primary radials, and the construction of the azygous area, are always of generic importance. Beside, certain combinations and associations of what are usually regarded as specific characters have been made the basis for establishing genera.

Wachsmuth, speaking from experience, says in young crinoids the basals are the most perfectly developed parts; they attain nearly their full size in young individuals, greater in proportion than the subradials and radials, which are comparatively early developed, and at a time when the interradian and anal plates have scarcely made their appearance. The latter develop the slowest, and in some genera increase continually, both in size and number, during the growth of the individual. Abnormal growths, or sudden modifications of specific characters, almost always take place in the interradian and azygous areas, the azygous rays and dome. His experience is corroborated by others, and the author never saw a small specimen that did not have its basals or first circle of plates as distinctly marked as they occur in large specimens of the same species.

The columns of crinoids very frequently show injuries received by the animal in its life-time. The column is sometimes much swollen on one side and depressed on the other; sometimes a parasite that attached to the column is found imbedded or enveloped in the crinoid column. The animal could also repair its arms and other parts of its body by secretions of lime in the same way.

Some of the Cystoidea may be arranged into families, upon characters similar to those upon which families are founded in the Palaeocrinoidea; but, generally, this is not the case. Some of the Cystoidea possessed an ambulacral opening and two other orifices, the purposes of which may not be fully understood; in others, the two openings referred to are absent. In addition to these, many bear openings called "pectinated rhombs," and all have pores passing through the plates. These pores passed to organs called "hydrospires," which were largely developed within the calyx of the Cystoidea and Blastoidea. The communication, through the test, with the outside water is supposed to show the hydrospires belonged to the respira-

tory system. The number and position of the larger orifices and the pectinated rhombs constitute the principal basis for family classification. The Blastoidea have orifices at the summit of the calyx which are important in classification. Some have fissures at the summit, others have slits along each side of the ambulacra, and others have five pairs surrounding an oral center. These openings connect with hydrospires situated beneath the ambulacra. These orifices are of family importance, and some have regarded the number of hydrospires as of generic importance.

In the nomenclature of the Blastoidea the calyx consists of the basals, radials or forked plates, and orals or deltoid plates. The suture between the basals and radials is the basi-radial suture. The ridge at the median line of an oral is an oral or interrarial ridge. In the forked plates the lower part is the body of the radial, and the two prongs are the limbs. Between the limbs is the radial sinus, which is occupied by the ambulacrum, consisting of a lancet-piece, which is excavated lengthwise by the food-groove or ambulacrum, and against it rest side plates or pore pieces, marked by pinnule pits or sockets, and there are also side plates. Beneath the ambulacra there are interrarial systems of lamellar tubes or hydrospires. The openings of these tubes on the ventral surface of the calyx, as in *Codaster*, are called hydrospire slits; if they are concentrated beneath the ambulacra, as in *Codonites*, the gap between the edge of the lancet-plate and the sides of the radial sinus is the hydrospire cleft, which leads downward into the hydrospire canal. The canals open externally by spiracles, sometimes called ovarian openings. The spiracles of the anal interradius may be confluent with the anal opening to form the anal spiracle. The plates covering the mouth and peristome, and which are sometimes continued down the ambulacra covering the food-grooves, are the summit plates or the vault.

The Cyclocystoidea have tubes radiating from the center of the disk, which connect with a circular tube in the rim. It is evident there was both a circular and radiate system of circulation in this order of animals. The Myelodactyloidea also had a compound internal system of both circular and radiate circulation. The Lichenocrinoidea attached by a base that appears to have been a single solid plate. Internally there are numerous thin, upright septa radiating from the center, which supported the very small external plates, and the sarcode between which must have been connected with the tube in the column to have given support to it, and to have maintained it in an upright position. The column tapered to a point, and no evidence has been found of any external opening of these animals. The affluent and effluent openings that abound in all other Echinoderms, and even among the sponges, have thus far never been discovered in the Lichenocrinoidea. The notice of this order in Wachsmuth's Palæocrinoidea seems to be wholly erroneous. The three orders—Cyclocystoidea, Myelodactyloidea and Lichenocrinoidea—are unknown in rocks later than the Upper Silurian.

The Class Stellerida is composed of animals with a flattened and more or less pentagonal body and central disk. The mouth opens in the center of the lower surface of the disk; the skin is coriaceous, the whole body more or less flexible, and along the lower surface of each arm or prolonged ray from the central disk, there is a more or less distinct furrow from which the ambulacra are protruded. The Palæozoic orders, Asteroidea and Ophiuroidea, are exceedingly abundant in all existing seas. In the common starfish the arms are mere prolongations of the disk, and the plates from which the ambulacra are exerted are in deep furrows along the lower

surface of the arms. The mouth is in the center of the disk, and the ramifications of the stomach extend a greater or less distance into the arm-furrows. In the Ophiuroidea [*Ophis*, snake; *oura*, tail] there are usually five simple curving or flowing arms with undefined furrows and furnished with cirri, which give them a ragged and tangled exterior.

The class Echinida is composed of animals having a complete exterior calcareous shell of closely-fitting plates, which prevents all flexion of the body. The animal has no arms, but the holes, through which the sucking feet are protruded, are arranged upon five rows of plates running from the center of the top of the shell to the angles of the mouth at the bottom; or, when they are confined to the dorsal surface, they form a distinct five-rayed star surrounding the apex of the shell. A striking character in this class is the manner in which spines are articulated upon tubercles on the surface of the shell; the base of the spines being hollowed for the reception of the convex surface of the tubercle, and, being sustained in place by a ligament, the spines are movable, and serve economical purposes. The Palæozoic order Perischoechinida is extinct, but some of them had an internal masticatory apparatus that will compare with any that exists in the living representatives.

CLASS CRINOIDEA.

ORDER PALÆOCRINOIDEA.

FAMILY ACROCRINIDÆ.—Acrocrinus.

FAMILY ACTINOCRINIDÆ.—Actinocrinus, Agaricocrinus, Alloprosallocrinus, Amphoraerinus, Batocrinus, Doryerinus, Eretmocrinus, Gennæocrinus, Megistocrinus, Melocrinus, Phytocrinus, Saccocrinus, Siphonocrinus, (?) Steganocrinus, Stereocrinus, Strotocrinus, Teleiocrinus.

FAMILY AGASSIZOCRINIDÆ.—Agassizocrinus.

FAMILY ALLAGECRINIDÆ.—Allagecrinus.

FAMILY ANCYROCRINIDÆ.—Ancyrocrinus.

FAMILY ARTHRACANTHIDÆ.—Arthracantha.

FAMILY BELEMNOCRINIDÆ.—Belemnocrinus.

FAMILY CALCEOGRINIDÆ.—Calceocrinus, Deltacrinus.

FAMILY CAMAROCRINIDÆ.—Camarocrinus.

FAMILY CATILLOCRINIDÆ.—Catillocrinus.

FAMILY CUPRESSOCRINIDÆ.—Aspidoerinus.

FAMILY CYATHOCRINIDÆ.—Ampheristocrinus, Arachnocrinus, Atelestocrinus, Baryerinus, Carabocrinus, Cyathocrinus, Erisocrinus, Eupachyrcinus, Euspirocrinus, Menocrinus, Palæocrinus, Vasocrinus.

FAMILY DICHOCRINIDÆ.—Cotyledonocrinus, Dichocrinus, Pterotocrinus, Tal-arocrinus.

FAMILY DIMEROCRINIDÆ.—Coronocrinus, Cytoerinus.

FAMILY EDRIOCRINIDÆ.—Edriocrinus.

FAMILY EUCALYPTOCRINIDÆ.—Eucalyptocrinus.

FAMILY GASTEROCOMIDÆ.—Myrtilloerinus.

FAMILY GAUROCRINIDÆ.—Gaurocrinus, Retiocrinus, Rhanocrinus, Thysanocrinus.

FAMILY GLYPTASTERIDÆ.—Glyptaster, Lampterocrinus.

- FAMILY GLYPTOCRINIDÆ.—Archæocrinus, Compsoocrinus, Glyptoocrinus, Pycno-
crinus, Schizoocrinus.
- FAMILY HAPLOCRINIDÆ.—Coccoocrinus, Haploocrinus.
- FAMILY HETEROCRINIDÆ.—Ectenocrinus, Heterocrinus, Iocrinus, Ohioocrinus.
- FAMILY HYBOCRINIDÆ.—Anomalocrinus, Hyboocrinus.
- FAMILY ICHTHYOCRINIDÆ.—Cleoocrinus, Ichthyoocrinus, Lecanocrinus, Mespilo-
crinus, Nipteroocrinus, Onychoocrinus, Taxoocrinus.
- FAMILY MELOCRINIDÆ.—Alloocrinus, Dolatoocrinus, Macrostyloocrinus, Maria-
crinus, Technoocrinus.
- FAMILY PISOCRINIDÆ.—Pisoocrinus.
- FAMILY PLATYCRINIDÆ.—Cordylocrinus, Eucladoocrinus, Marsupioocrinus, Platy-
crinus.
- FAMILY POTERIOCRINIDÆ.—Bursacrinus, Cælioocrinus, Dendroocrinus, Graphio-
crinus, Homocrinus, Hydreionoocrinus, Meroocrinus, Ottawacrinus, Pote-
rioocrinus, Stemmatocrinus, Zeacrinus.
- FAMILY RHODOCRINIDÆ.—Goniasteroidocrinus, Hadroocrinus, Lyriocrinus,
Rhodoocrinus.
- FAMILY SYNATHOCRINIDÆ.—Synbathocrinus.
- FAMILY TAXOCRINIDÆ.—Cupuloocrinus, Forbesioocrinus, Taxoocrinus.
- FAMILY XENOCRINIDÆ.—Xenoocrinus.
- FAMILY AFFINITY UNCERTAIN.—Brachioocrinus, Closterocrinus, Cystocrinus.

ORDER CYSTOIDEA.

- FAMILY AMYGDALOCYSTIDÆ.—Amygdalocystites, Palæocystites.
- FAMILY ANOMALOCYSTIDÆ.—Anomalocystites.
- FAMILY CARYOCRINIDÆ.—Caryocrinus.
- FAMILY COMAROCYSTIDÆ.—Comarocystites.
- FAMILY ECHINOCYSTIDÆ.—Echinocystites.
- FAMILY EOCYSTIDÆ.—Eocystites.
- FAMILY GOMPHOCYSTIDÆ.—Gomphocystites, Hemicosmites.
- FAMILY HOLOCYSTIDÆ.—Alloocystites, Crinocystites, Holocystites.
- FAMILY HYBOCYSTIDÆ.—Hyboocystites.
- FAMILY LEPADOCRINIDÆ.—Apiocystites, Calloocystites, Glyptocystites, Lepado-
crinus, Pleurocystites, Sphaerocystites, Strobilocystites.
- FAMILY PLATYCYSTIDÆ.—Platycystites.
- FAMILY UNCERTAIN.—Heterocystites, Lysocystites, Malocystites, Porocrinus.

ORDER BLASTOIDEA.

- FAMILY BLASTOIDOCRINIDÆ.—Blastoidocrinus.
- FAMILY CODASTERIDÆ.—Codaster, Heteroschisma.
- FAMILY CODONITIDÆ.—Codonites.
- FAMILY ELEUTHEROCRINIDÆ.—Eleutheroocrinus.
- FAMILY GRANATOCRINIDÆ.—Granatocrinus, Schizoblastus.
- FAMILY NUCLEOCRINIDÆ.—Nucleoocrinus.
- FAMILY PENTREMITIDÆ.—Pentremites, Pentremitidea.
- FAMILY STEPHANOCRINIDÆ.—Stephanocrinus.
- FAMILY TROOSTOCRINIDÆ.—Troostocrinus, Tricæloocrinus.

ORDER AGELACRINOIDEA.

FAMILY AGELACRINIDÆ.—Agelacrinus, Echinodiscus, Edrioaster, Lepidodiscus.

FAMILY HEMICYSTIDÆ.—Hemicystites.

ORDER MYELODACTYLOIDEA.

FAMILY MYELODACTYLIDÆ.—Myelodactylus.

ORDER CYCLOCYSTOIDEA.

FAMILY CYCLOCYSTOIDIDÆ.—Cyclocystoides.

ORDER LICHENOCRINOIDEA.

FAMILY LICHENOCRINIDÆ.—Lichenocrinus.

CLASS STELLERIDA.

ORDER ASTEROIDEA.

FAMILY ONYCHASTERIDÆ.—Onychaster.

FAMILY PALÆASTERIDÆ.—Cholaster, Compsaster, Palæaster, Palæasterina, Petraster, Schoenaster, Stenaster, Tremataster.

ORDER OPHIUROIDEA.

FAMILY PROTASTERIDÆ.—Eugaster, Palæocoma, Protaster, Tæniaster.

CLASS ECHINIDA.

ORDER PERISCHOECHINIDA.

FAMILY ARCHÆOCIDARIDÆ.—Archæocidaris, Eocidaris, Lepidocidaris, Perischodomus, Pholidocidaris.

FAMILY LEPIDECHINIDÆ.—Hybochinus, Lepidechinus.

FAMILY PALÆCHINIDÆ.—Lepidesthes, Melonites, Oligoporus, Palæchinus.

ACROCRINUS, Yandell, 1855, Am. Jour. Sci. and Arts, 2d ser., vol. 20, p. 135. [Ety. *akros*, extreme, from the great number of plates covering the body; *krinon*, lily.] Body goblet or urn-shaped, consisting of many series of plates; two basals, the suture from the anterior to the posterior side, followed by a series of small plates, and these again by another and another, so that the plates reach the 5th to 10th series before the arms become free; the size of the plates increase as they approach the arms; arms 20, long, composed of two series of plates bearing pinnules; column round. Type A. shumardi.

shumardi, Yandell, 1855, Am. Jour. Sci. and Arts, 2d ser., vol. 20, p. 135, Kaskaskia Gr.

urniformis, Hall, 1858, Geo. Rep. Iowa, p. 690, Kaskaskia Gr.

wortheni, Wachsmuth, 1882, Bull. No. 1, Ill. St. Mus. Nat. Hist., p. 4, and Geo. Sur. Ill., vol. 7, p. 343, Coal Meas.

ACTINOCRINUS, Miller, 1821, Nat. Hist. Crinoidea, p. 95. [Ety. *aktin*, ray; *krinon*, lily.] Body turbinate, plates sculptured; basals 3; primary radials 3x5; secondary 1x10, axillary; succeeding radials having a single series to each division, one axillary, the other simple; arms 20 to 50 or more; pinnules; regular interradians, one in the first series, two in the second, and one or two in the third; azygous interradians, one in line with the first primary radials, and of the same size, two in the second series, and one, two, or three in succeeding series; vault variable, plates nodose; tube or proboscis large, subcentral; column long. Type A. triacontadactylus.

abnormis, see *Megistocrinus abnormis*.
ægilops, see *Teleiocrinus ægilops*.
æqualis, see *Batocrinus æqualis*.
æquibrachiatus, see *Batocrinus æquibrachiatus*.
æquibrachiatus var. *alatus*, syn. for *Batocrinus æquibrachiatus*.
agassizi, Troost, 1850, Catal. Not defined.
althea, see *Teleiocrinus althea*.
amplus, see *Saccocrinus amplus*.
andrewsianus, see *Batocrinus andrewsanus*.
araneolus, see *Steganocrinus araneolus*.
arnoldi, Wachsmuth & Springer, (in press,) *Geo. Sur. Ill.*, vol. 8, p. 168, Kinderhook Gr.
asterias, McChesney, 1860, Desc. New. Pal. Foss. Syn. for *Batocrinus verrucosus*.
asteriscus, see *Batocrinus asteriscus*.
biturbinatus, see *Batocrinus biturbinatus*.
brevicornis, see *Megistocrinus brevicornis*.
brevis, see *Agaricocrinus brevis*.
brontes, Hall, 1860, Sup. to *Geo. Sur. Iowa*, p. 47, and *Geo. Sur. Ill.*, vol. 5, p. 341, Warsaw Gr.
cælatus, Hall, 1858, *Geo. Sur. Iowa*, p. 585, and *Geo. Sur. Ill.*, vol. 5, p. 341, Burlington Gr.
calyculoides, see *Eretmocrinus calyculoides*.
calyculus, see *Batocrinus calyculus*.
calypso, see *Gennæocrinus calypso*.
cassedayi, see *Gennæocrinus cassedayi*.
carica, see *Eretmocrinus carica*.
caroli, see *Batocrinus caroli*.
cauliculus, see *Gennæocrinus cauliculus*.
chloris, Hall, 1861, Desc. New Crinoidea, syn. for *A. tenuisculptus*.
christyi, Shumard, 1855, see *Batocrinus christyi*.
christyi, Hall, see *Saccocrinus christyi*.
clarus, Hall, 1861, Desc. New Crinoidea, p. 2, and *Geo. Sur. Ill.*, vol. 5, p. 341, Burlington Gr.
clavigerus, see *Batocrinus clavigerus*.
clio, see *Eretmocrinus clio*.
clivosus, see *Teleiocrinus clivosus*.
clælia, see *Eretmocrinus clælia*.
clypeatus, see *Batocrinus clypeatus*.
concaucus, see *Dorycrinus concaucus*.

concinus, see *Steganocrinus concinns*.
copei, see *Physetocrinus copei*.
corbulis, see *Eretmocrinus corbulis*.
coreyi, Lyon & Casseday, 1859, *Am. Jour. Sci. and Arts*, 2d ser., vol. 29, p. 76, Keokuk Gr.
corniculum, Hall, 1858, *Geo. Rep. Iowa*, p. 566, Burlington Gr. Wachsmuth says it is a syn. for *Agaricocrinus brevis*.
cornigerus, Hall, see *Dorycrinus cornigerus*.
cornigerus, Lyon & Casseday, see *Gennæocrinus cornigerus*.
cornutus, Troost, 1850, Catal. Not defined.

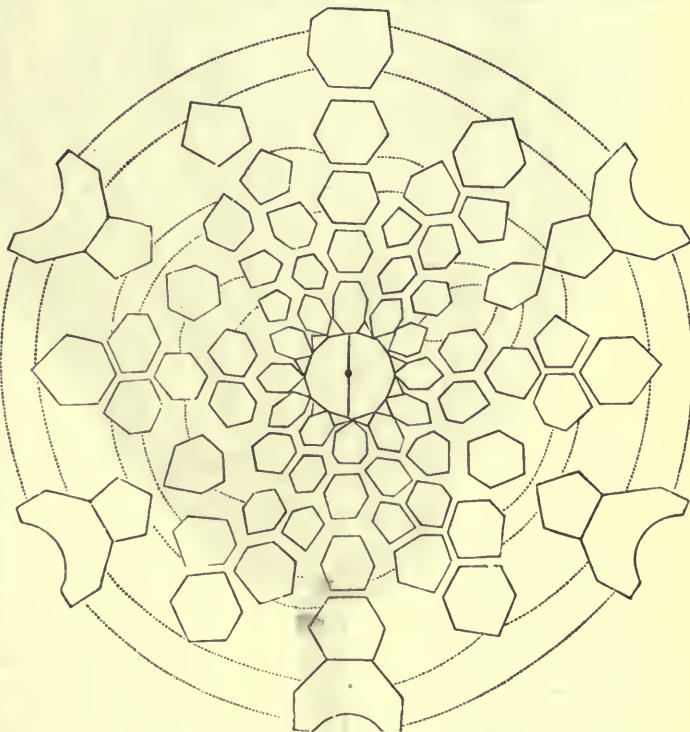


FIG. 231.—*Acrocrinus wortheni*; diagram.

coronatus, see *Eretmocrinus coronatus*.
dalyanus, S. A. Miller, 1881, *Jour. Cin. Soc. Nat. Hist.*, vol. 4, p. 309, Burlington Gr.
daphne, Hall, 1864, 17th Rep. N. Y. St. Mus. Nat. Hist., p. 52, and Ohio Pal., vol. 2, p. 162, Waverly Gr.
decornis, see *Dorycrinus decornis*.
delicatus, Meek & Worthen; the young of *Teleiocrinus umbrosus*.
desideratus, Hall, syn. for *Dorycrinus missouriensis*.
discoideus, see *Batocrinus discoideus*.
divaricatus, Hall, syn. for *Dorycrinus cornigerus*.
divergens, see *Amphoracrinus divergens*.
dodecadactylus, see *Batocrinus dodecadactylus*.

doris, see *Batocrinus doris*.
erodus, see *Teleiocrinus erodus*.
eryx, Hall, 1861, Desc. New Crinoidea, p. 12, Burlington Gr.
eucharis, see *Gennæocrinus eucharis*.
evansi, see *Megistocrinus evansi*.
excerptus, Hall, 1861, Desc. New Cri-

Foss., p. 24, and Trans. Chi. Acad. Sci., p. 17, Burlington Gr.
icosidactylus, see *Batocrinus icosidactylus*.
indianensis, see *Batocrinus indianensis*.
inflatus, see *Amphoracrinus inflatus*.
infrequens, Hall, 1861, Desc. New Crinoidea, p. 14, Burlington Gr.



FIG. 232.—*Actinocrinus arnoldi*.

noidea, p. 3, and Geo. Sur. Ill., vol. 5, p. 341, Burlington Gr.
fibula, Troost, 1850, Catal. Not defined.
fuscillus, see *Agaricocrinus fuscillus*.
fosteri, McChesney, 1860, Desc. New Pal. Foss., p. 19, and Trans. Chi. Acad. Sci., p. 14, Burlington Gr.
formosus, see *Batocrinus formosus*.
gemmiformis, see *Eretmocrinus gemmiformis*.
gibbosus, Troost, 1850. Not defined.
glans, Hall, 1860, Sup. to Geo. Sur. Iowa, p. 16, Burlington Gr.
glyptus, see *Strotocrinus glyptus*.
gouldi, see *Dorycrinus gouldi*.
hageri, see *Batocrinus hageri*.
helice, see *Agaricocrinus helice*.
helice var. eris, see *Agaricocrinus eris*.
humboldti, Troost. Not defined.
hurdanus, McChesney, 1860, New Pal.

inornatus, see *Batocrinus inornatus*.
insculptus, see *Teleiocrinus insculptus*.
irregularis, see *Batocrinus irregularis*.
jugosus, Hall, 1860, Supp. Geo. Sur. Iowa, p. 49, Keokuk Gr.
kentuckiensis, Shumard, syn. for *Gennæocrinus cornigerus*.
konincki, see *Eretmocrinus konincki*.
lagna, Hall, 1861, Desc. New Crinoidea, p. 13, Burlington Gr.
lagunculus, see *Batocrinus lagunculus*.
laura, see *Batocrinus laura*.
lepidus, see *Batocrinus lepidus*.
leucosia, see *Eretmocrinus leucosia*.
limabrachiatus, Hall, 1861, Desc. New Crinoidea, p. 2, and Bost. Jour. Nat. Hist., p. 268, Burlington Gr.
liratus, see *Teleiocrinus liratus*.
lobatus, Hall, 1860, Supp. Geo. Sur. Iowa, p. 51, Keokuk Gr.
locellus, Hall, 1861, Desc. New Crinoidea, p. 15, Burlington Gr.
longirostris, see *Batocrinus longirostris*.
longus, Meek & Worthen, Proc. Acad. Nat. Sci. Phil., p. 156, and Geo. Sur. Ill., vol. 5, p. 345, Burlington Gr.
lowii, Hall, 1858, Geo. Sur. Iowa, p. 611, Keokuk Gr.
lucina, Hall, 1861, Desc. New Crinoidea, p. 11, Burlington Gr.
matuta, see *Eretmocrinus matuta*.

matula var. *attenuatus*, see *Eretmocrinus attenuatus*.

meekei, see *Macrostylocrinus meeki*.

minor, Hall, 1858, Geo. Rep. Iowa, p. 573, Burlington Gr.

mississippiensis, see *Dorycrinus mississippiensis*.

mississippiensis var. *spiniger*, see *Dorycrinus mississippiensis* var. *spiniger*.

missouriensis, see *Dorycrinus missouriensis*.

moniliformis, Miller, cited by Troost. Not American.

mortoni, Troost, 1850. Not defined.

multibrachiatus, Hall, 1858, Geo. Rep. Iowa, p. 580, Burlington Gr.

multibrachiatus var. *echinatus*, Hall, 1861, Desc. New Crinoidea, p. 10, Warsaw Gr.

multicornis, see *Centrocrinus multicornis*.

mundulus, see *Batocrinus mundulus*.

multiradiatus, Shumard, 1857, Trans. St. Louis Acad. Sci., p. 75, and Geo. Rep. Iowa, p. 579, Burlington Gr.

nashvillæ, see *Batocrinus nashvillæ*.

nashvillæ var. *subtractus*, see *Batocrinus nashvillæ* var. *subtractus*.

novobrachiatus, Wachsmuth & Springer, (in press,) Geo. Sur. Ill., vol. 8, p. 165, Kinderhook Gr.

nyssa, see *Gennæocrinus nyssa*.

oblatum, see *Batocrinus oblatum*.

obpyramidalis, see *Melocrinus obpyramidalis*.

olla, McCoy, 1849. Not American.

olliculus, syn. for *Megistocrinus whitii*.

opuseulum, Hall, 1861, Bost. Jour. Nat. Hist., p. 264, Burlington Gr.

ornatissimus, Wachsmuth & Springer, (in press), Geo. Sur. Ill., vol. 8, p. 163, Kinderhook Gr.

ornatus, see *Physetocrinus ornatus*.

ovatum, Hall, 1861, Desc. New Crinoidea, p. 19, Burlington Gr.

papillatus, see *Batocrinus papillatus*.

parvus, see *Dorycrinus parvus*.

pendens, see *Dorycrinus pendens*.

penicillus, Meek & Worthen, 1869, Proc. Acad. Nat. Sci. Phil., p. 155, and Geo. Sur. Ill., vol. 5, p. 342, Burlington Gr.

pentagonus, see *Steganocrinus pentagonus*.

pentaspinus, see *Centrocrinus pentaspinus*.

pernodosus, Hall, 1858, Geo. Rep. Iowa, p. 608, Keokuk Gr.

perumbrosus, see *Strotocrinus perumbrosus*.

pistilliformis, see *Batocrinus pistilliformis*.

pistillus, see *Batocrinus pistillus*.

planobasalis, see *Amphoracrinus planobasalis*.

planodiscus, see *Batocrinus planodiscus*.

plumosus, Hall, 1843, Geo. Rep. 4th Dist. N. Y., p. 72, and Pal. N. Y., vol. 2, p. 180, Clinton Gr. Not an *Actinocrinus*, and the fragments too poor for determination.

poecilum, see *Gennæocrinus poecilum*.

polydactylus, see *Mariacrinus polydactylus*.

præcursor, see *Dorycrinus præcursor*.

proboscivalis, Hall, 1858, Geo. Rep. Iowa, p. 584, Burlington Gr.

pyriformis, see *Batocrinus pyriformis*.

pyriformis, var. *rudis*, Meek & Worthen, see *Batocrinus pistilliformis*.

pyramidatus, see *Agaricocrinus pyramidatus*.

quadriscopinus, see *Amphoracrinus quadriscopinus*.

quaternarius, Hall, 1860, Supp. Geo. Rep. Iowa, p. 22, Burlington Gr.

quaternarius var. *spiniferus*, Hall, 1861, Desc. New Crinoidea, p. 11, Burlington Gr.

quinquelobus, see *Dorycrinus quinquelobus*.

ramulosus, see *Eretmocrinus ramulosus*.

regalis, see *Strotocrinus regalis*.

remibrachiatus, see *Eretmocrinus remibrachiatus*.

reticulatus, see *Physetocrinus reticulatus*.

rotundus, see *Batocrinus rotundus*.

rudis, see *Teleiocrinus rudis*.

rusticus, Hall, 1861, Desc. New Crinoidea, p. 2, syn. for *A. scitulus*.



FIG. 234.—*Actinocrinus proboscivalis*.

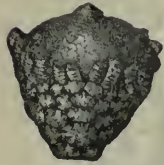


FIG. 233.—*Actinocrinus ornatissimus*.

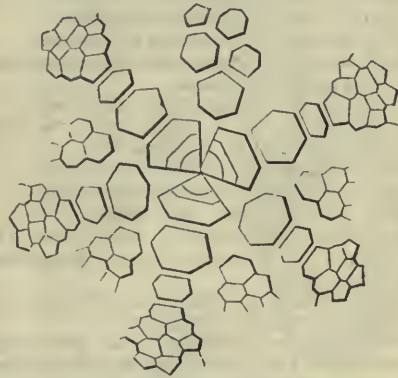


FIG. 235.—*Actinocrinus scitulus*. Diagram x 2.

scitulus, Meek & Worthen, 1860, Proc. Acad. Nat. Sci. Phil., p. 386, and Geo. Sur. Ill., vol. 2, p. 202, Burlington Gr.

sculptus, see *Steganocrinus sculptus*.

securis, Hall, 1861, Desc. New Crinoidea, p. 14, Burlington Gr.

semiradiatus, see *Saccocrinus semiradiatus*.

senarius, see *Physetocrinus senarius*.

sexarmatus, Hall, 1860, Supp. Geo. Rep. Iowa, p. 21, Burlington Gr.

sillimani, Meek & Worthen, syn. for *A. scitulus*.

similis, see *Batocrinus similis*.

sinuosus, see *Batocrinus sinuosus*.

speciosus, Meek & Worthen, syn. for *Strotocrinus regalis*.

spinobrachiatus, see *Amphoracrinus spinobrachiatus*.

spinotentaculus, Hall, 1860, Supp. Geo.

Rep. Iowa, p. 86, Burlington Gr.

spinulosus, see *Dorycrinus spinulosus*.

steropes, see *Batocrinus steropes*.

subaculeatus, see *Dorycrinus subaculeatus*,

subæqualis, see *Batocrinus subæqualis*.

subturbinatus, see *Dorycrinus subturbinatus*.

subumbrosus, Hall, syn. for *Teleiocrinus liratus*.

subventricosus, see *Physetocrinus subventricosus*.

superlatus, see *Megistocrinus superlatus*.

symmetricus, see *Dorycrinus symmetricus*.

tenuidiscus, Hall, 1861, Desc. New Crinoidea, p. 14, Burlington Gr.

tenuiradiatus, Hall, 1847, see *Palæocystites tenuiradiatus*.

tenuiradiatus, Hall, 1861, see *Teleiocrinus tenuiradiatus*.

tenuisculptus, McChesney, 1860, Desc. New Pal. Foss., p. 15, and Trans. Chi.

Acad. Sci., pl. 5, fig. 11, Burlington Gr.

thalia, Hall, 1861, Desc. New Crinoidea, p. 13, Burlington Gr.

themis, Hall, 1861, Desc. New Crinoidea, p. 11, Burlington Gr.

thetis, Hall, 1861, Desc. New Crinoidea, p. 11, Burlington Gr.

thoas, Hall, syn. for *A. reticulatus*.

tholus, syn. for *A. glans*.

tricornis, see *Dorycrinus tricornis*.

trinodus, see *Dorycrinus trinodus*.

turbinatus, see *Batocrinus turbinatus*.

turbinatus var. *elegans*, see *Batocrinus turbinatus* var. *elegans*.

umbrosus, see *Teleiocrinus umbrosus*.

unicarinatus, Hall, 1860, Supp. to Geo. Sur. Iowa, p. 48, Keokuk Gr.

unicornis, see *Dorycrinus unicornis*.

unispinus, see *Dorycrinus unispinus*.

urna, Troost, 1850. Not defined.

urniformis, McChesney, 1860, New Pal. Foss., p. 23, syn. for *Eretmocrinus konineki*.

validus, Meek & Worthen, 1860, syn. for *Steganocrinus concinnus*.

ventricosus, see *Physetocrinus ventricosus*.

ventricosus var. *cancellatus*, see *Physetocrinus ventricosus* var. *cancellatus*.

ventricosus var. *internodus*, see *Physetocrinus ventricosus* var. *internodus*.

verneuli, see *Melocrinus verneuli*.

verneuillianus, see *Eretmocrinus verneuillianus*.

verrucosus, Hall, 1858, Geo. Rep. Iowa, p. 578, Burlington Gr.

viaticus, White, 1874, Rep. Invert. Foss., p. 16, and Geo. Sur. W. 100th Merid., vol. 4, p. 82, Subcarboniferous.

viminalis, see *Amphoraacrinus viminalis*.

wachsmuthi, White, 1862, Proc. Bost. Soc. Nat. Hist., vol. 9, p. 17, syn. for *A. scitulus*.

wachsmuthi, White, 1880, see *Batocrinus wachsmuthi*.

whitfieldi, see *Saccocrinus whitfieldi*.

whitii, see *Megistocrinus whitii*.

yandelli, see *Batocrinus yandelli*.

AGARICOCRINUS, Troost, 1850, Catal. in Proc. Am. Ass'n, and Hall in Geo. Sur. Iowa, p. 560. [Ety. *Agaricus*, mushroom; *krinon*, lily.] The form of the calyx is that of an inverted basin or mushroom; plates smooth; dome composed of large nodose plates and smaller convex ones, the central plate being the largest in the body; basals 3, small; primary radials 3x5; secondary radials 1 or 2x10, which are succeeded by shorter arm-plates; regular interradials 3; azygous plates 4 to 7, or more; aperture, at the upper part, directed laterally; arms long, constructed of two rows of plates bearing pinnule; columns round. Type *A. americanus*.

americanus, Roemer, 1854, (*Amphoraacrinus americanus*.) Bronn's Leth. Geog., vol. 2, p. 250, and Geo. Sur. Iowa, p. 617, Keokuk Gr.

bellitrema, Hall, 1861, Bost. Jour. Nat. Hist., p. 281, Burlington Gr. Wachsmuth says it is a syn. for *A. ornotrema*.

brevis, Hall, 1858, (*Actinocrinus brevis*.) Geo. Sur. Iowa, p. 567, Burlington Gr.

bullatus, Hall, 1858, Geo. Sur. Iowa, p. 562, Burlington Gr. Wachsmuth says it is a syn. for *A. americanus*.

convexus, Hall, 1860, (*A. pentagonus* var. *convexus*.) Supp. to Geo. Sur. Iowa, p. 58, Burlington Gr.

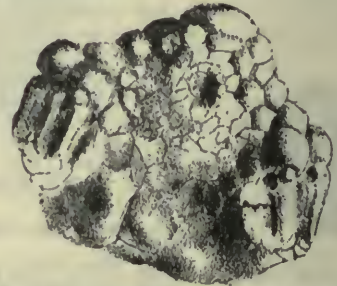


FIG. 236.—*Agaricocrinus crassus*, azygous view of calyx.

corrugatus, Hall, 1861, Desc. New Spec. Crin., p. 4, and Bost. Jour. Nat. Hist., p. 283, Burlington Gr. Wachsmuth says it is a syn. for *A. pyramidatus* founded upon a mature specimen.

crassus, Wetherby, 1881, Jour. Cin. Soc. Nat. Hist., vol. 4, p. 178, Keokuk Gr.

elegans, Wetherby, 1881, Jour. Cin. Soc. Nat. Hist., vol. 4, p. 179, Keokuk Gr.

eris, Hall, 1864, (*Actinocrinus helice* var. *eris*.) 17th Rep. N. Y. St. Mus. Nat. Hist., p. 53,

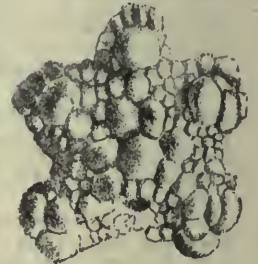


FIG. 237.—*Agaricocrinus elegans*, view of the vault.

and Ohio Pal., vol. 2, p. 164, Waverly Gr.



FIG. 238.—Agaricocrinus elegans, basal view.

New Spec. Crin., p. 2, and Bost. Jour. Nat. Hist., p. 272, Burlington Gr.

geometricus, Hall, 1860, Supp. to Geo. Sur. Iowa, p. 56, Burlington Gr.

gracilis, Meek & Worthen, 1861, Proc. Acad. Nat. Sci. Phil., p. 135, Burlington Gr.

helice, Hall, 1864, (Actinocrinus helice,) 17th Rep. N. Y. St. Mus. Nat. Hist., p. 53, and Ohio Pal., vol. 2, p. 163, Waverly Gr.

inflatus, Hall, 1861, Desc. New Crinoidea, p. 4, and Bost. Jour. Nat. Hist., p. 284, Burlington Gr.

macadamisi, Worthen, (in press,) Geo. Sur. Ill., vol. 8, p. 94, Keokuk Gr.

nodosus, Meek & Worthen, 1869, Proc. Acad. Nat. Sci. Phil., p. 167, and Geo. Sur. Ill., vol. 5, p. 387, Burlington Gr. Wachsmuth says it is a syn. for A. americanus.

nodulosus, Worthen, (in press,) Geo. Sur. Ill., vol. 8, p. 94, Keokuk Gr.

ornotrema, Hall, 1861, Desc. New Crinoidea, p. 3, Burlington Gr.

pentagonus, Hall, 1860, Supp. Geo. Rep. Iowa, p. 57, Burlington Gr.

pentagonus var. convexus, see A. convexus. planoconvexus, Hall, 1861, Desc. New Crinoidea, p. 3, and Bost. Jour. Nat. Hist., p. 280, Burlington Gr.

pyramidatus, Hall, 1858, (Actinocrinus pyramidatus,) Geo. Rep. Iowa, p. 565, Burlington Gr.

springeri, White, 1882, 11th Rep. Geo. and Nat. Hist. Indiana, p. 363, Keokuk Gr.

stellatus, Hall, 1858, Geo. Rep. Iowa, p. 564, Burlington Gr.

tuberosus, Troost, 1850, Catal. Hall, 1858, Geo. Rep. Iowa, p. 617, syn. for A. americanus.

whitfieldi, Hall, 1858, Geo. Rep. Iowa, p. 621, Keokuk Gr.

wortheni, Hall, 1858, Geo. Rep. Iowa, p. 619, Keokuk Gr.

excavatus, Hall, 1861, (Actinocrinus excavatus,) Desc. New Spec. Crin., p. 3, and Bost. Jour. Nat. Hist., p. 282, Burlington Gr.

Wachsmuth says it is a syn. for A. americanus.

fiscellus, Hall, 1861, (Actinocrinus fiscellus,) Desc.



FIG. 239.—Agaricocrinus helice.

AGASSIZOCRINUS, Troost, 1850 Mss., Shumard, 1853, Marcy's Rep. Red Riv., and Hall, 1858, Geo. Rep. Iowa, p. 684. [Ety. proper name; *krinon*, lily.] Calyx conical or semielliptical; not ornamental;

basals 5, usually ankylosed, very small inner cavity; subradials 5, thick, usually ankylosed; radials 2x5; arms 10; azygous plates 3 or 4; column evidenced by a small cylindrical tube extending from a minute cicatrix at the center of the basals to the interior of the cup. Type A. dactyliformis.

carbonarius, Worthen, 1873, Geo. Sur. Ill., vol. 5, p. 566, Up. Coal Meas.

chesterensis, Worthen, 1873, Geo. Sur. Ill., vol. 5, p. 558, Kaskaskia Gr.

conicus, Owen & Shumard, 1851, Jour. Acad. Nat. Sci. Phil., 2d. ser., vol. 2, p. 93, and Geo. Sur. Ill., vol. 5, p. 557, Kaskaskia Gr.

constrictus, Hall, 1858, Geo. Rep. Iowa, p. 687, Kaskaskia Gr.

dactyliformis, Troost, 1850, described by Shumard, 1853, Marcy's Rep. Red Riv., p. 199, Kaskaskia Gr.

gibbosus, Hall, 1858, Geo. Rep. Iowa, p. 686, Kaskaskia Gr.

globosus, Worthen, 1873, Geo. Sur. Ill., vol. 5, p. 557, Kaskaskia Gr.

gracilis, Troost, 1850. Not defined.

hemisphericus, Worthen, 1882, Bull. No. 1, Ill. St. Mus. Nat. Hist., p. 37, and Geo. Sur. Ill., vol. 7, p. 316, Kaskaskia Gr.

occidentalis, Owen & Shumard, 1852, (Poteriocrinus occidentalis,) Jour. Acad. Nat. Sci. Phil., vol. 2, p. 92, Kaskaskia Gr.

papillatus, Worthen, 1882, Bull. No. 1, Ill. St. Mus. Nat. Hist., p. 36, and Geo. Sur. Ill., vol. 7, p. 315, Kaskaskia Gr.

pentagonus, Worthen, 1873, Geo. Sur. Ill., vol. 5, p. 556, Kaskaskia Gr.

tumidus, Owen & Shumard, 1852, (Poteriocrinus tumidus,) Jour. Acad. Nat. Sci. Phil., vol. 2, p. 90, Kaskaskia Gr.

AGELACRINUS, Vanuxem, 1842, (Agelacrinites,) Geo. Rep. 3d Dist. N. Y., p. 158. [Ety. *agele*, herd; *krinon*, lily.] A thin, circular, parasitic disk; upper face more or less convex, and composed of thin imbricating plates; ambulacra consist-



FIG. 240.—Agassizocrinus dactyliformis.

ing of a double series of alternating plates, forming convex ridges, constituting part of the upper face, and bearing two or more rows of ambulacral pores; ovarian or anal aperture is situated within the azygous interambulacral area, surrounded by cuneiform plates. Type A. *hamiltonensis*.

billingsi, Chapman, 1860, Can. Jour., vol. 5, p. 358, Trenton Gr.

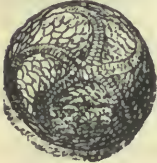


FIG. 241.—*Agelacrinus cincinnatiensis*.

cincinnatiensis, Roemer, 1851, Verh. Naturh. Rhein. Westph., vol. 8, p. 372, and Ohio Pal. vol. 1, p. 55, Hud. Riv. Gr.

dicksoni, Billings, 1857, Rep. of Progr. Geo. Sur. Can., p. 294, and Can. Org. Rem., Dec. 3, p. 84, Trenton Gr.

hamiltonensis, Vanuxem, 1842, Geo. Rep. 3d Dist. N. Y., p. 158, Ham. Gr.

holbrookii, James, 1887, Jour. Cin. Soc. Nat. Hist., vol. 10, p. 25, Hud. Riv. Gr.

kaskaskiensis, see *Echinodiscus kaskaskiensis*.

pileus, Hall, 1866, Adv. sheets, 24th Rep. N. Y. St. Mus. Nat. Hist., p. 214, and Ohio Pal., vol. 1, p. 56, Hud. Riv. Gr.

septembrachiatus, Miller & Dyer, 1878, Jour. Cin. Soc. Nat. Hist., vol. 1, p. 27, Hud. Riv. Gr.

squamosus, Meek & Worthen, 1868, Proc. Acad. Nat. Sci. Phil., p. 357, and Geo. Sur. Ill., vol. 5, p. 573, Keokuk Gr.

stellatus, see *Hemicystites stellatus*.

vorticellatus, Hall, 1866, Adv. sheets, 24th Rep. N. Y. St. Mus. Nat. Hist., p. 215, and Ohio Pal., vol. 1, p. 57, Hud. Riv. Gr.

ALLAGECRINUS, Etheridge & Carpenter, 1881, Ann. and Mag. Nat. Hist., p. 281. [Ety. *allage*, change; *krinon*, lily.] Calyx minute, pyriform, without ornamentation; basals 5, ankylosed; radials 1 x 5; arms 10; interradials none; column round. Type A. *austini*.

carpenteri, Wachsmuth, 1882, Bull. No. 1, Ill. St. Mus. Nat. Hist., p. 40, and Geo. Sur. Ill., vol. 7, p. 341, Kaskaskia Gr.

ALLOCRINUS, Wachsmuth and Springer, (in press,) Geo. Sur. Ill., vol. 8, p. 206. [Ety. *allos*, another; *krinon*, lily.] Calyx small; arms stout; basals 3, small; primary radials 3 x 5, first large, others smaller; secondary radials 2 or 3, rounded, quadrangular; arms composed of transverse plates; interradials two or more deeply impressed; column small; canal pentangular. Type A. *typus*.

typus, Wachsmuth & Springer, (in press,) Geo. Sur. Ill., vol. 8, p. 207, Niagara Gr.

ALLOCYSTITES, n. gen. [Ety. *allos*, another; *kustis*, bladder.] Small, irregularly sub-elliptical, tapering below to a small column; plates polygonal, without definite order of arrangement and of very

unequal size; all the plates poriferous; mouth near the margin of the summit; the plates which form it cover part of the body, and on approaching the orifice curve up so as to form part of the opening. The collector says when found it projected an eighth of an inch, and the plates forming the projection were accidentally broken off. The ambulacral opening is upon the extreme height of the summit, and projects above the body, where it is covered by minute plates forming a pentagonal star. Type A. *hammelli*.

hammelli, n. sp., Niagara Gr. In addition to the characters above ascribed to the genus, the ranges of plates, if in regular series, would form about six series; the first series are ankylosed so that two plates only can be distinguished; in the second range there are seven plates; above this the plates are extremely variable in form and size, no two of them being alike; only four plates are distinguished as forming the mouth, but there is no reasonable doubt there are five, and that one is narrow, and situated between the mouth and ambulacral orifice, as is usual in this family of Cystidians. The projecting mouth-plates and elevated ambulacral opening specially characterize this genus and species. The specific name is in honor of Mr. J. F. Hammell, of Madison, Indiana, who collected it in Jefferson County.



FIG. 242.—*Allocystites hammelli*. Side and summit view.

ALLOPROSALLOCRINUS, Casseday & Lyon, 1860, Proc. Am. Acad. Arts and Sci., vol. 5, p. 29.] Ety. *allos*, inclining first to one side and then to another; *krinon*, lily.] Turbinate; basals 3; primary radials 3 x 5; secondary radials 2 x 10; regular interradials 1; azygous plates 3; vault elevated, bearing a central tube or proboscis; arms 11 to 13; distinguished from *Agaricocrinus* by general form and fewer interradials. Type A. *conicus*.

conicus, Casseday & Lyon, 1860, Proc. Am. Acad. Arts and Sci., vol. 5, p. 29, Warsaw Gr.

euconus, see *Batocrinus euconus*.

depressus, Casseday & Lyon, 1860, Proc. Am. Acad. Arts and Sci., vol. 5, p. 31, Warsaw Gr.

AMPHERISTOCRINUS, Hall, 1879, Desc. New Spec. Foss., p. 11, and 11th Rep. Geo. and Nat. Hist. Indiana, p. 278. [Ety. *ampheristos*, disputed; *krinon*, lily.] Turbinate, base attenuate; azygous area, large; plates 6; basals 3; subradials 5; radials 1x5, with a narrow cicatrix on the middle of the top of each for the attachment of the arms; no regular interradials. Type A. *typus*.



FIG. 243.—*Ampheristocrinus typus*. Basal and side view of calyx.

typus, Hall, 1879, Desc. New Spec. Foss., p. 11, and 11th Rep. Geo. and Nat. Hist. Indiana, p. 278, Niagara Gr.

AMPHORACRINUS, Austin, 1848, Quar. Jour. Geo. Soc. Lond., vol. 4, p. 292, and Geo. Sur. Ill., vol. 5, p. 386. [Ety. *amphora*, cup; *krinon*, lily.] Body short, lobed, dome elevated, with tube or proboscis excentric on the azygous side; basals 3; primary radials 3x5; secondary radials 1x10; arms numerous, variable, composed of a double series of plates; regular interradials 3; azygous interradials, 3 or 4 large ones and a few smaller ones; column round. Type A. *gilbertsoni*.

americanus, see *Agaricocrinus americanus*.

bellatrema, see *Agaricocrinus bellatrema*.

divergens, Hall, 1860, (*Actinocrinus divergens*.) Supp. Geo. Rep. Iowa, p. 36, and Geo. Sur. Ill., vol. 5, p. 388, Burlington Gr.

excavatus, see *Agaricocrinus excavatus*.

inflatus, see *Agaricocrinus inflatus*.

jerseyensis, Worthen, (in press.) Geo. Sur. Ill., vol. 8, p. 96, Kinderhook Gr.

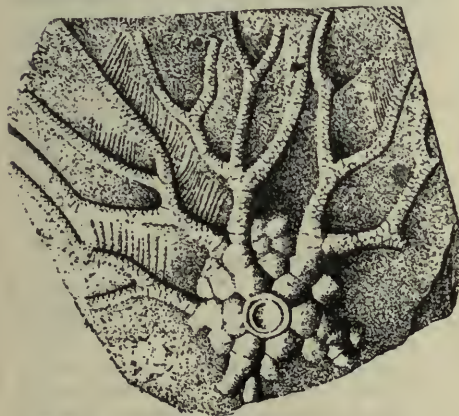


FIG. 244.—*Amphoracrinus viminalis*.

planobasalis, Hall, 1858, (*Actinocrinus planobasalis*.) Geo. Rep. Iowa, p. 19, Burlington Gr. Wachsmuth says it is a syn. for *A. divergens*.

quadrispinus, White, 1862, (*Actinocrinus quadrispinus*.) Proc. Bost. Soc. Nat. Hist., vol. 9, p. 15, Burlington Gr. Wachsmuth says it is a syn. for *A. divergens*.

spinobrachiatus, Hall, 1860, (*Actinocrinus spinobrachiatus*.) Supp. Geo. Rep. Iowa, p. 6, and Geo. Sur. Ill., vol. 5, p. 389, Burlington Gr.

viminalis, Hall, 1864, (*Actinocrinus viminalis*.) 17th Rep. N. Y. St. Mus. Nat. Hist., p. 54, and Ohio Pal., vol. 2, p. 165, Waverly Gr.

AMYGDALOCYSTITES, Billings, 1854, Can. Jour., vol. 2, p. 270, and Can. Org. Rem., Decade 3, p. 63. [Ety. *amygdalos*, almond; *kustis*, bladder.] Body flattened, ovate, covered with nonporiferous plates arranged without order; ambulacral opening at the apex, mouth near by; arms recumbent, composed of a double series of plates; column round. Type A. *florealis*.

florealis, Billings, 1854, Can. Jour., vol. 2, p. 270, and Can. Org. Rem., Decade 3, p. 63, Trenton Gr.

florealis var. *laevis*, W. R. Billings, 1883, Trans. No. 4, Ottawa Field Nat. Club, p. 52, Trenton Gr.

huntingtoni, Wetherby, 1881, Jour. Cin. Soc. Nat. Hist., vol. 4, p. 177, Trenton Gr.

radiatus, Billings, 1854, Can. Jour., vol. 2, p. 271, and Can. Org. Rem., Decade 3, p. 65, Trenton Gr.

tenuistriatus, Billings, 1854, Can. Jour., vol. 2, p. 271, and Can. Org. Rem., Decade 3, p. 64, Trenton Gr.



FIG. 245.—*Amygdalocystites huntingtoni*.

ANCYROCINUS, Hall, 1862, 15th Rep. N. Y. St. Mus. Nat. Hist., p. 89. [Ety. *ankura*, grapnel; *krinon*, lily.] A bulb with lateral ascending processes and a central column. But little is known of this genus. Type A. *bulbosus*.

bulbosus, Hall, 1862, 15th Rep. N. Y. St. Mus. Nat. Hist., p. 90, Ham. Gr.

spinus, Hall, 1862, 15th Rep. N. Y. St. Mus. Nat. Hist., p. 90, Up. Held. Gr.

ANOMALOCRINUS, Meek & Worthen, 1868, Geo. of Ill., vol. 3, p. 327. [Ety. *anomalous*, irregular; *krinon*, lily.] Calyx depressed, irregularly saucer-shaped; basals 5; sometimes a 6th intercalated one; radials 1x3 and 2x2, the last ones truncated in the central part for the free arms, and curving over on the vault on either side, thus widely separating the arms; arms irregular, frequently bifurcating, composed of a single series of plates, round on the exterior; pinnules strong; vault convex

and supposed to possess a tube or proboscis; column large and longitudinally from 5 to 20 partite. Type A. incurvus.

caponiformis, Lyon, 1869, (Ataxocrinus caponiformis,) Trans. Am. Phil. Soc., vol. 13, p. 464, and Jour. Cin. Soc. Nat. Hist., vol. 2, p. 109, Hud. Riv. Gr.

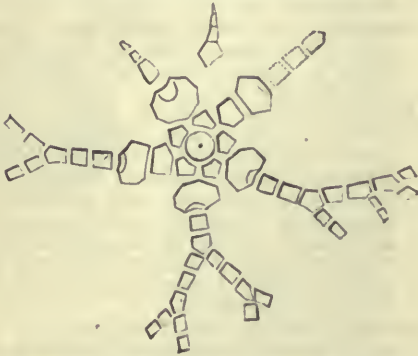


FIG. 246.—*Anomalocrinus incurvus*. Diagram.

incurvus, Meek & Worthen, 1865, (*Heterocrinus incurvus*.) Proc. Acad. Nat. Sci. Phil., p. 148, and Geo. Sur. Ill., vol. 3, p. 327, Hud. Riv. Gr.

ANOMALOCYSTITES, Hall, 1859, Pal. N. Y. vol. 3, p. 132. [Ety. *anomalos*, irregular; *kystis*, bladder.] Somewhat semielliptical, sides unequal, vertical outline oval or ovoid; first series of plates 3 on the convex and 2 on the flat or concave side; second series 4 or 5 on the convex side and 2 on the concave side; third series 4 on the convex and 1 on the other; succeeding series have smaller plates and the apex is unknown; column large at the body and very rapidly tapering; no pores or pectinated rhombs. Type A. *cornutus*. Wetherby supposed this to be a Crustacean and gave it the name of *Enoploura*.



FIG. 247.—*Anomalocystites balanoides*. Convex and flattened sides.

balanoides, Meek, 1872, Am. Jour. Sci., 3d ser., vol. 3, p. 423, and Ohio Pal., vol. 1, p. 41, Hud. Riv. Gr.
cornutus, Hall, 1859, Pal. N. Y., vol. 3, p. 133, Low, Held. Gr.
disparilis, Hall, 1859, Pal. N. Y., vol. 3, p. 145, Oriskany sandstone.
huxleyi, Billings, 1858, (*Ateleocystites huxleyi*.) Can. Org. Rem., Decade 3, p. 72, Trenton Gr.

Anomaloides, Ulrich, 1878, Jour. Cin. Soc. Nat. Hist., vol. 1, p. 92. A word constructed of adjectives making it meaningless, contrary to the rules of nomenclature, and the attempt to found a genus was made on a fossil fragment not understood.

reticulatus, Ulrich, 1878, Jour. Cin. Soc. Nat. Hist., vol. 1, p. 92, Hud. Riv. Gr. A fossil fragment not understood.

APIOCYSTITES, Forbes, 1848, Mem. Geo. Sur. Great Brit., vol. 2, p. 502. [Ety. *apion*, pear; *kystis*, bladder.] Body ovoid, or oblong oval, angular and covered by four series of plates; first series has 4 plates; second series 5; third series 5 or 6; fourth series 5 or more; arms 4, recumbent and filling shallow grooves at the angles of the body, column rapidly tapering; ovarian aperture near the summit, on the anterior side; all the plates bearing calcine pores; a pectinated rhomb upon each side in the 3d and 4th series, and one on the anterior side in the 2d series, but these may be variable. Type A. *pentremittoides*.

canadensis, Billings, 1866, Catal. Sil. Foss. Antic., p. 90, Niagara Gr.

elegans, Hall, 1852, Pal. N. Y., vol. 2, p. 243, Niagara Gr.

huronensis, Billings, 1866, Catal. Sil. Foss. Antic., p. 91, Niagara Gr.

imago, Hall, 1867, 20th Rep. N. Y. St. Mus. Nat. Hist., p. 358, Niagara Gr.

tecumseth, Billings, 1866, Catal. Sil. Foss. Antic., p. 91, Niagara Gr.

ARACHNOCRINUS, Meek & Worthen, 1866, Geo. Sur. Ill., vol. 2, p. 177. [Ety. *arachne*, spider; *krinon*, lily.] Calyx small, resembling *Cyathocrinus*, but more depressed; basals 5; subradials 5; radials 3x5; arms long, robust, spreading, furrow deep; no pinnules; azygous plate supporting a lateral tube; column round. Type A. *bulbosus*.

bulbosus, Hall, 1860, (*Cyathocrinus bulbosus*.) 15th Rep. N. Y. St. Mus. Nat. Hist., p. 123, Up. Held. Gr.

extensus, Wachsmuth & Springer, 1879, Revis. Palaeocrinoidea, p. 93, Ham. Gr.

knappi, Wachsmuth & Springer, 1879, Revis. Palaeocrinoidea, p. 93, Ham. Gr.

pisiformis, Roemer, 1860, (*Poteriocrinus pisiformis*.) Sil. Fauna W. Tenn., p. 54, Niagara Gr.

Wachsmuth says it is a *Lecanocrinus*.

ARCHAEOCIDARIS, McCoy, 1844, Carb. Foss. Ireland, p. 173. [Ety. *archaios*, ancient; *cidaris*, turban.] Spherical; ambulacra narrow, each composed of two ranges of plates, with two pores in each plate; interambulacral plates large, thin, each with a large, perforated, central tubercle, surrounded, at its base, by a smooth ring, and rounded, at the base, for the artic-



FIG. 248. *Arachnocrinus pisiformis*.

ARCHAEOCIDARIS, McCoy, 1844, Carb. Foss. Ireland, p. 173. [Ety. *archaios*, ancient; *cidaris*, turban.] Spherical; ambulacra narrow, each composed of two ranges of plates, with two pores in each plate; interambulacral plates large, thin, each with a large, perforated, central tubercle, surrounded, at its base, by a smooth ring, and rounded, at the base, for the artic-

ulation of a primary spine, and the whole surrounded by smaller tubercles for the articulation of secondary spines; mouth surrounded by numerous imbricating plates; jaws strong with mesial suture; primary spines large, variously ornamented. Type *A. urii*.

aculeata, Shumard, 1858, Trans. St. Louis Acad. Sci., vol. 1, p. 223, Permian Gr.

agassizi, Hall, 1858, Geo. Rep. Iowa, p. 698, Burlington Gr.
biangulata, Shumard, 1858, Trans. St. Louis Acad. Sci., vol. 1, p. 224, Coal Meas.

cratis, White, 1876, Geol. of Uinta Mountains, p. 109, and Cont. to Pal., No. 6, p. 130, Lower Aubrey Gr.

dininni, White, 1880, Proc. U. S. Nat. Mus., vol. 2, p. 260, and Cont. to Pal.,

No. 6, p. 131, Up. Coal Meas.
edgarensis, Worthen & Miller, 1883, Geo. Sur. Ill., vol. 7, p. 337, Up. Coal Meas.

gracilis, Newberry, 1861, Ives Col. Ex. Ex., p. 117, Up. Carb.

illinoisensis, Worthen & Miller, 1883, Geo. Sur. Ill., vol. 7, p. 338, St. Louis Gr.

keokuk, Hall, 1858, Geo. Rep. Iowa, p. 699, Keokuk Gr.

longispina, Newberry, 1861, Ives Col. Ex. Ex., p. 116, Up. Carb.

megastylus, Shumard, 1858, Trans. St. Louis Acad. Sci., vol. 1, p. 225, Up. Coal Meas.

mucronata, Meek & Worthen, 1860, Proc. Acad. Nat. Sci. Phil., p. 395, and Geo. Sur. Ill., vol. 2, p. 295, Kaskaskia Gr.

newberryi, Hambach, 1884, Trans. St. Louis Acad. Sci., vol. 4, p. 548, Kaskaskia Gr.

norwoodi, Hall, 1858, Geo. Rep. Iowa, p. 701, Kaskaskia Gr.

ornata, Newberry, 1861, Ives Col. Ex. Ex., p. 116, Up. Carb.

shumardana, Hall, 1858, Geo. Rep. Iowa, p. 699, Warsaw Gr.

spinoclavata, Worthen & Miller, 1883, Geo. Sur. Ill., vol. 7, p. 337, Coal Meas.

triplex, White, 1882, Rep. Carb. Invert. Foss. New Mex., p. xxii, Coal Meas.

triserrata, Meek, 1872, Pal. E. Neb., p. 151, Up. Coal Meas.

trudifera, White, 1874, Rep. Invert. Foss., p. 17, and Geo. Sur. W. 100th Mer., vol. 4, p. 104, Carb.

verneuiliana, Swallow, 1858, Trans. St. Louis Acad. Sci. This name was pre-occupied by King. The species is *A. aculeata*.

wortheni, Hall, 1858, Geo. Rep. Iowa, p. 700, St. Louis Gr.

ARCHÆOCRINUS, Wachsmuth & Springer, 1881, Proc. Acad. Nat. Sci. and Rev. Palæocrinoida, p. 189. [Ety. *archaios*, ancient; *krinon*, lily.] Basals 5; sub-radials 5; primary radials 3 x 5; secondary radials 3 or 4 x 10; median line of radial plates keeled as in *Glyptocrinus*; interradial areas wide; arms composed of a double series of plates; column round. Type *A. lacunosus*.

desideratus, Billings, 1885, Trans. Ottawa Field Nat. Club, p. 248, Trenton Gr.

lacunosus, Billings, 1857, (Glyptocrinus lacunosus,) Rep. of Prog. Geo. Sur. Can., p. 261, and Org. Rem., Decade 4, p. 61, Trenton Gr.

marginatus, Billings, 1857, (Glyptocrinus marginatus,) Rep. of Prog. Geo. Sur. Can., p. 260, and Org. Rem., Decade 4, p. 59, Trenton Gr.

microbasalis, Billings, 1857, (Rhodocrinus microbasalis,) Rep. of Progr. Geo. Sur. Can., p. 264, and Org. Rem., Decade 4, p. 63, Trenton Gr.

pyriformis, Billings, 1857, (Rhodocrinus pyriformis,) Rep. of Prog. Geo. Sur. Can., p. 262, and Org. Rem., Decade 4, p. 61, Trenton Gr.



FIG. 250.—*Archæocrinus sculptus*.

sculptus, S. A. Miller, 1882, Jour. Cin. Soc. Nat. Hist., vol. 5, p. 83 and 117, Trenton Gr.

ARTHRA-CANTHA, Williams, 1883, Proc. Am. Phil. Soc., p. 84. [Ety. *arthron*, joint;

akantha, spine.] Calyx bowl-shaped; plates of body and arms covered with spine-bearing tubercles; basals 3; primary radials 3 x 5, the lower one large, the others small; an azygous interradial as large as the primary radials rests upon the basals, and is followed by numerous small plates; regular interradials small; arms 10, bearing pinules; column round. Type *A. ithacensis*.

carpenteri, Hinde, 1885, (Hystricrinus carpenteri,) Ann. and Mag. Nat. Hist., p. 162, Ham. Gr. Probably a syn. for *A. punctobrachiata*.

ithacensis, Williams, 1883, Proc. Am. Phil. Soc., p. 83, Ham. Gr.

punctobrachiata, Williams, 1883, Proc. Am. Phil. Soc., p. 83, Ham. Gr.

ASPIDOCRINUS, Hall, 1859, Pal. N. Y., vol. 3, p. 122. [Ety. *aspis*, shield; *krinon*, lily.] Calyx broadly circular, depressed, hemispheric or scutelliform; upper margin plain or plicate exteriorly; articulating edges irregular; point for attachment of column small. Type *A. scutelliformis*.

- callosus, Hall, 1859, Pal. N. Y., vol. 3, p. 123, Low. Held. Gr.
 digitatus, Hall, 1859, Pal. N. Y., vol. 3, p. 123, Low. Held. Gr.
 scutelliformis, Hall, 1859, Pal. N. Y., vol. 3, p. 122, Low. Held. Gr.
Asterias, Lamarck, 1815, Hist. Nat. Anim. sans Vert. Not Palæozoic.
anthonyi, see *Palæaster jamesi*.
antiqua, see *Palæaster antiqua*.
antiquata, see *Palæaster antiquata*.
matutina, see *Palæaster matutina*.
Asterocrinus, Lyon, 1857, Geo. Sur. Ky., vol. 3. This name was preoccupied by Munster. See *Pterotocrinus*.
capitalis, see *Pterotocrinus capitalis*.
coronarius, see *Pterotocrinus coronarius*.
Astrios, Troost, 1850, Catalogue. Not defined.
tennesseæ, Troost, 1850. Not defined.

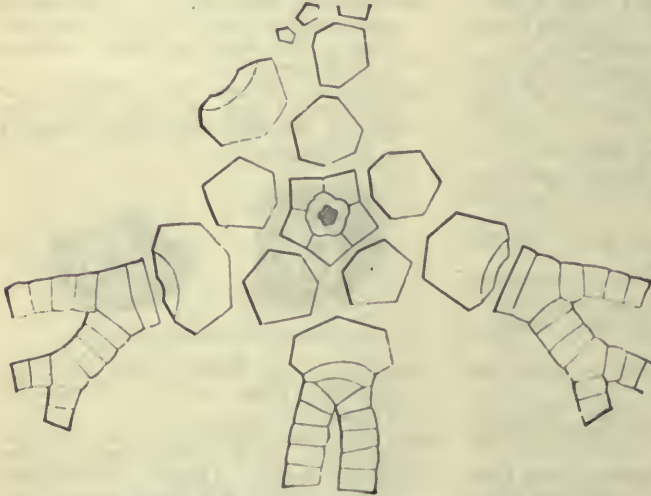


FIG. 251.—*Baryocrinus wachsmuthi*. Diagram.

- Astrocrinites*, Conrad in Catalogue Ann. Geo. Rep., 1840-'41. This name was proposed, but not defined; moreover it was preoccupied.
pachydactylus, see *Mariacrinus pachydactylus*.
Astylocrinus, Roemer, 1854, Leth. Geo., p. 229, syn. for *Agassizocrinus*.
levis, syn. for *Agassizocrinus dactyliformis*.
Ataxocrinus, Lyon, 1869, syn. for *Anomalocrinus*.
caponiformis, see *Anomalocrinus caponiformis*.
Ateleocystites, Billings, 1858, Can. Org. Rem., Decade 3, p. 72, syn. for *Anomalocystites*.
huxleyi, see *Anomalocystites huxleyi*.
 ATELESTOCRINUS, Wachsmuth & Springer, 1886, Rev. Pal., pt. 3, p. 221. [Ety. *atelestos*, incomplete; *krinon*, lily.] Calyx elongate, bell-shaped, sides concave, restricted along the suture between basals and subradials; basals 5; subradials 5; long, narrow, irregular; 3 hexagonal, 2 heptagonal; azygous radial, non-arm bearing, the other four supporting each from 2 to 5 brachials; the eight arms give off branching armlets; azygous plate large, resting upon two subradials; column pentangular. Type A. *delicatus*.
delicatus, Wachsmuth & Springer, 1886, Rev. Pal., pt. 3, p. 223, Burlington Gr.
robustus, Wachsmuth & Springer, 1886, Rev. Pal., pt. 3, p. 223, Burlington Gr. or base of Keokuk Gr.
Balanocrinus, Troost, 1850. This name was preoccupied. See *Lampteroocrinus*.
inflatus, see *Lampteroocrinus inflatus*.
 BARYOCRINUS, Wachsmuth, 1868, Proc. Acad. Nat. Sci., p. 338. [Ety. *barus*, heavy; *krinon*, lily.] Distinguished from *Cyathocrinus* by being more robust, having thicker plates, and a shallower cup; there are usually two azygous plates, while in *Cyathocrinus* there is never more than one; there are never more than two brachials, and these are shorter and wider than in *Cyathocrinus*; the arms are shorter, heavier, and have narrower grooves; the column is stouter; subpentagonal and longitudinally five partite, with a highly organized central canal. Type B. *angulatus*.
angulatus, Meek & Worthen, 1860, (*Cyathocrinus angulatus*.) Proc. Acad. Nat. Sci. Phil., p. 391, and Geo. Sur. Ill., vol. 2, p. 234, Keokuk Gr.
bullatus, Hall, 1858, (*Cyathocrinus bullatus*.) Geo. Sur. Iowa, p. 624, Keokuk Gr.
cornutus, Owen & Shumard, 1850, (*Cyathocrinus cornutus*.) Jour. Acad. Nat. Sci., 2d ser., vol. 2, p. 63, and Geo. Sur. Wis., Iowa, and Minn., p. 591, Burlington Gr.
crassibrachiatus, Hall, 1860, (*Cyathocrinus crassibrachiatus*.) Sup. to Geo. Sur. Iowa, p. 60, Keokuk Gr.
geometricus, Meek & Worthen, 1873, Geo. Sur. Ill., vol. 5, p. 485, Keokuk Gr.
herculeus, Meek & Worthen, 1868, Proc. Acad. Nat. Sci. Phil., p. 341, and Geo. Sur. Ill., vol. 5, p. 485, Keokuk Gr.
hoveyi, Hall, 1861, (*Cyathocrinus hoveyi*.) Desc. New Crin., p. 5, and Geo. Sur. Ill., vol. 5, p. 486, Keokuk Gr.

- kelloggi, White, 1862, (*Cyathocrinus kelloggi*.) Proc. Bost. Soc. Nat. Hist., p. 8, Keokuk Gr.
- magister, Hall, 1858, (*Cyathocrinus magister*.) Geo. Sur. Iowa, p. 628, Keokuk Gr.
- magnificus, Meek & Worthen, 1868, Proc. Acad. Nat. Sci. Phil., p. 340, and Geo. Sur. Ill., vol. 5, p. 483, Keokuk Gr.
- mammatus, Worthen, 1873, Geo. Sur. Ill., vol. 5, p. 486, Keokuk Gr.
- pentagonus, Worthen, 1873, Geo. Sur. Ill., vol. 5, p. 487, Keokuk Gr.
- protuberans, Hall, 1858, (*Cyathocrinus protuberans*.) Geo. Sur. Iowa, p. 626, Keokuk Gr. Wachsmuth says it is a syn. for *B. bullatus*.
- rhombiferus, Owen & Shumard, 1850, (*Potriocrinus rhombiferus*.) Jour. Acad. Nat. Sci. Phil., 2d ser., vol. 2, and Geo. Wis., Iowa, and Minn., p. 595, Burlington Gr.
- sculptilis, Hall, 1860, (*Cyathocrinus sculptilis*.) Supp. Geo. Sur. Iowa, p. 59, Burlington Gr.
- solidus, Hall, 1861, (*Cyathocrinus solidus*.) Desc. New Crin., p. 5, and Bost. Jour. Nat. Hist., vol. 7, p. 293, Burlington Gr.
- spectabilis, Meek & Worthen, 1869, Proc. Acad. Nat. Sci. Phil. and Geo. Sur. Ill., vol. 5, p. 530, St. Louis Gr.
- spurius, Hall, 1858, (*Cyathocrinus spurius*.) Geo. Sur. Iowa, p. 625, Keokuk Gr.
- stellatus, Hall, 1858, (*Cyathocrinus stellatus*.) Geo. Sur. Iowa, p. 623, Keokuk Gr.
- striatus, Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 515, Keokuk Gr.
- thomae, Hall, 1860, (*Cyathocrinus thomae*.) Supp. Geo. Sur. Iowa, p. 61, Warsaw Gr.
- tumidus, Hall, 1858, (*Cyathocrinus tumidus*.) Geo. Sur. Iowa, p. 624, Keokuk Gr.
- wachsmuthi, Meek & Worthen, 1861, (*Cyathocrinus wachsmuthi*.) Proc. Acad. Nat. Sci. Phil., p. 136, and Geo. Sur. Ill., vol. 3, p. 482, Burlington Gr.
- BATOOCRINUS**, Casseday, 1854, Deutsche Zeitschr. d. Geol. Gesellsch., vol. 6, p. 237, and Geo. Sur. Ill., vol. 2, p. 150. [Ety. *batos*, prickly bush; *krinon*, lily.] Calyx biturbinate or globose; basals 3; primary radials 3x5; secondary radials 2x10; tertiary radials 2x2x10; regular interradials 1 to 5; azygous plates 6 to 12 or more; tertiary radials meet so as to cut off the connection of the interradials with the dome plates; vault elevated; tube or proboscis nearly central; arms 18 to 26 or 36 to 40; pinnules; column round, distinguished from *Actinocrinus* by the quadrangular second radial instead of hexagonal; by the number of plates in the interradial areas; by the number of secondary radials; and by having a double series of plates in each arm from the beginning. Type *B. icosidactylus*.
- æqualis*, Hall, 1858, (*Actinocrinus æqualis*.) Geo. Rep. Iowa, p. 592, Burlington Gr.
- æquibrachiatus*, McChesney, 1860, (*Actinocrinus æquibrachiatus*.) New Pal. Foss., p. 25, and Trans. Chi. Acad. Sci., p. 18, Burlington Gr.
- æquibrachiatus*, var. *alatus*, Hall, 1861, (*Actinocrinus æquibrachiatus* var. *alatus*.) Bost. Jour. Nat. Hist., vol. 7, p. 263. Wachsmuth says it is a syn. for *B. æquibrachiatus*.
- andrewsanus*, McChesney, 1859, (*Actinocrinus andrewsanus*.) New Pal. Foss., p. 27, and Trans. Chi. Acad. Sci., p. 20, Burlington Gr.
- asteriscus*, Meek & Worthen, 1860, (*Actinocrinus asteriscus*.) Proc. Acad. Nat. Sci. Phil., p. 385, and Geo. Sur. Ill., vol. 2, p. 207, Burlington Gr.
- biturbinatus*, Hall, 1858, (*Actinocrinus biturbinatus*.) Geo. Sur. Iowa, p. 616, Keokuk Gr.
- calyculus*, Hall, 1860, (*Actinocrinus calyculus*.) Supp. Geo. Sur. Iowa, p. 55, Warsaw Gr.
- calyculus* var. *hardinensis*, Meek & Worthen, 1866, (*Actinocrinus calyculus* var. *hardinensis*.) Proc. Acad. Nat. Sci. Phil., p. 253, Warsaw Gr.
- caroli*, Hall, 1860, (*Actinocrinus caroli*.) Supp. Geo. Rep. Iowa, p. 54, Warsaw Gr.
- cassedayanus*, Meek & Worthen, 1868, Proc. Acad. Nat. Sci. Phil., p. 353, and Geo. Sur. Ill., vol. 5, p. 370, Burlington Gr.
- christyi*, Shumard, 1855, (*Actinocrinus christyi*.) Geo. Sur. Mo., p. 191, Burlington Gr.
- clavigerus*, Hall, 1860, (*Actinocrinus clavigerus*.) Supp. Geo. Sur. Iowa, p. 44, Burlington Gr. Wachsmuth says it is a syn. for *B. similis*.
- clypeatus*, Hall, 1860, (*Actinocrinus clypeatus*.) Supp. Geo. Sur. Iowa, p. 12, and Geo. Sur. Ill., vol. 2, p. 150, Burlington Gr.
- discoideus*, Hall, 1858, (*Actinocrinus discoideus*.) Geo. Rep. Iowa, p. 594, Burlington Gr.
- dodecadactylus*, Meek & Worthen, 1861, (*Actinocrinus dodecadactylus*.) Proc. Acad. Nat. Sci. Phil., p. 13, and Geo. Sur. Ill., vol. 2, p. 205, Burlington Gr.
- doris*, Hall, 1861, (*Actinocrinus doris*.) Desc. New Crinoidea, p. 15, Burlington Gr. Wachsmuth says it is a syn. for *B. æqualis*.
- euconus*, Meek & Worthen, 1860, (*Alloprosallocrinus euconus*.) Proc. Acad. Nat. Sci. Phil., p. 164, Warsaw Gr.



FIG. 252. — *Batoocrinus dodecadactylus*. Diagram.

formosus, Hall, 1860, (*Actinocrinus formosus*.) Supp. to Geo. Sur. Iowa, p. 30, Burlington Gr. Wachsmuth says it is a syn. for *B. discoideus*.

hageri, McChesney, 1860, (*Actinocrinus hageri*.) New Pal. Foss., p. 28, and Trans. Chi. Acad. Sci., p. 21, Burlington Gr.

icosidactylus, Casseday, 1854, (*Actinocrinus icosidactylus*.) Zeitsch. Deutsch. Geol. Gesellsch., vol. 6, p. 238, Warsaw Gr.

indianensis, Casseday & Lyon, 1859, Am. Jour. Sci. and Arts, 2d ser., vol. 29, p. 75, Keokuk Gr.

inornatus, Hall, 1860, (*Actinocrinus inornatus*.) Supp. to Geo. Sur. Iowa, p. 34, Burlington Gr. Wachsmuth says it is a syn. for *B. clypeatus*.

irregularis, Casseday, 1854, Zeitsch. Deutsch. Geol. Gesell., vol. 6, p. 238, Warsaw Gr.

lagunculus, Hall, 1860, (*Actinocrinus lagunculus*.) Supp. to Geo. Sur. Iowa, p. 41, Warsaw Gr.

laura, Hall, 1861, (*Actinocrinus laura*.) Desc. New Crinoidea, p. 15, Burlington Gr.

lepidus, Hall, 1860, (*Actinocrinus lepidus*.) Supp. to Geo. Sur. Iowa, p. 32, Burlington Gr.

longirostris, Hall, 1858, (*Actinocrinus longirostris*.) Geo. Sur. Iowa, p. 589, Burlington Gr.

lovii, Wachsmuth & Springer, 1881, Proc. Acad. Nat. Sci., p. 342, Burlington Gr.



FIG. 253.—*Batocrinus macbridii*.

macbridii, Wachsmuth & Springer, (in press,) Geo. Sur. Ill., vol. 8, p. 172, Kinderhook Gr.

montgomeryensis, Worthen, 1884, Bull. No. 2, Ill. St. Mus. Nat. Hist., p. 35, and Geo.

Sur. Ill., vol. 8, p. 83, Keokuk Gr.

mundulus, Hall, 1860, (*Actinocrinus mundulus*.) Supp. to Geo. Sur. Iowa, p. 39, Warsaw Gr.

nashvillae, Troost, Hall, 1858, (*Actinocrinus nashvillae*.) Geo. Sur. Iowa, p. 609, Keokuk Gr.

nashvillae var. subtractus, White, 1863, (*Actinocrinus nashvillae* var. *subtractus*.) Proc. Bost. Soc. Nat. Hist., vol. 9, p. 16, Keokuk Gr.

neglectus, see *Eretmocrinus neglectus*.

oblatus, Hall, 1860, (*Actinocrinus oblatus*.) Supp. to Geo. Sur. Iowa, p. 38, Burlington Gr. Wachsmuth says it is a syn. for *B. rotundus*.

papillatus, Hall, 1860, (*Actinocrinus papillatus*.) Supp. to Geo. Sur. Iowa, p. 29, Burlington Gr. Wachsmuth says it is a syn. for *B. clypeatus*.

pistilliformis, Meek & Worthen, 1865, Proc. Acad. Nat. Sci. Phil., p. 153, and Geo. Sur. Ill., vol. 2, p. 151 Waverly or Kinderhook Gr.

pistillum, Meek & Worthen, 1865, (*Actinocrinus pistillum*.) Proc. Acad. Nat. Sci. Phil., p. 152, and Geo. Sur. Ill., vol. 3, p. 472, Burlington Gr.

planodiscus, Hall, 1860, (*Actinocrinus planodiscus*.) Supp. to Geo. Sur. Iowa, p. 45, Warsaw Gr.

pyriformis, Shumard, 1855, (*Actinocrinus pyriformis*.) Geo. Sur. Mo., p. 192, Burlington Gr.

quasillus, Meek & Worthen, 1869, Proc. Acad. Nat. Sci. Phil., p. 352, and Geo. Sur. Ill., vol. 5, p. 369, Burlington Gr.

rotundus, Yandell & Shumard, 1855, (*Actinocrinus rotundus*.) Geo. Sur. Mo., p. 191, Burlington Gr.

similis, Hall, 1860, (*Actinocrinus similis*.) Supp. to Geo. Sur. Iowa, p. 40, Keokuk Gr.

sinuosus, Hall, 1860, (*Actinocrinus sinuosus*.) Supp. to Geo. Sur. Iowa, p. 26 Burlington Gr.

steropes, Hall, 1860, (*Actinocrinus steropes*.) Supp. to Geo. Sur. Iowa, p. 43, Keokuk Gr.

subæqualis, McChesney, 1860, (*Actinocrinus subæqualis*.) New Pal. Foss., p. 17, and Trans. Chi. Acad. Sci., p. 13, Burlington Gr. Wachsmuth says it is a syn. for *B. discoideus*.

subconicus, Worthen, 1884, Bull. No. 2, Ill. St. Mus. Nat. Hist., p. 26, and Geo. Sur. Ill., vol. 8, p. 84, Keokuk Gr.

trochiscus, Meek & Worthen, 1868, Proc. Acad. Nat. Sci. Phil., p. 354, and Geo. Sur. Ill., vol. 5, p. 372, Burlington Gr.

turbinatus Hall, 1858, (*Actinocrinus turbinatus*.) Geo. Rep. Iowa, p. 587, Burlington Gr.

turbinatus var. *elegans*, (*Actinocrinus turbinatus* var. *elegans*.) Geo. Rep. Iowa, p. 588, Burlington Gr.

unionensis, Worthen, (in press,) Geo. Sur. Ill., vol. 8, p. 84, St. Louis Gr.

wachsmuthi, White, 1880, (*Actinocrinus wachsmuthi*.) 12th Rep. U. S. Geo. Sur. Terr., p. 162, and 2d Rep. Ind. Geo. Sur., p. 510 Keokuk Gr.

whitii, Wachsmuth & Springer, 1881, Proc. Acad. Nat. Sci., Phil., p. 343, Keokuk Gr.

yandelli, Shumard, 1857, (*Actinocrinus yandelli*.) Trans. St. Louis Acad. Sci., vol. 1, p. 76, and Geo. Sur. Ill., vol. 5, p. 341, Keokuk Gr.

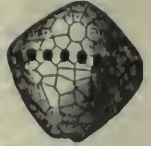


FIG. 254.—*Batocrinus rotundus*.

BELEMNOCRINUS, White, 1862, Proc. Bost. Soc.

Nat. Hist., vol. 9, p. 14.

[Ety. *belemnion*, dart, javelin; *krinon*, lily.]

Basals 5, large, long, narrow and of irregular shape; radials 5; arms 10, with one or two syzygies in each joint; pinnules long, arm-like, and bifurcating; azygous plate rests between radials, and upon one of the basals, and supports a large ventral sac composed of numerous hexagonal plates; column pentagonal, with or without lateral cirrhi. Type B. typus.

florifer, Wachsmuth & Springer, 1877, Am. Jour. Sci. and Arts, 3d ser., vol. 13, p. 256, Burlington Gr.

pourtalesi, Wachsmuth & Springer, 1877, Am. Jour. Sci. and Arts, 3d ser., vol. 13, p. 258, Burlington Gr.

typus, White, 1862, Proc. Bost. Soc. Nat. Hist., vol. 9, p. 14, Burlington Gr.

whitii, Meek & Worthen, 1866, Proc. Acad. Nat. Sci. Phil., p. 251, and Geo. Sur. Ill., vol. 3, p. 463, Burlington Gr.



FIG. 255.—Belemnocrinus typus.

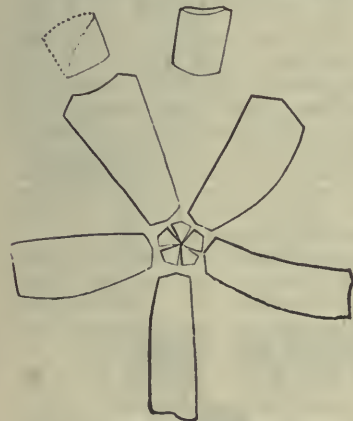


FIG. 256.—Belemnocrinus whitii. Diagram x 2.

BLASTOIDOCRINUS, Billings, 1859, Can. Org. Rem., Decade 4, p. 18. [Ety. *blastos*, a bud; *eidos*, form; *krinon*, lily.] The general form is like a Pentremites; basals do not rest upon the top of the column, but have their inner edges turned upward, and the column passes on into the visceral

cavity; the deltoids occupy the whole space between the pseudambulacra; the orifices unknown; column round. Type B. carcharidens.

carcharidens, Billings, 1859, Geo. Sur. of Can., Decade 4, p. 18, Chazy Gr.

BRACHIOCRINUS, Hall, 1859, Pal. N. Y., vol. 3, p. 118. [Ety. *brachium*, an arm; *krinon*, lily.]

Founded upon arms rounded at the base, composed of single articulating plates having thickened, node-like joints, and bearing pinnules. Type B. nodosarius. nodosarius, Hall, 1859, Pal. N. Y., vol. 3, p. 118, Low. Held. Gr.

BURSACRINUS, Meek & Worthen, 1861, Proc. Acad. Nat. Sci. Phil., p. 136. [Ety. *bursa*, purse; *krinon*, lily.] Calyx somewhat like Graphiocrinus, but arms widely different; basals 5; subradials 5; radials 2 x 5; regular interradials 0; azygous interradial 1; arms wide, flat, jointing below, in compact series, and bifurcating above. Type B. wachsmuthi.

confirmatus, White, 1862, Proc. Bost. Soc. Nat. Hist., vol. 9, p. 11, Burlington Gr. wachsmuthi, Meek & Worthen, 1861, Proc. Acad. Nat. Sci. Phil., p. 137, and Geo. Sur. Ill., vol. 3, p. 479, Burlington Gr.

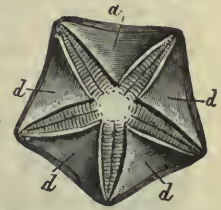


FIG. 257.—Blastoidocrinus carcharidens. a, deltoid plates extending the whole length of the pseudambulacra.

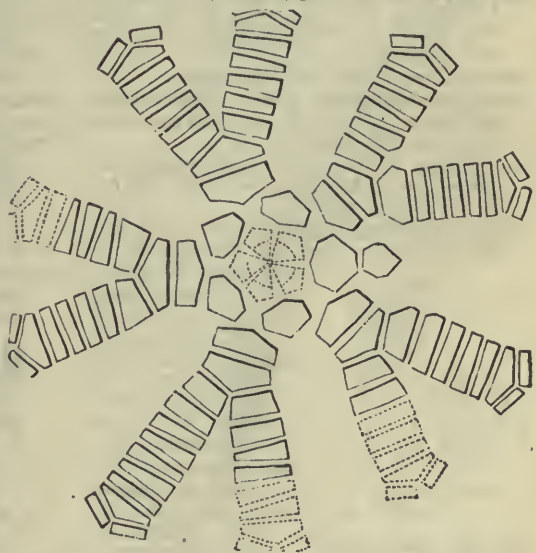


FIG. 258.—Bursacrinus wachsmuthi. Diagram.

Cacabocrinus, Troost, 1850. Never described. The fossils referred to it belong to Dolatocrinus.

Calathocrinus, Hall, 1861. The name was preoccupied by Von Meyer in 1848. See *Teleocrinus*.

CALCEOCRINUS, Hall, 1852, Pal. N. Y., vol. 2, p. 352, and 13th Rep. N. Y. St. Mus. Nat. Hist., p. 122. [Ety. *calceus*, shoe; *krinon*, lily.] Base, a single subtriangular or semioval plate, composed of four anchylosed pieces, with cicatrix, for columnar attachment at lower angle; body, above the base, consisting of 5 or 7 plates, of which two are much the larger; a central, elongated plate separates the two large lateral radial plates, and bears an arm; lateral radial plates, each, support brachials that bear bifurcating arms; azygous side arched and composed of 4 or more plates, after which a free arm arises. Type *C. chrysalis*.

articulosus, Billings, 1859, (*Heterocrinus articulosus*), Can. Org. Rem., Decade 4, p. 51, Trenton Gr.

barrandii, Walcott, 1883, 35th Rep. N. Y. St. Mus. Nat. Hist., p. 212, Trenton Gr. *barrisi*, see *Deltacrinus barrisi*.

bradleyi, see *Deltacrinus bradleyi*.

chrysalis, Hall, 1860, (*Cheirocrinus chrysalis*), 13th Rep. N. Y. St. Mus. Nat. Hist., p. 123, Niagara Gr.

clarus, see *Deltacrinus clarus*.

dactylus, see *Deltacrinus dactylus*.

furcillus, Billings, 1887, Trans. Ottawa Field Nat. Club, vol. 3, p. 51, Trenton Gr.

inaequalis, Billings, 1859, (*Heterocrinus inaequalis*), Can. Org. Rem., Decade 4, p. 51, Trenton Gr.

lamellosus, Hall, 1860, (*Cheirocrinus lamellosus*), 13th Rep. N. Y. St. Mus. Nat. Hist., p. 123, Burlington Gr. Not well defined.

nodosus, see *Deltacrinus nodosus*.

perplexus, Shumard, 1866, (*Cheirocrinus perplexus*), Trans. St. Louis Acad. Sci., vol. 2, p. 358, Keokuk Gr.

punctatus, Ulrich, 1886, (*Cremacrinus punctatus*), 14th Rep. Geo. Sur. Minn., p. 107, Trenton Gr.

radicula, Ringueberg, 1882, Jour. Cin. Soc. Nat. Hist., vol. 5, p. 120, Niagara Gr.



FIG. 259.—*Calceocrinus rugosus*.

robustus, Worthen, (in press), Geo. Sur. Ill., vol. 8, p. 92, Keokuk Gr.

rugosus, Billings, 1887, Trans. Ottawa Field Nat. Club, vol. 3, p. 53, Trenton Gr.

stigmatus, see *Deltacrinus stigmatus*.

tunicatus, Hall, 1860, (*Cheirocrinus tunicatus*), 13th Rep. N. Y. St. Mus. Nat. Hist., p. 124, Keokuk Gr.

ventricosus, Hall, 1860, (*Cheirocrinus ventricosus*), 13th Rep. N. Y. St. Mus. Nat. Hist., p. 123, Burlington Gr.

wachsmuthi, see *Deltacrinus wachsmuthi*.

CALLOCYSTITES, Hall, 1852, Pal. N. Y., vol. 2, p. 238. [Ety. *kallos*, beautiful; *kustis*, bladder.] Ovoid; 1st series of plates 4; 2d series 8; 3d series about the same number; small plates at the apex; arms recumbent, resting in a small shallow groove; pectinated rhombs in three pairs; oral, ovarian and anal apertures. Type *C. jewetti*.



FIG. 260.—*Callocystites jewetti*, Hall, 1852, Pal. N. Y., vol. 2, p. 239, Niagara Gr.

tripectinatus, Ringueberg, 1886, Bull. Buf. Soc. Nat. Sci., vol. 5, p. 12, Niagara Gr.

CAMAROCRINUS, Hall, 1879, 28th Rep. N. Y. St. Mus. Nat. Hist., p. 205. [Ety. *kamara*, arching chambers; *krinon*, lily.] Body large, unsymmetrical, externally lobed, chambered within and bearing no arms; wall of the dome composed of two layers, the infolding of the inner one forming the partitions dividing the chambers; subcircular area in the basal portion composed of spreading, radiceform, bifurcating rays, composed of plates resembling those of a crinoid column, and connected by irregular polygonal plates; ambulacral openings between bifurcations near the outer rim of the area; column cylindrical, internal canal five-rayed. Type *C. stellatus*.

clarki, Hall, 1879, 28th Rep. N. Y. St. Mus. Nat. Hist., p. 209, Low. Held. Gr.

saffordi, Hall, 1879, 28th Rep. N. Y. St. Mus. Nat. Hist., p. 208, Low. Held. Gr.

stellatus, Hall, 1879, 28th Rep. N. Y. St. Mus. Nat. Hist., p. 207, Low. Held. Gr.

Campanulites, Troost, 1850. Not defined.

tessellatus, Troost, 1850. Not defined.

Canistocrinus, Wachsmuth & Springer, 1885, Paleocrinidae, vol. 1, pt. 3, p. 94.

Founded upon *Glyptocrinus richardsoni* and *G. pattersoni*, two widely different species. The generic characters are not satisfactorily pointed out.

CARABOCRINUS, Billings, 1857, Rep. of Progr. Geo. Sur. Can., p. 275, and Can. Org. Rem., Decade 4, p. 30. [Ety. *karabos*,

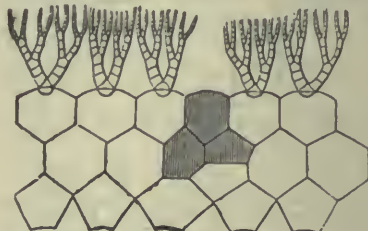


FIG. 261.—*Carabocrinus radiatus*. Diagram.

a crab; *krinon*, lily.] Calyx globular or ovoid; basals 5; subradials 5; primary radials 5; arms five, and frequently

dividing; regular interradials 0; azygous interradials 3, the first one resting on a basal plate; five calycinal, ambulacral grooves on the dome; opening in the margin over the azygous plates. Type *C. radiatus*.

radiatus, Billings, 1857, Rep. of Progr. Geo. Sur. Can., p. 276, and Can. Org. Rem., Decade 4, p. 31, Trenton Gr.

tuberculatus, Billings, 1859, Can. Org. Rem., Decade 4, p. 33, Hud. Riv. Gr.
vancouverlandti, Billings, 1859, Can. Org. Rem., Decade 4, p. 32, Trenton Gr.

CARYOCRINUS, Say, 1825, Jour. Acad. Nat. Sci., vol. 4, p. 289. [Ety. *karyon*, a nut; *krinon*, lily.] Body ovoid or subglobose; 1st series of plates 4; 2d series 6; 3d series 6, which bear 9 to 13 arms more or less; vault covered by polygonal plates of moderate size; upon the azygous side, near the outer edge of the vault, 6 triangular plates, forming a conical elevation, represent the mouth or anal orifice; calycine pores numerous, and also in double rows radiating from the center of the body plates; no pectinated rhombs; column round. Type *C. ornatus*.

globosus, Troost, 1850. Not defined.

granulatus, Troost, 1850. Not defined.

hexagonus, Troost. Not defined.

insculptus, Troost. Not defined.

loricatus, Say, 1825, Jour. Acad. Nat. Sci., vol. 4, syn. for *C. ornatus*.

meconoides, Troost. Not defined.

ornatus, Say, 1825, Jour. Acad. Nat. Sci., vol. 4, p. 289, and Pal. N. Y., vol. 2, p. 216, Clinton and Niagara Gr.

Caryocystites, Von Buch, as cited by Hall in 1861, in Geo. Rep. Wis. See *Holocystites*.

alternatus, see *Holocystites alternatus*.

cylindricus, see *Holocystites cylindricus*.



FIG. 262.—*Caryocrinus ornatus*.

CATILICRINUS, Troost, 1850, Cat. Foss. described by Shumard, 1866, Trans. St. Louis Acad. Sci., vol. 2, p. 357. [Ety. *catillus*, a small bowl; *krinon*, lily.] Calyx hemispherical concave at the bottom; basals 5; primary radials 1 x 5; secondary radials 1 x 5, very irregular; arms numerous, rising directly from the summit of the radials; column round. Type *C. tennesseæ*.

bradleyi, Meek & Worthen, 1868, Proc. Acad. Nat. Sci. Phil., p. 342, and Geo. Sur. Ill., vol. 5, p. 504, Keokuk Gr.

tennesseæ, Troost, 1850, Catalogue, but described by Shumard, in 1866, in Trans.

St. Louis Acad. Nat. Sci., vol. 2, p. 358, Warsaw Gr.

wachsmuthi, Meek & Worthen, 1866, (Synbathocrinus *wachsmuthi*.) Proc. Acad. Nat. Sci. Phil., p. 251, and Geo. Sur. Ill., vol. 3, p. 465, Burlington Gr.

Centrocrinus, *wachsmuthi* & Springer, 1881, Proc. Acad. Nat. Sci. Proposed as a subgenus under *Actinocrinus*, to include *A. multicornis* and *A. pentaspinus*, but the name was preoccupied by Austin in 1843.

tennesseensis, Worthen, (in press,) Geo. Sur. Ill., vol. 8, p. 95, Niagara Gr.

Certiocrinus, White, 1880, proposed as a subgenus of *Erisocrinus*, but the name was preoccupied.

Cheirocrinus, Hall, 1860, 13th Rep. N. Y. St. Mus. Nat. Hist., p. 122. This name was preoccupied by Eichwald in 1856, and is a syn. for *Calceocrinus*.

chrysalis, see *Calceocrinus chrysalis*.

clarus, see *Deltacrinus clarus*.

dactylus, see *Deltacrinus dactylus*.

lamellosus, see *Calceocrinus lamellosus*.

nodosus, see *Deltacrinus nodosus*.

perplexus, see *Calceocrinus perplexus*.

stigmatus, see *Deltacrinus stigmatus*.

tunicatus, see *Deltacrinus tunicatus*.

ventricosus, see *Calceocrinus ventricosus*.

CHOLASTER, Worthen & Miller, 1883, Geo. Sur. Ill., vol. 7, p. 328. Ety. *cholos*, defective; *aster*, star.] Body truncated pentagonal; central area circular, large, deep; rays distant, small, short, truncated; centro-dorsal plate large, surrounded by five plates in the position of radials. Type *C. peculiaris*.

peculiaris, Worthen & Miller, 1883, Geo. Sur. Ill., vol. 7, p. 328, Kaskaskia Gr.

CLEIOCRINUS, Billings, 1857, Rep. of Progr. Geo. Sur. Can., p. 276, and Can. Org. Rem., Decade 4, p. 52. [Ety. *kleio*, I close; *krinon*, lily.] Calyx conical or pyriform; basals 5; primary radials 3 x 5; secondary radials 4 x 10; tertiary radials numerous; azygous interradials forming a single series from the base to the top of the calyx; regular interradials none; arms numerous and compact. Type *C. regius*.

grandis, Billings, 1869, Can. Org. Rem., Decade 4, p. 54, Trenton Gr.

libanus, Safford, 1869, Geo. of Tenn. Not defined.



FIG. 263.—*Catilicrinus wachsmuthi*.

magnificus, Billings, 1859, Can. Org. Rem., Decade 4, p. 54, Trenton Gr.
regius, Billings, 1857, Rep. of Prog. Geo. Sur. Can., p. 277, and Can. Org. Rem., Decade 4, p. 53, Trenton Gr.

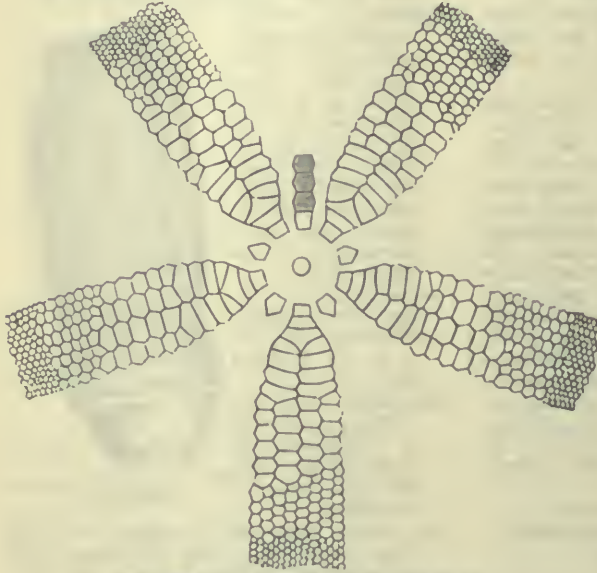


FIG. 264.—Cleoocrinus regius. Diagram.

CLOSTEROCRINUS, Hall, 1852, Pal. N. Y., vol. 2, p. 79. [Ety. *kloster*, a spindle; *krinon*, lily.] Body obconic; basals 3; subradials 1x5; number of radials unknown; azygous interradials present; arms composed of a single series of plates; column round. Type *C. elongatus*.

elongatus, Hall, 1852, Pal. N. Y., vol. 2, p. 179, Clinton Gr.

COCCOOCRINUS, Muller, 1855, Verhand. Naturhist. Vereins Rhein und Westph., Jahr. 12, p. 20. [Ety. *kokkos*, a berry; *krinon*, lily.] Basals 3; radials 2x5; interradials 1; column round; distinguished from *Haploocrinus* by the characters of the first radials and the oral plates, and from *Platycrinus* by the character of the vault which is composed of five oral plates resting upon the five interradials, and by the character of the column. Type *C. rosaceus*.



FIG. 265.—Coccoocrinus bacca.

bacca, Roemer, 1860, Sil. Fauna West Tenn., p. 57, Niagara Gr.

CODASTER, McCoy, 1849, Ann. & Mag. Nat. Hist., 2d ser., vol. 3, p. 250. [Ety. *kodon*, a bell; *aster*, star.] Calyx inverted conical; summit broad; basals 3, one

tetragonal and two pentagonal, each having its inner apex notched to form part of the round columnar canal; radials 1x5, large, equal, reaching to the truncated summit, to which, from their mesial gibbosity, they give a pentagonal outline; deltoid plates on the summit; mouth central, and from it five prominent ambulacra diverge, one to each angle, each being on a thick tapering ridge, divided by a mesial sulcus; from the re-entering angles of these interradial ridges four other ridges extend to the middle of the four straight sides, the fifth space having no ridge, but, instead, a large ovate opening; hydrospire slits in four interradial areas, but no hydrospire canals, and no pores. Type *C. acutus*.

alternatus, Lyon, 1857, Geo. Sur. Ky., vol. 3, p. 493. A misprint for *C. attenuatus*.
americanus, Shumard, 1858, Trans. St. Louis Acad. Sci., vol. 1, p. 239, Up. Held. Gr. Syn. (?) for *C. pyramidatus*.

attenuatus, Lyon, 1857, Geo. Sur. Ky., vol. 3, p. 493-498, Up. Held. Gr.

canadensis, Billings. Not defined.

gratiosus, S. A. Miller, 1880, Jour. Cin. Soc. Nat. Hist., vol. 2, p. 257, Keokuk Gr. The hydrospire slits are visible on the casts but are very fine.

hindii, Etheridge & Carpenter, 1882, Ann. and Mag. Nat. Hist., p. 235, Ham. Gr. *C. canadensis*. (?)

kentuckiensis, Shumard, 1858, Trans. St. Louis Acad. Sci., vol. 1, p. 239, Burlington Gr.

pentalobus, see *Stephanocrinus pentalobus*.



FIG. 267.—Codaster pulchellus. Summit and side views.

pulchellus, Miller & Dyer, 1878, Jour. Cin. Soc. Nat. Hist., vol. 1, p. 35, Niagara Gr. Possibly a *Stephanocrinus*.
pyramidatus, Shumard, 1858, Trans. St. Louis Acad. Sci., vol. 1, p. 238, Up. Held. Gr.

FIG. 266.—Codaster gratiosus. Summit and side view of cast, the latter showing an aperture at the summit.

whitii, Hall, 1861, Desc. New Crinoidea, p. 10, and Bost. Jour. Nat. Hist., vol. 7, p. 237, Burlington Gr.

CODONITES, Meek & Worthen, 1869, Proc. Acad. Nat. Sci. Phil., p. 84, and Geo. Sur. Ill., vol. 5, p. 463. [Ety. *kodon*, bell; *lithos*, stone.] Calyx truncate-obpyramidal, elongate below, which distinguishes it, in form, from Pentremites and allied genera; deltoid plates constricted in the middle; anal opening large, remote from the center; ambulacra narrow, without marginal pores; side plates large, their apposed edges having pinnule sockets; ten spiracles parallel or subparallel to the ambulacra; the slits are equally developed in all the interradial areas, while they are absent in the azygous interradius of Codaster. Type *C. stelliformis*.
campanulatus, Hambach, 1884, Trans. St. Louis Acad. Sci., vol. 4, p. 548, Burlington Gr.

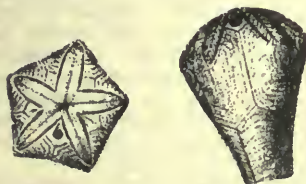


FIG. 268.—Codonites conicus.

conicus, Wachsmuth & Springer, (in press,) (Orophocrinus *conicus*.) Geo. Sur. Ill., vol. 8, p. 201, Waverly or Kinderhook Gr.

gracilis, Meek & Worthen, 1869, Proc. Acad. Nat. Sci. and Geo. Sur. Ill., vol. 5, p. 467, Burlington Gr.

fusiformis, Wachsmuth & Springer, (in press,) (Orophocrinus *fusiformis*.) Geo. Sur. Ill., vol. 8, p. 203, Waverly or Kinderhook Gr.

stelliformis, Owen & Shumard, 1850. (Pentremites *stelliformis*.) Jour. Acad. Nat. Sci. Phil., 2d ser., vol. 2, p. 67, Burlington Gr.

CÆLIOCRINUS, White, 1863, Jour. Bost. Soc. Nat. Hist., vol. 7, p. 499. [Ety. *kouilia*, belly; *krinon*, lily.] Distinguished from Hydreionocrinus and Zeacrinus by its balloon-shaped ventral sac or proboscis, and from the former, also, by the less robust body and comparatively longer arms. Type *C. dilatatus*.

cariniferus, Worthen, 1873, (Zeacrinus *wortheni*.) Geo. Sur. Ill., vol. 5, p. 535, St. Louis Gr.

dilatatus, Hall, 1861, (Poteriocrinus *dilatatus*.) Desc. New Crinoidea, p. 6, and Bost. Jour. Nat. Hist., p. 300, Burlington Gr.

lyra, Meek & Worthen, 1869, (Zeacrinus *lyra*.) Proc. Acad. Nat. Sci., p. 152, and Geo. Sur. Ill., vol. 5, p. 432, Burlington Gr.

subspinosus, White, 1863, Jour. Bost. Soc. Nat. Hist., vol. 7, p. 501, Burlington Gr.

ventricosus, Hall, 1861, (Poteriocrinus *ventricosus*.) Desc. New Crinoidea, p. 6, and Bost. Jour. Nat. Hist., p. 301, Burlington Gr.

Cæliocrinus, Meek & Worthen, 1865, Proc. Acad. Nat. Sci. Phil., and Geo. Sur. Ill., vol. 2, p. 214, syn. for Dorycrinus.

concauus, see Dorycrinus *concauus*.

COMAROCYSTITES, Billings, 1854, Can. Jour., vol. 2, p. 269, and Can. Org. Rem.,

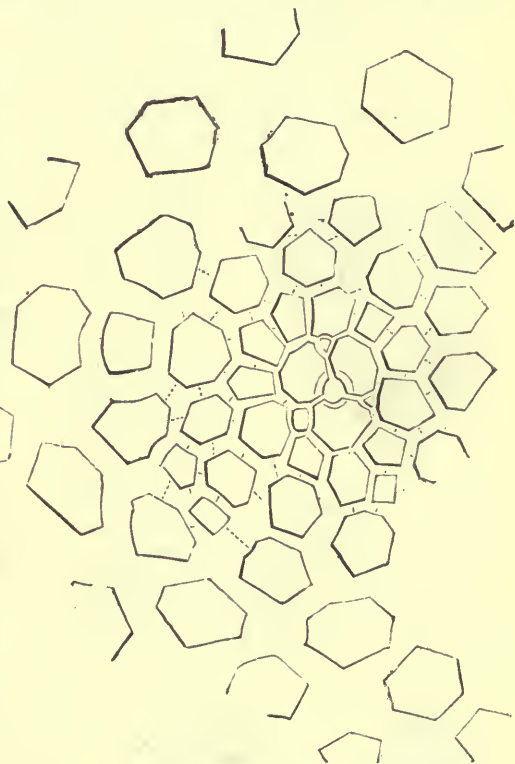


FIG. 270.—Comarocystites shumardi. Diagram of part of it.

Decade 3, p. 61. [Ety. *komaron*, strawberry; *kustis*, bladder.] Body ovate; 1st series of plates 3, above which there are from 5 to 11 series, in irregular order; mouth or valvular orifice near the summit; arms free, grooved, bearing pinnules; ambulacral orifice at the apex; column round; all the plates poriferous. Type *C. punctatus*.



FIG. 269.—Codonites fusiformis.

- obconicus, Meek & Worthen, 1865, (C. shumardi var. obconicus,) Proc. Acad. Nat. Sci. Phil., p. 144, and Geo. Sur. Ill., vol. 3, p. 294, Trenton Gr.
- punctatus, Billings, 1854, Can. Jour., vol. 2, p. 270, and Can. Org. Rem., Decade 3, p. 61, Trenton Gr.
- shumardi, Meek & Worthen, 1865, Proc. Acad. Nat. Sci. Phil., p. 143, and Geo. Sur. Ill., vol. 3, p. 292, Trenton Gr.
- COMPASTER, Worthen & Miller, 1883, Geo. Sur. Ill., vol. 7, p. 327. [Ety. *kompasos*, elegant; *aster*, star.] Central disk small; rays large, long, fusiform; grooves deep, bordered by numerous adambulacral plates; several rows of the ambulacral furrows. Type C. formosus.
- formosus, Worthen & Miller, 1883, Geo. Sur. Ill., vol. 7, p. 327, Kaskaskia Gr.
- COMPSOCRINUS, S. A. Miller, 1883, Jour. Cin. Soc. Nat. Hist., vol. 6, p. 233. [Ety. *kompso*, elegant; *krinon*, lily.] Basals 4; primary radials, 3x5; secondary radials 2 or more by 10; tertiary radials more or less numerous; median line of radials keeled; interradials numerous; column four-sided. Type C. harrisi.



FIG. 271.—*Compsocrinus harrisi*. Mag. 2 diam.

resembling *Platycrinus*; basals 3; unequal; radials 3x5; arms single or branching; pinnules long; interradials between the upper edges of the first radials; followed by 3 or 4 more; column cylindrical. Type C. comtus.

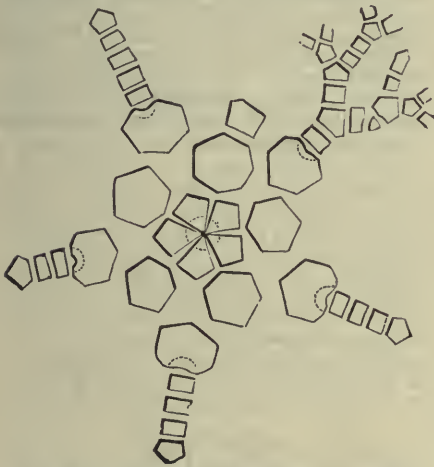


FIG. 272.—*Compsocrinus harrisi*. Diagram of basal part and a specimen flattened, natural size.

parvus, Hall, 1861, (*Platycrinus parvus*,) Pal. N. Y., vol. 3, p. 114, Low Held. Gr.

- plumosus, Hall, 1861, (*Platycrinus plumosus*,) Pal. N. Y., vol. 3, p. 113, Low Held. Gr.
- ramulosus, Hall, 1861, (*Platycrinus ramulosus*,) Pal. N. Y., vol. 3, p. 115, Low Held. Gr.
- CORONOCRINUS, Hall, 1859, Pal. N. Y., vol. 3, p. 124. [Ety. *korone*, a crown; *krinon*, lily.] Founded upon the fragment of the upper part of the calyx showing great breadth, probably hemispheric form, and as many as 40 arm openings in the circumference. Wachsmuth says it is a syn. for *Dolatocrinus*, but as that genus is not known, in rocks, so low as this is found, there is great doubt about the synonymy. Type C. polydactylus.
- polydactylus, Hall, 1859, Pal. N. Y., vol. 3, p. 124, Low Held. Gr.
- COTYLEDONOCRINUS, Casseday & Lyon, 1860, Proc. Am. Acad. Arts and Sci., vol. 5, p. 26. [Ety. *kotyledon*, any cup-shaped cavity; *krinon*, lily.] Basals 2; radials 3x5; secondary radials 2x10; arms 10; interradials 3x5. Distinguished from *Dichocrinus* by having no azygous plate in line with the first radials, and believed, by Wachsmuth, to have been founded upon an abnormal *Dichocrinus*. Type C. pentalobus.
- pentalobus, Casseday & Lyon, 1860, Proc. Am. Acad. Arts and Sci., vol. 5, p. 26, Kaskaskia Gr.
- Cremaocrinus*, Ulrich, syn. for *Calceocrinus punctatus*, see *Calceocrinus punctatus*.
- CRINOCYSTITES, Hall, 1864, 20th Rep. N. Y. St. Mus. Nat. Hist., p. 361. [Ety. *krinon*, lily; *kustis*, bladder.] Elongate, swelling in the upper third of the azygous side, and contracting below the arms; covered by five or more ranges of irregularly disposed plates; central and submarginal apertures. Type C. chrysalis.
- chrysalis, Hall, 1864, 20th Rep. N. Y. St. Mus. Nat. Hist., p. 362. Niagara Gr.
- (?) *rectus*, Hall, 1864, see *Rhodocrinus* (?) *rectus*.
- Crinosoma antiqua*, Castelneau, 1843, Syst. Sil. Probably a fucoid.
- Cromyocrinus*, Trautschold, 1867, syn. for *Eupachyocrinus*.
- gracilis*, see *Eupachyocrinus gracilis*.
- Crumenocrinites*, Troost, 1850. Not defined.
- ovalis*, Troost, 1850. Not defined.
- Cryptoblastus*, Etheridge & Carpenter, 1886, Catalogue of Blastoidea, p. 229. This genus is founded upon *Granatocrinus melo*, and distinguished from *Granatocrinus*, by a slight difference, in the hydrospires. They also referred to it *G. pisum*, and two other species, about which they had very little information.
- Ctenocrinus*, Bronn, 1840, Leonh. und Bronn. Jahrb., syn. for *Melocrinus*.
- bainbridgensis*, see *Melocrinus bainbridgensis*.

- breviradiatus*, see *Melocrinus breviradiatus*.
- Cupellæcrinus*, Troost, 1850. Not defined.
- CUPULOCRINUS**, D'Orbigny, 1850, Prodr. d. Pal., t. 1, p. 23. Proposed instead of *Scyphocrinus*, Hall, Pal. N. Y., vol. 1, p. 85, that was preoccupied, by Zenker. Basals 5; radials 4x5, regular interradials 3; azygous interradials 4; arms 10; column round. Type C. heterocostalis. Wachsmuth regards it as a syn. for *Taxocrinus*.
- heterocostalis, Hall., 1847, (*Scyphocrinus heterocostalis*.) Pal. N. Y., vol. 1, p. 85, Trenton Gr.
- CYATHOCRINUS**, Miller, 1821, Nat. Hist. Crinoidea, p. 85. [Ety. *cyathos*, cup or goblet; *krinon*, lily.] Calyx saucer-shaped; basals 5; subradials 5; radials 1x5; as large or larger than the basals, with articulating facet occupying only part of the width of a plate; brachials irregular in number; arms long, branching; column round; no regular interradials; azygous interradial 1, which is followed, in the ventral sac or proboscis, by other plates. Type C. planus.
- æmulus*, Hall, 1879, Desc. new spec. foss., p. 10, and 11th Rep. Geo. and Nat. Hist., Indiana, p. 266, Niagara Gr.
- angulatus*, see *Barycrinus angulatus*.

FIG. 273.—*Cyathocrinus arboreus*. Diagram.

- arboreus*, Meek & Worthen, 1865, Proc. Acad. Nat. Sci. Phil., p. 160, and Geo. Sur. Ill., vol. 3, p. 520, Keokuk Gr.
- barrisi*, Hall, 1861, (*Poteriocrinus barrisi*.) Desc. New Crin., p. 5, and Bost. Jour. Nat. Hist., p. 303, Burlington Gr.
- barydactylus*, Wachsmuth & Springer, 1878, Proc. Acad. Nat. Sci., p. 257, Burlington Gr.
- bulbosus*, see *Arachnocrinus bulbosus*.
- bullatus*, see *Barycrinus bullatus*.
- conglobatus*, Troost. Not defined.

- cora*, Hall, 1864, 20th Rep. N. Y. St. Mus. Nat. Hist., p. 366, Niagara Gr.
- cornutus*, see *Barycrinus cornutus*.
- corrugatus*, Troost. Not defined.
- crassibrachiatus*, see *Barycrinus crassibrachiatus*.
- crassus*, see *Eupachycrinus crassus*.
- crateriformis*, Troost. Not defined.
- crawfordsvillensis*, S. A. Miller, 1882, Jour. Cin. Soc. Nat. Hist., vol. 5, p. 79, Keokuk Gr.
- decadactylus*, Lyon & Casseday, 1860, Am. Jour. Sci. and Arts, vol. 29, p. 73, Keokuk Gr.
- depressus*, Troost, see *Zeacrinus depressus*.
- divaricatus*, Hall, 1858, Geo. Sur. Iowa, p. 554, Burlington Gr.
- enormis*, Meek & Worthen, 1865, (*Poteriocrinus enormis*.) Proc. Acad. Nat. Sci. Phil., p. 152, and Geo. Sur. Ill., vol. 3, p. 481, Burlington Gr.

FIG. 274.—*Cyathocrinus farleyi*. Diagram.

- farleyi*, Meek & Worthen, 1866, Proc. Acad. Nat. Sci. Phil., p. 252, and Geo. Sur. Ill., vol. 3, p. 517, Keokuk Gr.
- fasciatus*, see *Macrostylocrinus fasciatus*.
- florealis*, see *Zeacrinus florealis*.
- fragilis*, Meek & Worthen, 1868, Proc. Acad. Nat. Sci. Phil., p. 237, and Geo. Sur. Ill., vol. 5, p. 401, Burlington Gr.
- globosus*, Troost. Not defined.
- gilesi*, Wachsmuth & Springer, 1878, Proc. Acad. Nat. Sci., p. 259, Burlington Gr.
- granuliferus*, Shumard, 1854, Red Riv. Expl. Louisiana, p. 199, Kaskaskia Gr.
- hamiltonensis*, Worthen, 1882, Bull. No. 1, Ill. St. Mus. Nat. Hist., p. 32, syn. for *C. parvibrachiatus*.
- harrisi*, S. A. Miller, 1880, Jour. Cin. Soc. Nat. Hist., vol. 2, p. 255, Keokuk Gr. As suggested at the time of describing this species, it may become the type of a new genus.
- harrodi*, Wachsmuth & Springer, 1879, Proc. Acad. Nat. Sci., p. 87, Keokuk Gr.
- hexadactylus*, Lyon & Casseday, 1860, Am. Jour. Sci., vol. 29, p. 74, syn. for *Vasocrinus lyoni*. The name was essentially incorrect and definition wrong.
- hoveyi*, see *Barycrinus hoveyi*.

inæquidactylus, Whitfield, 1882, Ann. N. Y. Acad. Sci., vol. 2, p. 219, Kaskaskia Gr.
incipiens, Hall, 1861, Desc. New Crinoidea, p. 5, and Bost. Jour. Nat. Hist., vol. 7, p. 296, Burlington Gr.
inflatus, Troost. Not defined.
inflexus, see *Erisocrinus inflexus*.
inspiratus, Lyon, 1860, Trans. Am. Phil. Soc., vol. 13, p. 457, Keokuk Gr.
intermedius, Hall, 1858, Geo. Rep. Iowa, p. 627, Keokuk Gr.
iowensis, Owen & Shumard, 1850, Jour. Acad. Nat. Sci., 2d ser., vol. 2, p. 63, and Geo. Sur. Wis., Iowa, and Minn., p. 591, Burlington Gr.
kelloggi, see *Barycrinus kelloggi*.
læviculus, Lyon, 1861, Proc. Acad. Nat. Sci. Phil., p. 409, Up. Held. Gr.
latus, Hall, 1861, Desc. New Crinoidea, p. 5, syn. for *Barycrinus sculptilis*.
lamellosus, White, 1863, Jour. Bost. Soc. Nat. Hist., vol. 7, p. 504, Burlington Gr.



FIG. 275.—*Cyathocrinus multibrachiatus*.

multibrachiatus, Lyon & Casseday, 1859, Am. Jour. Sci., vol. 28, p. 245, Keokuk Gr.
nucleus, Hall, 1876, (Dendrocrinus nucleus,) 28th Rep. N. Y. St. Mus. Nat. Hist., p. 136, Niagara Gr.
ornatissimus, Hall, 1843, Geo. Rep. 4th Dist. N. Y., p. 247, Portage Gr.
parvibrachiatus, Hall, 1861, Desc. New Crinoidea, p. 6, and Bost. Jour. Nat. Hist., vol. 7, p. 294, Keokuk Gr.

lyoni, see *Vasocrinus lyoni*.
macropleurus, see *Vasocrinus macropleurus*.
magister, see *Barycrinus magister*.
magnoliiformis, see *Zeacrinus magnoliiformis*.
malvaceus, Hall, 1858, Geo. Sur. Iowa, p. 554, Burlington Gr. Wachsmuth says it is founded on a depressed specimen of *C. iowensis*.
maniformis, see *Zeacrinus maniformis*.
marshallensis, Worthen, 1882, Bull. No. 1, Ill. St. Mus. Nat. Hist., p. 33, and Geo. Sur. Ill., vol. 7, p. 310, Waverly or Kinderhook Gr.

pentalobus, see *Eupachycrinus pentalobus planus*, Troost. Not defined.
polyxo, Hall, 1863, Trans. Alb. Inst., vol. 4, p. 199, and 28th Rep. N. Y. St. Mus. Nat. Hist., p. 135, Niagara Gr.
poterium, Meek & Worthen, 1870, Proc. Acad. Nat. Sci. Phil., p. 24, and Geo. Sur. Ill., vol. 5, p. 489, Keokuk Gr.
protuberans, see *Barycrinus protuberans pusillus*, see *Lecanocrinus pusillus*.
pyriformis, Murchison as identified by Hall. See *Ichthyocrinus levis*

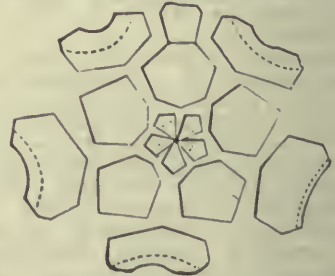


FIG. 276.—*Cyathocrinus quinquelobus*.

quinquelobus, Meek & Worthen, 1865, Proc. Acad. Nat. Sci. Phil., p. 150, and Geo. Sur. Ill., vol. 3, p. 519, Keokuk Gr.
rarus, Lyon, 1869, Trans. Am. Phil. Soc., vol. 13, p. 453, Up. Held. Gr.
rigidus, White, 1862, Proc. Bost. Soc. Nat. Hist., vol. 9, p. 8, Burlington Gr.
robustus, Troost. Not defined.
roemeri, Troost. Not defined.
rotundatus, Hall, 1858, Geo. Rep. Iowa, p. 555, Burlington Gr.

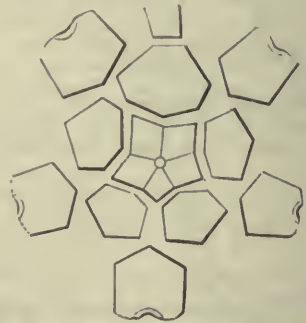


FIG. 277.—*Cyathocrinus saffordi*. Diagram.

saffordi, Meek & Worthen, 1860, Proc. Acad. Nat. Sci. Phil., p. 371, and Geo. Sur. Ill., vol. 2, p. 336, Keokuk Gr.
sangamonensis, see *Eupachycrinus sangamonensis*.
scitulus, Meek & Worthen, syn. for *Barycrinus scitulus*.
sculptilis, see *Barycrinus sculptilis*. Not defined.
sculptus, Troost. Not defined.
solidus, see *Barycrinus solidus*.

somersi, Whitfield, 1882, Ann. N. Y. Acad. Sci., vol. 2, p. 226, Coal Meas.

spurius, see *Barycrinus spurius*.

stellatus, see *Barycrinus stellatus*.

stillativus, White, 1880, Proc. U. S. Nat.

Mus., vol. 2, p. 253, and Cont. to Pal.

No. 6, p. 125, Up. Coal Meas.

subtumidus, Meek & Worthen, 1869, Proc.

Acad. Nat. Sci. Phil., p. 151, and Geo.

Sur. Ill., vol. 5, p. 487, Keokuk Gr.

tennesseæ, Troost. Not defined.

tenuibrachiatus, Lyon, 1869, Trans. Am.

Phil. Soc., vol. 13, p. 460, Up.

Held. Gr.

tenuidactylus, Meek & Worthen, 1868,

Proc. Acad. Nat. Sci. Phil., p. 238, and

Geo. Sur. Ill., vol. 5, p. 403, Burling-

ton Gr.

thomæ, see *Barycrinus thomæ*.

tiaræformis, see *Ichthyocrinus tiariformis*.

tumidus, see *Barycrinus tumidus*.

vanhornii, S. A. Miller, 1881, Jour. Cin.

Soc. Nat. Hist., vol. 4, p. 261, Ni-

agara Gr.

viminalis, Hall, 1861, Desc. New Crin.,

p. 5, syn. for *C. iowensis*.

wachsmuthi, see *Barycrinus wachsmuthi*.

waldronensis, Miller & Dyer, 1878, Cont.

to Pal. No. 2, p. 6, Niagara Gr. Wachsmuth

refers it to *Macrostylocrinus*.

waukoma, Hall, 1864, 20th Rep. N. Y. St.

Mus. Nat. Hist., p. 367, Niagara Gr.

wortheni, Lyon, 1861, Proc. Acad. Nat.

Sci. Phil., p. 410, Up. Held. Gr.

Cyclaster, Billings, 1857, Rep. of Progr.

This name was preoccupied. See *Ed-*

riaster.

bigsbyi, see *Edriaster bigsbyi*.

CYCLOCYSTOIDES, Billings & Salter, 1858,

Can. Org. Rem., Decade 3, p. 86. [Ety.

kuklos, circle; *kustis*, bladder; *eidos*,

form.] Body consisting of a circular

disk, surrounded by a series of short,

cylindrical, perforated, porous plates;

the interior is covered by an integu-

ment of small plates, with radiating

channels, which bifurcate and connect

with the channel in the marginal series,

which makes a complete circle; mouth

supposed to be central; mammillary

elevations on the exterior of the rim as

if for the attachment of small spines.

Type *C. halli*.

anteceptus, Hall, 1866, 24th Rep. N. Y.

St. Mus. Nat. Hist., p. 219, Tren-

ton Gr.

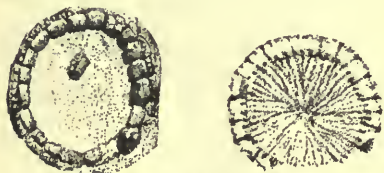


FIG. 278.—*Cyclocystoides magnus*.

bellulus, Miller & Dyer, 1878, Jour. Cin.

Soc. Nat. Hist., vol. 1, p. 34, Hud.

Riv. Gr.

halli, Billings, 1858, Can. Org. Rem.,

Decade 3, p. 86, Trenton Gr.

huronensis, Billings, 1865, Pal. Foss., vol.

1, p. 393, Hud. Riv. Gr.

magnus, Miller & Dyer, 1878, Jour. Cin.

Soc. Nat. Hist., vol. 1, p. 32, and vol. 4,

p. 70, Hud. Riv. Gr.

minus, Miller & Dyer, 1878, Jour. Cin.

Soc. Nat. Hist., vol. 1, p. 33, Hud.

Riv. Gr.

mundulus, Miller & Dyer, 1878, Jour.

Cin. Soc. Nat. Hist., vol. 1, p. 34, Hud.

Riv. Gr.

nitidus, Faber, 1886, Jour. Cin. Soc. Nat.

Hist., vol. 9, p. 17, Hud. Riv. Gr.

parvus, Miller & Dyer, 1878, Jour. Cin.

Soc. Nat. Hist., vol. 1, p. 33, Hud.

Riv. Gr.

salteri, Hall, 1866, 24th Rep. N. Y. St.

Mus. Nat. Hist., p. 218, Trenton

Gr.

CYSTOCRINUS, Roemer, 1860, Sil. Fauna West

Tenn., p. 56. [Ety. *kustis*, bladder;

krinon, lily.] A cylindrical body, the

interior of which looks like a crinoid

column, but the external part consists

of a compact mass of tubes connecting

with the central canal. Wachsmuth

has called it a detached column, but it

is anomalous, and I retain the genus.

Type *C. tennesseensis*.

tennesseensis, Roemer,

1860, Sil. Fauna West

Tenn., p. 56, Niagara Gr.

Cytocrinus, Roemer, 1860, Sil.

Fauna West Tenn., p.

46, syn. for *Melocrinus*.

lævis, see *Melocrinus lævis*.

Dæmonicri-

nites, Troost

Not de-

defined.

Decadactylo-

crinites,

Owen. Not

defined.

Decadocrinus,

Wachsmuth & Springer,

1879, Proc. Acad. Nat. Sci. Phil. and

Revis. Palæocrinoidea, pt. 1, p. 119. It

was described as a subgenus of *Po-*

teriocrinus, but it hardly arises to that

dignity. Their type is *Scaphiocrinus*

scalaris.

DELTAOCRINUS, Ulrich, 1886, 14th Rep. Geo.

Sur. Minn., p. 109. [Ety. *delta*, Greek

letter; *krinon*, lily.] Basal piece tri-

angular, composed of anchylosed plates;

four plates form the dorsal side

above the base; lower central plate tri-

angular and separated from the upper

triangular plate by the union of the

two lateral radial plates. Distinguished

from *Calceocrinus*, which has a long plate

on the dorsal side between the lateral

radials instead of the two triangular

plates separated, as above described by

the union of the two radials. Type *D.*

clarus.

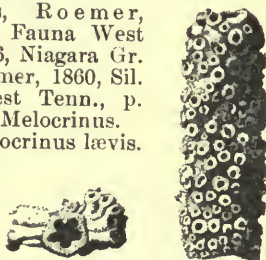


FIG. 279.—*Cystocrinus tennesseensis*.

barrisi, Worthen, 1875, (*Calceocrinus barrisi*, Geo. Sur. Ill., vol. 6, p. 510, Ham. Gr.

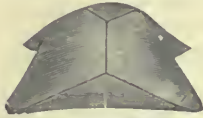


FIG. 280.—*Deltacrinus barrisi*.

clarus, Hall, 1862, (*Cheirocrinus clarus*), 15th Rep. N. Y. St. Mus. Nat. Hist., p. 88, Niagara Gr.

dactylus, Hall, 1860, (*Cheirocrinus dactylus*), 13th Rep. N. Y. St. Mus. Nat. Hist., p. 123, Burlington Gr.

nodosus, Hall, 1860, (*Cheirocrinus nodosus*), 13th Rep. N. Y. St. Mus. Nat. Hist., p. 124, Keokuk Gr.

stigmatus, Hall, 1863, (*Cheirocrinus stigmatus*), Trans. Alb. Inst., vol. 4, p. 225, Niagara Gr.

tunicatus, Hall, 1660, (*Cheirocrinus tunicatus*), 13th Rep. N. Y. St. Mus. Nat. Hist., p. 124, Keokuk Gr.

wachsmuthi, Meek & Worthen, 1869, (*Calceocrinus wachsmuthi*), Proc. Acad. Nat. Sci. Phil., p. 74, and Geo. Sur. Ill., vol. 5, p. 444, Burlington Gr.



FIG. 281.—*Deltacrinus stigmatus*. Dorsal view of calyx enlarged 2 diam.

DENDROCRINUS, Hall, 1852, Pal. N. Y., vol. 2, p. 193. [Ety. *dendron*, tree; *krinon*, lily.] Calyx obconoidal; basals 5; subradials 5; radials 1x5, and an additional one caused by a division of the plate on the left side of the large azygous one; regular interradians 0; azygous interradius 1; large and long proboscis or ventral sac rises from the azygous interradius; arms long, branching; ambulacra

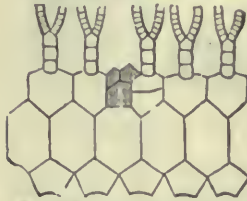


FIG. 282.—*Dendrocrinus*. Diagram.

furrow deep; pinnules wanting; column round or pentagonal; without base or roots for attachment. Type *D. longidactylus*.

acutidactylus, Billings, 1857, Rep. of Progr. Geo. Sur. Can., p. 266, and Can. Org. Rem., Decade 4, p. 37, Trenton Gr.

ahilla, Hall, 1879, Desc. New Spec. Foss., p. 9, and 11th Rep. Geo. and Nat. Hist. Indiana, p. 271, Niagara Gr.

alternatus, Hall, 1847, (*Poteriocrinus alternatus*), Pal. N. Y., vol. 1, p. 83, Trenton Gr.

angulatus, see *Palæocrinus angulatus*.

angustatus, Meek & Worthen, 1870, (*Homocrinus angustatus*), Proc. Acad. Nat. Sci. Phil., p. 30, and Geo. Sur. Ill., vol. 6, p. 492, Hud. Riv. Gr.

caduceus, Hall, 1866, 24th Rep. N. Y. St. Mus. Nat. Hist., p. 208, Hud. Riv. Gr.

casii, Meek, 1871, Am. Jour. Sci. and Arts, 3d ser., vol. 2, p. 295, and Ohio Pal., vol. 1, p. 28, Hud. Riv. Gr.

cincinnatiensis, Meek, 1872, Proc. Acad. Nat. Sci. Phil., p. 312, and Ohio Pal., vol. 1, p. 20, Hud. Riv. Gr.

conjugans, Billings, 1857, Rep. of Progr. Geo. Sur. Can., p. 268, and Can. Org. Rem., Decade 4, p. 41, Trenton Gr.

celsus, Ringueberg, 1888, Proc. Acad. Nat. Sci. Phil., p. 132, Niagara Gr.

curtus, see *Merocrinus curtus*.

cylindricus, Billings, 1859, Can. Org. Rem., Decade 4, p. 44, Trenton Gr.

dyeri, Meek, 1872, Proc. Acad. Nat. Sci. Phil., p. 310, and Ohio, Pal., vol. 1, p. 24, Hud. Riv. Gr.

erratics, S. A. Miller, 1881, Jour. Cin. Soc. Nat. Hist., vol. 4, p. 316, Hud. Riv. Gr.

gracilis, Hall, 1847, (*Poteriocrinus gracilis*), Pal. N. Y., vol. 1, p. 84, Trenton Gr.

gregarius, Billings, 1857, Rep. of Progr. Geo. Sur. Can., p. 265, and Can. Org. Rem., Decade 4, p. 36, Trenton Gr.

humilis, Billings, 1857, Rep. of Progr. Geo. Sur. Can., p. 265, and Can. Org. Rem., Decade 4, p. 39, Trenton Gr.

jewetti, Billings, 1859, Can. Org. Rem., Decade 4, p. 43, Trenton Gr.

latibrachiatus, Billings, 1857, Rep. Prog. Can. Geo. Sur., p. 270, and Can. Org. Rem., Decade 4, p. 39, Hud. Riv. Gr.

longidactylus, Hall, 1852, Pal. N. Y., vol. 2, p. 193, Niagara Gr.

modestus, Safford. Not defined.

navigiolus, S. A. Miller, 1880, Jour. Cin. Soc. Nat. Hist., vol. 3, p. 235, Utica Slate Gr.

nucleus, see *Cyathocrinus nucleus*.



FIG. 283.—*Dendrocrinus jewetti*.



FIG. 284.—*Dendrocrinus oswegoensis*. Diagram.

oswegoensis, Meek & Worthen, 1868, Geo. Sur. Ill., vol. 3, p. 333, Hud. Riv. Gr.

- polydactylus, Shumard, 1857, (Homocrinus polydactylus,) Trans. St. Louis Acad. Sci., vol. 1, p. 78, and Ohio Pal., vol. 1, p. 22, Hud. Riv. Gr.
- posticus, Hall, 1872, (Pterotocrinus posticus,) 24th Rep. N. Y. St. Mus. Nat. Hist., p. 209, and Ohio Pal., vol. 1, p. 22, Hud. Riv. Gr.
- proboscidiatus, Billings, 1857, Rep. of Progr. Can. Geo. Sur., p. 267, and Can. Org. Rem., Decade 4, p. 38, Trenton Gr.
- retractilis, Walcott, 1883, 35th Rep. N. Y. St. Mus. Nat. Hist., p. 211, Trenton Gr.
- rusticus, Billings, 1857, Rep. of Progr. Geo. Sur. Can., p. 270, and Can. Org. Rem., Decade 4, p. 41, Trenton Gr.
- similis, Billings, 1857, Rep. of Progr. Geo. Sur. Can., p. 267, and Can. Org. Rem., Decade 4, p. 40, Trenton Gr.
- tener, Billings, 1866, Catal. Sil. Foss. Antic., p. 9, Hud. Riv. Gr.
- DICROCRINUS, Munster, 1839, Beitrag. Zur. Petref., vol. 1, p. 2. [Ety. *dicha*, in two parts; *krinon*, lily.] Calyx deep, cup-shaped; plates delicate; basals 2; primary radials 5, large, resting two upon each basal, and the other in a notch at one end of the basal suture, opposite which there is a large azygous plate in line with the first radials; succeeding radials 1 to 3, in each ray, the last supporting arms; arms 10, long, bifurcating and bearing stout pinnules; interradials 4 or 5, small, situate above the first radials; vault slightly elevated, with a small opening upon the azygous side; column round. Type *D. radiatus*.
- angustus, White, 1862, Proc. Bost. Soc. Nat. Hist., vol. 9, p. 19, Burlington Gr.
- chesterensis*, see *Pterotocrinus chesterensis*.
- constrictus, Meek & Worthen, 1860, Proc. Acad. Nat. Sci. Phil., p. 381, and Geo. Sur. Ill., vol. 2, p. 263, Warsaw Gr.
- conus, Meek & Worthen, 1860; Proc. Acad. Nat. Sci. Phil., p. 381, and Geo. Sur. Ill., vol. 2, p. 169, Burlington Gr.
- cornigerus*, see *Talarocrinus cornigerus*.
- coxanus, Worthen, 1882, Bull. No. 1, Ill. St. Mus. Nat. Hist., p. 35, and Geo. Sur. Ill., vol. 7, p. 313, Keokuk Gr.
- crassitestus, White, 1862, Proc. Bost. Soc. Nat. Hist., vol. 9, p. 19, Burlington Gr.
- crassus*, see *Pterotocrinus crassus*.
- dichotomus, Hall, 1860, Supp. to Geo. Sur. Iowa, p. 85, Warsaw Gr.
- elegans*, Casseday & Lyon, see *Talarocrinus elegans*.
- expansus, Meek & Worthen, 1868. The name was preoccupied by DeKoninck & LeHon, but the name is probably a synonym for *D. polydactylus*.
- ficus, Casseday & Lyon, 1860, Proc. Am. Acad. Arts and Sci., vol. 5, p. 24, and Geo. Sur. Ill., vol. 5, p. 502, Keokuk Gr.
- inornatus, Wachsmuth & Springer, (in press,) Geo. Sur. Ill., vol. 8, p. 190, Waverly or Kinderhook Gr.
- hamiltonensis, Worthen, 1882, Bull. No. 1, Ill. St. Mus. Nat. Hist., p. 35, and Geo. Sur. Ill., vol. 7, p. 313, Keokuk Gr.
- lachrymosus, Hall, 1860, Supp. to Geo. Sur. Iowa, p. 84, Burlington Gr. Wachsmuth says it is a syn. for *Platycrinus subspinulosus*.
- lævis, Hall, 1860, Supp. Geo. Sur. Iowa, p. 83, Burlington Gr.
- lineatus, Meek & Worthen, 1869, Proc. Acad. Nat. Sci. Phil., p. 69, and Geo. Sur. Ill., vol. 5, p. 440, Burlington Gr.
- liratus, Hall, 1861, Desc. New Crinoidea, p. 5, and Jour. Bost. Nat. Hist., vol. 7, p. 290, Burlington Gr.
- ornatus, Wachsmuth & Springer, 1881, Proc. Acad. Nat. Sci. Phil. and Revis. Palæocrin., p. 84, Keokuk Gr. This name was proposed instead of *D. sculptus*, Casseday & Lyon, because the latter was preoccupied.
- ovatus, Owen & Shumard, 1850, Jour. Acad. Nat. Sci., 2d ser., vol. 2, p. 61, and Geo. Sur. Iowa, Wis., and Minn., p. 590, Burlington Gr.
- pisum, Meek & Worthen, 1869, Proc. Acad. Nat. Sci. Phil., p. 69, and Geo. Sur. Ill., vol. 5, p. 441, Burlington Gr.
- plicatus, Hall, 1861, Desc. New Crinoidea, p. 4, and Jour. Bost. Soc. Nat. Hist., vol. 7, p. 288, Burlington Gr.
- pocillum, Hall, 1861, Desc. New Crinoidea, p. 5, and Jour. Bost. Soc. Nat. Hist., vol. 7, p. 291, Burlington Gr.
- polydactylus, Casseday & Lyon, 1860, Proc. Am. Acad. Arts and Sci., vol. 5, p. 20, Keokuk Gr.
- protuberans*, Hall, see *Pterotocrinus protuberans*.
- scitulus, Hall, 1861, Desc. New Crinoidea, p. 4, and Jour. Bost. Soc. Nat. Hist., vol. 7, p. 289, Burlington Gr.
- sculptus, Casseday & Lyon, 1860, Proc. Am. Acad. Arts and Sci., vol. 5, p. 25. The name was preoccupied by DeKoninck & LeHon in 1853. See *D. ornatus*.
- sexlobatus*, see *Talarocrinus sexlobatus*.
- simplex, Shumard, 1857, Trans. St. Louis Acad. Sci., p. 74, and Geo. Sur. Iowa, p. 654, Warsaw Gr.
- striatus, Owen & Shumard, 1850, Jour. Acad. Nat. Sci., 2d ser., vol. 2, and Geo. Sur. Iowa, Wis., and Minn., p. 590, Burlington Gr.
- symmetricus*, see *Talarocrinus symmetricus*.



FIG. 285. — *Dicho- crinus inornatus*.

Dictyocrinus, Conrad, 1841, (*Dictyocrinites*), Ann. Rep. N. Y. and Pal. N. Y., vol. 3, p. 135, syn. for *Receptaculites*.

squamifer, Hall, see *Receptaculites squamifer*.

DOLATOCRINUS, Lyon, 1857, Geo. Sur. Ky., vol. 3, p. 482. [Ety. *dolatus*, hewn or tooled; *krinon*, lily.] Body subspheroidal; calyx basin-shaped; vault hemispherical, depressed in the interradial areas; basals anchylosed and probably numbering 5; radials 3x5; secondary radials 2x10; sometimes tertiary radials 2x20; arms 20 to 40, bifurcating and bearing pinnules; interradials 5 or more, the first one large; aperture subcentral; column round. Type *D. lacus canadensis*, Whiteaves, 1887, Cont. to Can. Pal. vol. 1, p. 99, Ham. Gr.

glyptus, Hall, 1862, (*Cacabocrinus glyptus*), 15th Rep. N. Y. St. Mus. Nat. Hist., p. 140, Ham. Gr.



FIG. 286.—*Dolatocrinus lacus*. Side view.

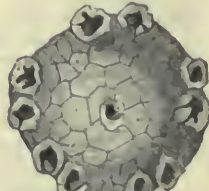


FIG. 287.—*Dolatocrinus lacus*. Ventral view.

glyptus var. *intermedius*, Hall, 1862, (*Cacabocrinus glyptus* var. *intermedius*), 15th Rep. N. Y. St. Mus. Nat. Hist., p. 141, Ham. Gr.



FIG. 288.—*Dolatocrinus lacus*. Diagram of a ray.

lacus, Lyon, 1857, Geo. Sur. Ky., vol. 3, p. 482, Up. Held. Gr.

lamellosus, Hall, 1862, (*Cacabocrinus lamellosus*), 15th Rep. N. Y. St. Mus. Nat. Hist., p. 141, Up. Held. Gr.

liratus, Hall, 1862, (*Cacabocrinus liratus*), 15th Rep. N. Y. St. Mus. Nat. Hist., p. 139, Ham. Gr.

liratus var. *multilira*, Hall, 1862, (*Cacabocrinus liratus* var. *multilira*), 15th Rep. N. Y. St. Mus. Nat.

Hist., p. 139, Ham. Gr.

marshi, Lyon, 1869, Trans. Am. Phil. Soc., vol. 13, p. 461, Up. Held. Gr.

ornatus, Meek, 1871, Proc. Acad. Nat. Sci., p. 57, Up. Held. Gr.

speciosus, Hall, 1862, (*Cacabocrinus speciosus*), 15th Rep. N. Y. St. Mus. Nat. Hist., p. 137, Up. Held. Gr.

triadactylus, Barris, 1885, Proc. Dav. Acad. Sci., vol. 4, p. 100, Ham. Gr.

troosti, Hall, 1862, (*Cacabocrinus troosti*), 15th Rep. N. Y. St. Mus. Nat. Hist., p. 138, Ham. Gr.

Donacirinites, Troost. Not defined.

simplex, Troost. Not defined.

DORYCRINUS, Roemer, 1854, Archiv. f. Naturgesch. Jahrg. 19, p. 207. [Ety. *dory*, spear; *krinon*, lily.] Body turbinate or subglobose, truncate at the base, depressed in the interradial spaces so as to make it pentalobate; dome convex and usually bearing from 1 to 6 spines; basals 3; primary radials 3x5; secondary radials 2x2; or where there are tertiary radials, there are only 1x2 secondaries; arms 24 to 40; interradials 2 or 3, in two series; azygous area very different from the interradial areas, and having several more plates and an aperture near the top directed laterally; readily distinguished from *Batocrinus* and *Eretmocrinus* by the lobed form of the body, by the azygous area and lateral opening, and by the shortness of the arms. Type *D. mississippiensis*.

canaliculatus, Meek & Worthen, 1869, Proc. Acad. Nat. Sci., p. 166, and Geo. Sur. Ill., vol. 5, p. 381, Burlington Gr.

concaus, Meek & Worthen, 1861, (*Actinoocrinus concaus*), Proc. Acad. Nat. Sci. Phil., p. 131, and Geo. Sur. Ill., vol. 2, p. 215, Low. Burlington Gr.

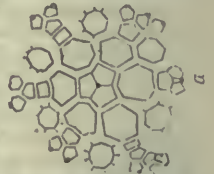


FIG. 289.—*Dorycrinus concaus*. Diagram.

cornigerus, Hall, 1858, (*Actinoocrinus cornigerus*), Geo. Rep. Iowa, p. 576, Burlington Gr.

gouldi, Hall, 1858, (*Actinoocrinus gouldi*), Geo. Rep. Iowa, p. 613, Keokuk Gr.



FIG. 290.—*Dorycrinus immaturus*. Posterior and anterior views.

immaturus, Wachsmuth & Springer, (in press), Geo. Sur. Ill., vol. 8, p. 175, Waverly or Kinderhook Gr.

kelloggi, Worthen, 1875, Geo. Sur. Ill. vol. 6, p. 513, Keokuk Gr.

lineatus, S. A. Miller, 1881, Jour. Cin. Soc. Nat. Hist., vol. 4, p. 310, Burlington Gr.
 mississippiensis, Roemer, 1853, Archiv. fur Nat. Jahr. 19, p. 207, Keokuk Gr.
 mississippiensis, var. spiniger, Hall, 1860, Supp. to Geo. Sur. Iowa, p. 53, Keokuk Gr.
 missouriensis, Shumard, 1858, (Actinocrinus missouriensis,) Geo. Rep. Mo., p. 190, Burlington Gr.
 parvibasis, Wachsmuth & Springer, (in press,) Geo. Sur. Ill., vol. 8, p. 177, Kinderhook Gr.



FIG. 291.—*Dorycrinus parvibasis*. Anterior, posterior, and ventral views.

parvus, Shumard, 1855, (Actinocrinus parvus,) Geo. Sur. Mo., p. 193, Upper Burlington Gr.
 pendens, Hall, 1860, (Actinocrinus pendens,) Supp. to Geo. Sur. Iowa, p. 31, Burlington Gr.
 præcursor, Hall, 1862, (Actinocrinus præcursor,) 15th Rep. N. Y. St. Mus. Nat. Hist., p. 131, Ham. Gr.
 quinquelobus, Hall, 1860, (Actinocrinus quinquelobus,) Supp. to Geo. Rep. Iowa, p. 15, Burlington Gr.

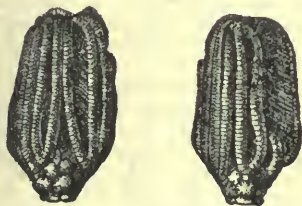


FIG. 292.—*Dorycrinus radiatus*. Posterior and anterior views.

quinquelobus var. intermedius, Meek & Worthen, 1868, Proc. Acad. Nat. Sci., p. 346, and Geo. Sur. Ill., vol. 5, p. 385, Burlington Gr.
 radiatus, Wachsmuth & Springer, (in press,) Geo. Sur. Ill., vol. 8; p. 176, Kinderhook Gr.
 roemeri, Meek & Worthen, 1868, Proc. Acad. Nat. Sci. Phil., p. 346, and Geo. Sur. Ill., vol. 5, p. 383, Burlington Gr.
 spinulosus, Hall, 1860, (Actinocrinus spinulosus,) Supp. Geo. Sur. Iowa, p. 52, Keokuk Gr.

subaculeatus, Hall, 1858, (Actinocrinus subaculeatus,) Geo. Rep. Iowa, p. 570, Burlington Gr.

subturbinatus, Meek & Worthen, 1860, (Actinocrinus subturbinatus,) Proc. Acad. Nat. Sci. Phil., p. 388, and Geo. Sur. Ill., vol. 2, p. 212, Burlington Gr.



FIG. 293.—*Dorycrinus subturbinatus*. Diagram.

symmetricus, Hall, 1858, (Actinocrinus symmetricus,) Geo. Sur. Iowa, p. 574, Burlington Gr.
 trinodus, Hall, 1858, (Actinocrinus trinodus,) Geo. Sur. Iowa, p. 575, Burlington Gr.



FIG. 294.—*Dorycrinus unicornis*.

unicornis, Owen & Shumard, 1850, (Actinocrinus unicornis,) Jour. Acad. Nat. Sci. Phil., vol. 2, new ser., p. 67, and Geo. Sur. Ill., vol. 5, p. 380, Burlington Gr.

unispinus, Hall, 1861, Actinocrinus unispinus,) Desc. New Crinoidea, p. 2, and Bost. Jour. Nat. Hist., vol. 7, p. 270, Burlington Gr.

Echinocystites, Hall, 1864, 20th Rep. N. Y. St. Mus. Nat. Hist., p. 360. The name was preoccupied by Wyville Thompson. See *Lysocystites*.

nodosus, see *Lysocystites nodosus*.

Echinodiscus, Worthen & Miller, 1883, Geo. Sur. Ill., vol. 7, p. 335. [Ety. *echinos*, sea urchin; *diskos*, quoit.] Body discoid; depressed convex, larger plates in the center of the interradial areas, none imbricating; narrow elongate plates form the border and pass to the under side forming a non-sessile rim; ambulacra 5, connected near the center, and composed of numerous interlocking plates; mouth central or subcentral. Type *E. optatus*.

kaskaskiensis, Hall, 1858, (Agelacrinus kaskaskiensis,) Geo. Sur. Iowa, p. 696, Kaskaskia Gr.

optatus, Worthen & Miller, 1883, Geo. Sur. Ill., vol. 7, p. 336, Kaskaskia Gr.

Echino-encrinites, Meyer, 1826, Karst. Archiv. Nat., vol. 7. [Ety. *echinos*, sea urchin; *krinon*, lily.]

anatiformis, see *Glyptocystites anatiformis*.

fenestratus, Troost. Not defined.

Echinus drydenensis, see *Eocidaris drydenensis*.

gyracanthus, see *Tentaculites gyracanthus*.

ECTENOCRINUS, n. gen. [Ety. *ekteino*, I stretch out; *krinon*, lily.] General

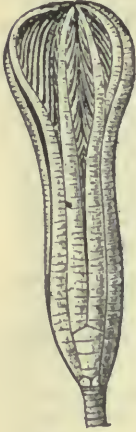


FIG. 295.
Ectenocrinus
grandis.

form very elongate; calyx small, subcylindrical, moderately expanding; basals 5, unequal; radials irregular, four plates in three series, before the bifurcation of the free arms, and three in each of the other two series; arms 10, long; pinnules strong; azygous plates 3, following each other, but not in a direct line; vault unknown; column very long, round, tripartite, and attaching by an expanded base. Type *E. simplex*. This genus is founded upon *Heterocrinus simplex*, Hall, as the type, because the genus *Heterocrinus* was founded upon *H. heterodactylus*, as

the type, which is quite widely removed from *H. simplex*.

canadensis, Billings, 1859, (*Heterocrinus canadensis*) Can. Org. Rem., Decade 4, p. 48, Trenton Gr.

grandis, Meek, 1873, (*Heterocrinus simplex* var. *grandis*) Pal. Ohio, vol. 1, pl. 1, Fig. 296.—*Ectenocrinus* fig. 7, Hud. *simplex*. Diagram. Riv. Gr.

simplex, Hall, 1847, (*Heterocrinus simplex*) Pal. N. Y., vol. 1, p. 280, Trenton and Hud. Riv. Gr.

EDRIOASTER, Billings, 1858, Can. Org. Rem., Decade 3, p. 82. [Ety. *edrion*, seat; *aster*, star.] A substitute for *Cyclaster*, proposed in 1857, the latter name having been preoccupied. Body sessile, discoid; plates numerous, irregular, polygonal; ambulacral grooves 5, tapering, composed of two series of oblong ossicles; with four rows of ambulacral pores in each; mouth large, formed of five oral and five internal ossicles. Type *E. bigsbyi*.

bigsbyi, Billings, 1857, (*Cyclaster bigsbyi*) Rep. of Progr. Geo. Sur. Can., p. 293, and Can. Org. Rem., Decade 3, p. 82, Trenton Gr.

EDRIOCRINUS, Hall, 1859, Pal. N. Y., vol. 3, p. 119. [Ety. *edrion*, seat; *krinon*, lily.] Body obconic; base solid, without column; radials 5, resting, in depressions, in the base; azygous plates 2, one large, resting in a basal depres-

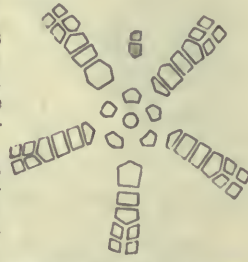


FIG. 296.—*Ectenocrinus* fig. 7, Hud. *simplex*. Diagram.

sion, the other smaller and succeeding the first; arms composed of transversely linear plates and bifurcating. Type *E. pocilliformis*.

pocilliformis, Hall, 1859, Pal. N. Y., vol. 3, p. 121, Low. Held. Gr.

pyriformis, Hall, 1862, 15th Rep. N. Y. St. Mus. Nat. Hist., p. 88, Up. Held. Gr. *sacculus*, Hall, 1859, Pal. N. Y., vol. 3, p. 143, Oriskany sandstone.

Elæocrinus, Roemer, 1852, syn. for *Nucleocrinus*.

kirkwoodensis, see *Nucleocrinus kirkwoodensis*.

verneuili, see *Nucleocrinus verneuili*.

ELEUTHEROCRINUS, Shumard & Yandell, 1856, Proc. Acad. Nat. Sci. Phil., vol. 8, p. 73. [Ety. *eleutheros*, free; *krinon*, lily.] Calyx subelliptical, resembling

Nucleocrinus in form but depressed on the azygous side; truncated at the summit and bulged on one side; subtriangular at the base and prolonged on one of its sides; basals 3, one small, two irregular and much elongated; radials 1x5, four-forked, occupying nearly the length of the calyx, one short and not forked; interradials 1x5; pseudambulacral areas 5, four linear, extending nearly the entire length of the calyx, one short, subtriangular, situated on the summit plane; apertures 8 (?). Type *E. casedayi*.

casedayi, Shumard & Yandell, 1856, Proc. Acad. Nat. Sci. Phil., vol. 8, p. 74, Up. Held. Gr.

whitfieldi, Hall, 1862, 15th Rep. N. Y. St. Mus. Nat. Hist., App. C, p. 123, Ham. Gr.

ECCIDARIS, Desor, 1858, Synopsis des Echinides Fossiles. [Ety. *eos*, dawn; *cidaris*, turban.] Plates hexagonal; one large tubercle on each plate, smooth at the base and perforated at the summit; distinguished from *Archæocidaris* by the absence of a second ring. Type *E.*

drydenensis, Vanuxem, 1842, (*Echinus drydenensis*) Geo. Rep. 3d Dist. N. Y., p. 184, and 20th Rep. N. Y. St. Mus. Nat. Hist., p. 343, Chemung Gr.

hallanus, Geinitz, 1866, Carb. und Dyas. in Neb., p. 61, and Pal. E. Neb., p. 152, Up. Coal Meas.

squamosus, see *Lepidocidaris squamosus*.

EOCYSTITES, Billings, 1868, Acad. Geol., p. 643. [Ety. *eos*, dawn; *kustis*, bladder.] Plates numerous, varying in size, form, and ornamentation, usually radiately sculptured. Type *E. primævus*.

longidactylus, Walcott, 1886, Bull. U. S. Geol. Sur., No. 30, p. 94, Upper Taconic.

primævus, Billings, 1868, Acad. Geol. p. 643, Up. Taconic, St. John's Gr.

ERETMOCRINUS, Lyon & Casseday, 1859, Am. Jour. Sci. and Arts, vol. 28, p. 241. [Ety. *eretmos*, oar; *krinon*, lily.] Body bitur-



FIG. 297.
Eocystites
primævus.

binate or subglobose, vault exceeding the calyx in size; basals 3, forming a wide rim; primary radials 3x5; arm openings 12 to 22; arms simple or compound, long, flattened in the upper portions; interradials 1 to 3; azygous interradials, 8 or more; tube or proboscis excentric and extending beyond the infolding arms; column round. Type *E. magnificus*.

adultus, Wachsmuth & Springer, 1881, Proc. Acad. Nat. Sci. Phil., p. 349, Keokuk Gr.

attenuatus, Hall, 1861, (Actinocrinus *matuta* var. *attenuatus*.) Desc. New Crin., p. 14, Burlington Gr.

calyculoides, Hall, 1860, (Actinocrinus *calyculoides*.) Supp. to Geo. Sur. Iowa, p. 17, Burlington Gr.

carica, Hall, 1861, (Actinocrinus *carica*.) Desc. New Crin., p. 10, Burlington Gr.

clio, Hall, 1861, (Actinocrinus *clio*.) Desc. New Crinoidea, p. 1, and Bost. Jour. Nat. Hist., vol. 7, p. 262, Burlington Gr.

clœlia, Hall, 1861, (Actinocrinus *clœlia*.) Desc. New Crinoidea, p. 1, and Bost. Jour. Nat. Hist., vol. 7, p. 266, Burlington Gr.

corbulis, Hall, 1861, (Actinocrinus *corbulis*.) Desc. New Crin., p. 1, and Bost. Jour. Nat. Hist., vol. 7, p. 265, Burlington Gr.

coronatus, Hall, 1860, (Actinocrinus *coronatus*.) Supp. Geo. Sur. Iowa, p. 28, Burlington Gr.

gemmaformis, Hall, 1860, (Actinocrinus *gemmaformis*.) Supp. Geo. Sur. Iowa, p. 23, Burlington Gr.

intermedius, Wachsmuth & Springer, 1881, Proc. Acad. Nat. Sci., p. 348, Keokuk Gr.

konincki, Shumard, 1855, (Actinocrinus *konincki*.) Geo. Sur. Mo., p. 194, Burlington Gr.

leucosia, Hall, 1861, (Actinocrinus *leucosia*.) Desc. New Crin., p. 1, and Bost. Jour. Nat. Hist., vol. 7, p. 261, Burlington Gr.

magnificus, Lyon & Caseday, 1859, Am. Jour. Sci. and Arts, vol. 28, p. 241, Keokuk Gr.

matuta, Hall, 1861, (Actinocrinus *matuta*.) Desc. New Crinoidea, p. 14, Burlington Gr.

matuta var. *attenuata*, see *E. attenuatus*.

neglectus, Meek & Worthen, 1869, (Bato-crinus *neglectus*.) Proc. Acad. Nat. Sci., p. 355, and Geo. Sur. Ill., vol. 5, p. 377, Burlington Gr.

originarius, Wachsmuth & Springer, 1881, Proc. Acad. Nat. Sci., p. 348, Keokuk Gr.

ramulosus, Hall, 1858, (Actinocrinus *ramulosus*.) Geo. Sur. Iowa, p. 615, Keokuk Gr.

remibrachiatus, Hall, 1861, (Actinocrinus *remibrachiatus*.) Desc. New Crinoidea, p. 11, Burlington Gr.

varsouviensis, Worthen, 1882, Bull. No. 1, Ill. St. Mus. Nat. Hist., p. 30, and Geo. Sur. Ill., vol. 7, p. 306, Warsaw Gr.

verneuillanus, Shumard, 1855, (Actinocrinus *verneuillanus*.) Geo. Sur. Mo., p. 193, Burlington Gr.



FIG. 299. Eretmocrinus verneuillanus.

ERISOCRINUS, Meek & Worthen, 1865, Am. Jour. Sci. and Arts, vol. 89, p. 174.

[Ety. *eris*, contention; *krinon*, lily.] Calyx saucer-shaped; basals 5, small; subradials 5, large; radials 2x5, large; no interradials; arms 10; column round. Type *E. typus*.

antiquus, Meek & Worthen, 1869, Proc. Acad. Nat. Sci. Phil., p. 71, and Geo. Sur. Ill., vol. 5, p. 447, Burlington Gr.

cognatus, Wachsmuth & Springer, 1887, Note to p. 255, Revis. Palæocrinoidea, syn. for *E. planus*.

conoideus, Meek & Worthen, 1865, Proc. Acad. Nat. Sci. Phil., p. 150, and Geo. Sur. Ill., vol. 2, p. 318, Up. Coal Meas.

inflexus, Geinitz, 1866, (Cyathocrinus *inflexus*.) Carb. und Dyas, in Neb., p. 62, and White's Cont. to Pal., No. 6, p. 128, Coal. Meas.

nebraskensis, Meek & Worthen, 1865, Am. Jour. Sci., vol. 89, p. 174, Up. Coal Meas. Regarded a variety of *E. typus*.

planus, White, 1880, Proc. U. S. Nat. Mus., vol. 2, p. 257, and Cont. to Pal., No. 6, p. 127, Coal Meas.

typus, Meek & Worthen, 1865, Am. Jour. Sci. and Arts, vol. 89, p. 174, and Geo. Sur. Ill., vol. 2, p. 319, Up. Coal Meas.

tuberculatus, see *Eupachycinus tuberculatus*.

whitii, Meek & Worthen, 1869, Proc. Acad. Nat. Sci. Phil., p. 72, and Geo. Sur. Ill., vol. 5, p. 448, Burlington Gr.

EUCALYPTOCRINUS, Goldfuss, 1826, Petref. Germ., p. 212. [Ety. *eu*, well; *kalyptos*, covered; *krinon*, lily.] Body turbinate

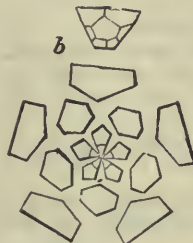


FIG. 300.—Erisocrinus conoideus. Side view, natural size; b, diagram, 2 diam.



FIG. 301.—Erisocrinus typus. Two side views, basal view, and top view of calyx.



FIG. 298. Eretmocrinus konincki.

or bowl-shaped from base to arms, and with arms and interbrachial plates subovate or subelliptical; basals 4, concealed in basal cavity and developed in the interior; primary radials 3 x 5, the first large; secondary radials 2 x 10; interradials 3, one very large; arms 20, composed of a double series of plates, which fill the interbrachial spaces; interbrachial plates solid, extending from the interradial plates as high as the arms reach, and uniting at the summit; proboscis or tube extending to the top, and sometimes far beyond; column round; attaching by branching roots. Type *E. rosaceus*.

armosus, see *Siphonocrinus armosus*.

celatus, Hall, 1843, (*Hypanthocrinites celatus*.) *Geo. Rep. 4th Dist. N. Y.*, p. 113, and 28th Rep. N. Y. St. Mus. Nat. Hist., p. 142, Niagara Gr.

chicagoensis, Winchell & Marcy, 1865, *Mem. Bos. Soc. Nat. Hist.*, p. 90, Niagara Gr.

conicus, Troost. Not defined.

constrictus, Hall, 1879, *Trans. Alb. Inst.*, vol. 10 (Abstract, p. 10), and 11th Rep. Geol. and Nat. Hist. Ind., p. 273, Niagara Gr.

cornutus, Hall, 1864, 20th Rep. N. Y. St. Mus. Nat. Hist., p. 363, Niagara Gr.

cornutus var. excavatus, Hall, 1864, 20th Rep. N. Y. St. Mus. Nat. Hist., p. 364, Niagara Gr.



FIG. 302.—*Eucalyptocrinus crassus*.

crassus, Hall, 1863, *Trans. Alb. Inst.*, vol. 4, p. 197, and 28th Rep. N. Y. St. Mus. Nat. Hist., p. 141, Niagara Gr.

decorus, Phillips, 1839, (*Hypanthocrinites decorus*.) *Murch. Sil. Syst.*, p. 672, and *Pal. N. Y.*, vol. 2, p. 207, Niagara Gr.

depressus, S. A. Miller, 1880, *Jour. Cin. Soc. Nat. Hist.*, vol. 3, p. 232, Niagara Gr.

egani, S. A. Miller, 1880, *Jour. Cin. Soc. Nat. Hist.*, vol. 3, p. 140, Niagara Gr.

extensus, Troost. Not defined.

gibbosus, Troost. Not defined.

goldfussi, Troost. Not defined.

inconspectus, Ringueberg, 1884, *Proc. Acad. Nat. Sci.*, p. 148. Not properly defined.

lævis, Troost. Not defined.

magnus, Worthen, 1875, *Geo. Sur. Ill.*, vol. 6, p. 501, Niagara Gr.

nashvilleæ, Troost. Not defined.

obconicus, Hall, 1864, 20th Rep. N. Y. St. Mus. Nat. Hist., p. 365, Niagara Gr.

ornatus, Hall, 1861, Rep. of Progr. Geo. Sur. of Wis., p. 20, Niagara Gr.

ovalis, Troost, as figured by Hall, 1876, 28th Rep. N. Y. St. Mus. Nat. Hist., p. 143, Niagara Gr.

papulosus, Hall, 1852, *Pal. N. Y.*, vol. 2, p. 211, Niagara Gr.

phillipsi, Troost. Not defined.

proboscidalis, S. A. Miller, 1882, *Jour. Cin. Soc. Nat. Hist.*, vol. 5, p. 224, Niagara Gr.

ramifer, Roemer, 1860, *Sil. Fauna West Tenn.*, p. 51, Niagara Gr.

rotundus, S. A. Miller, 1882, *Jour. Cin. Soc. Nat. Hist.*, vol. 5, p. 82, Niagara Gr.

splendidus, Troost, *Catal. Hall & Whitfield*, 1875, *Ohio Pal.*, vol. 2, p. 128, Niagara Gr.

tennesseeæ, Troost. Not defined.

tuberculatus,

Miller & Dyer, 1878, *Jour. Cin. Soc. Nat. Hist.*, vol. 1, p. 36, Niagara Gr.

turbinatus, S. A.

Miller, 1882, *Jour. Cin. Soc. Nat. Hist.*, vol. 5, p. 82, Niagara Gr.

EUCALDOCRINUS, Meek, 1871, U. S.

Geo. Sur. Terr., p. 373. [Ety. *eu*, very; *klados*, branch; *krinon*, lily.] Calyx like *Platycrinus*, and distinguished by having the radial series extended in the form of tubular free rays, which bear arms, alternately, on either side, throughout their length; arms composed of a double series of interlocking plates. Type *E. montanensis*.

millebrachiatus, Wachsmuth & Springer, 1878, *Proc. Acad. Nat. Sci. Phil.*, p. 245, Burlington and Keokuk Gr.

montanensis, Meek, 1871, *Hayden's Rep. U. S. Geo. Sur. Ter.*, p. 373, Subcarboniferous.

pleuroviminus, White, 1862, (*Platycrinus pleuroviminus*.) *Proc. Bost. Soc. Nat. Hist.*, vol. 9, p. 17, Up. Burlington Gr.

EUGASTER, Hall, 1868, 20th Rep. N. Y. St. Mus. Nat. Hist., p. 332. [Ety. *euge*, pre-eminent, remarkable; *aster*, star.] A central, alated disk, with five long, slender flexuous rays; disk composed on the ventral side of small polygonal



FIG. 303.—*Eucalyptocrinus tuberculatus*.

plates; rays consisting of a double series of alternating, subquadrate, ambulacral ossicles, with curved ambulacral plates; oral plates 10; pores large, two rows in each ray; adambulacral and disk-plates spine-bearing. Type *E. logani*.

concinus, Ringueberg, 1886, Bull. Buff. Soc. Nat. Sci., vol. 5, p. 8, Niagara Gr.

logani, Hall, 1868, 20th Rep. N. Y. St. Mus. Nat. Hist., p. 333, Ham. Gr.

EUPACHYCRINUS, Meek & Worthen, 1865, Proc. Acad. Nat. Sci. Phil., p. 159. [Ety. *eu*, very; *pachys*, thick; *krinon*, lily.] Calyx saucer or bowl shaped; plates heavy, tumid; sutures strongly defined; basals 5; subradials 5; radials 2 x 5, and sometimes there are third radials in some of the rays; the second radials are often spine-bearing; azygous interradials 3; arms 5 or 10, composed of a double series of plates, bearing pinnules; column round. Type *E. quatuordecembrachialis*.

asperatus, Worthen, 1882, Bull. No. 1, Ill. St. Mus. Nat. Hist., p. 34, and Geo. Sur. Ill., vol. 7, p. 311, Kaskaskia Gr.

bassetti, Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 528, Coal Meas.

boydi, Meek & Worthen, 1870, Proc. Acad. Nat. Sci. Phil., p. 30, and Geo. Sur. Ill., vol. 5, p. 554, Kaskaskia Gr.

craigi, Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 527, Coal Meas.

crassus, Meek & Worthen, 1870, (Cyathocrinus *crassus*.) Proc. Acad. Nat. Sci. Phil., p. 392, and Geo. Sur. Ill., vol. 2, p. 314, Low. Coal Meas.

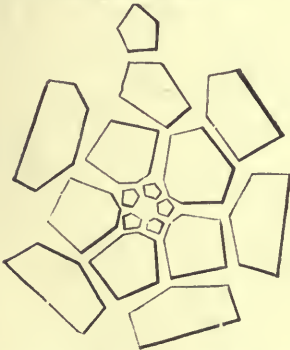


FIG. 304.—*Eupachyrcrinus crassus*. Diagram.

fayettensis, Worthen, 1873, Geo. Sur. Ill., vol. 5, p. 565, Up. Coal Meas.

formosus, Worthen, 1873, (*Zeacrinus formosus*.) Geo. Sur. Ill., vol. 5, p. 549, Kaskaskia Gr.

germanus, S. A. Miller, 1879, Jour. Cin. Soc. Nat. Hist., vol. 2, p. 40, Kaskaskia Gr.

gracilis, Wetherby, 1880, (*Cromyocrinus gracilis*.) Jour. Cin. Soc. Nat. Hist., vol. 2, p. 248, Kaskaskia Gr.

hemisphericus, Shumard, 1858, (*Poterocrinus hemisphericus*.) Trans. St. Louis, Acad. Sci., vol. 1, p. 221, and Geo. Sur. Ill., vol. 5, p. 561, Coal Meas.

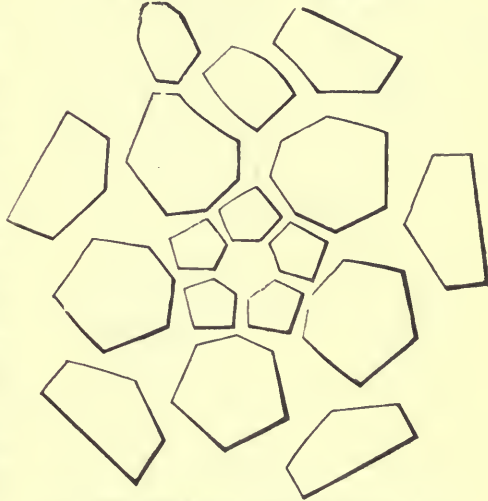


FIG. 305.—*Eupachyrcrinus saugamonensis*. Diagram.

monroensis, Worthen, 1882, Bull. No. 1, St. Mus. Nat. Hist., p. 30, Kaskaskia Gr.

orbicularis, Hall, 1861, (*Scaphiocrinus orbicularis*.) Bost. Jour. Nat. Hist., p. 311, Keokuk Gr.

pentalobus, Hall, 1858, (*Cyathocrinus pentalobus*.) Geo. Sur. Iowa, p. 687, Kaskaskia Gr.

platybasis, White, 1876, Geo. Uinta Mountains, p. 108, and Cont. to Pal., No. 6, p. 124, Low. Aubrey Gr.

quatuordecembrachialis, Lyon, 1857, (*Graphiocrinus quatuordecembrachialis*.) Geo. Sur. Ky., vol. 3, p. 477, Kaskaskia Gr.

sanctiludovici, Worthen, (in press.) Geo. Sur. Ill., vol. 8, p. 98, St. Louis Gr.

saugamonensis, Meek & Worthen, 1861, (*Cyathocrinus saugamonensis*.) Proc. Acad. Nat. Sci. Phil., p. 392, and Geo. Sur. Ill., vol. 2, p. 310, Up. Coal Meas.

spartarius, S. A. Miller, 1879, Jour. Cin. Soc. Nat. Hist., vol. 2, p. 38, Kaskaskia Gr.

subtumidus, Worthen, 1867, (*Zeacrinus subtumidus*.) Geo. Sur. Ill., vol. 5, p. 548, Kaskaskia Gr.

tuberculatus, Meek & Worthen, 1865, (*Erisocrinus tuberculatus*.) Proc. Acad. Nat. Sci. Phil., p. 150, and Geo. Sur. Ill., vol. 2, p. 319, Coal Meas.

verrucosus, White & St. John, 1869, Trans. Chi. Acad. Sci., p. 117, Coal Meas.



FIG. 306.—*Euspirocrinus obconicus*.

covered with large plates; arms bifurcate. Type E. spiralis.
obconicus, W. R. Billings, 1885, Ottawa Field Nat. Club, vol. 2, p. 248, Trenton Gr.

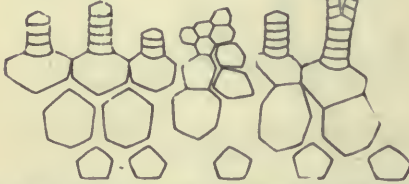


FIG. 307.—*Euspirocrinus obconicus*. Diagram.

FORBESOCRINUS, DeKoninck & LeHon, 1854, Resch. Crin. Carb. Belg., p. 118. [Ety. proper name; *krinon*, lily.] Calyx large, plates heavy; basals 3; subradials 5; primary radials 3 or 4 x 5; secondary radials 2 to 4 x 10; tertiary radials 2 to 4 x 20; arms 50 to 60, long and sometimes dividing; regular interradials 10 to 20 or more; azygous interradians numerous; interaxillaries 10 to 20 or more. Type F. nobilis.
agassizi, Hall, 1858 and 1860, Geo. Sur. of Iowa, p. 631, Burlington Gr.
agassizi var. *giganteus*, Meek & Worthen, 1861, Proc. Acad. Nat. Sci. Phil. p. 131, and Geo. Sur. Ill., vol. 3, p. 495, Burlington Gr.
asteriformis, see *Onychocrinus asteriformis*.
cestriensis, Hall, 1860, Supp. to Geo. Iowa, p. 68, Kaskaskia Gr.
communis, see *Taxocrinus communis*.
giddingi, see *Taxocrinus giddingi*.
juvenis, see *Taxocrinus juvenis*.
kelloggi, see *Taxocrinus kelloggi*.
lobatus, see *Taxocrinus lobatus*.
lobatus var. *tardus*, see *Taxocrinus lobatus* var. *tardus*.
meeki, see *Taxocrinus meeki*.
monroensis, see *Onychocrinus monroensis*.

multibrachiatus, see *Taxocrinus multibrachiatus*.
norwoodi, see *Onychocrinus norwoodi*.
nuntius, see *Taxocrinus nuntius*.
parvus, Wetherby, 1879, Jour. Cin. Soc. Nat. Hist., vol. 2, p. 138, Kaskaskia Gr.



FIG. 308.—*Forbesocrinus wortheni*.

pratteni, see *Melocrinus pratteni*.
ramulosus, Lyon & Casseday, see *Onychocrinus ramulosus*.
ramulosus, Hall, see *Taxocrinus ramulosus*.
saffordi, see *Taxocrinus saffordi*.
semiovatus, see *Taxocrinus semiovatus*.
shumardanus, see *Taxocrinus shumardanus*.
spiniger, see *Taxocrinus spiniger*.
subramulosus, Shumard, 1866, syn. for *Taxocrinus ramulosus*.
thiemii, see *Taxocrinus thiemii*.
whitfieldi, see *Taxocrinus whitfieldi*.
wortheni, Hall, 1858, Geo. Rep. Iowa, p. 632, Keokuk Gr.



FIG. 309.—*Gaurocrinus nealli*. Diagram.

GAUROCRINUS, S. A. Miller, 1883, Jour. Cin. Soc. Nat. Hist., vol. 6, p. 228. [Ety. *gauros*, haughty; proud; *krinon*, lily.]

Calyx having strong radial ridges and depressed interradial and intersecondary radial areas; basals 5; subradials 5; primary radials 3x5, or the left posterior ray only 2; secondary radials 10 to 16x10; interradial plates numerous and small; azygous area supported by a ridge up the middle series of plates; vault covered by small plates, which are continued as a covering over the arm furrows; arms 20 or more, bearing pinnules. Type *G. nealli*.

angularis, Miller & Dyer, 1878, (*Glyptocrinus angularis*.) Jour. Cin. Soc. Nat. Hist., vol. 1, p. 28, Hud. Riv. Gr.

cognatus, S. A. Miller, 1881, (*Glyptocrinus cognatus*.) Jour. Cin. Soc. Nat. Hist., vol. 4, p. 75, Hud. Riv. Gr.

magnificus, S. A. Miller, 1883, Jour. Cin. Soc. Nat. Hist., vol. 6, p. 230, Hud. Riv. Gr.

nealli, Hall, 1866, (*Glyptocrinus nealli*.) Adv. Sheets 24th Rep. N. Y. St. Mus. Nat. Hist., p. 206, and Ohio Pal., vol. 1, p. 34, Hud. Riv. Gr.

splendens, S. A. Miller, 1883, Jour. Cin. Soc. Nat. Hist., vol. 6, p. 230, Trenton Gr.

FIG. 310.—*Gaurocrinus nealli*.

GENNAEOCRINUS, Wachsmuth & Springer, 1882, Proc. Acad. Nat. Sci., p. 334. [*Ety. gennaios*, of noble birth; *krinon*, lily.] Body wider than high, lobed, striated; vault low; basals 3; primary radials 3x5; secondary radials 1x10; interradials 5 to 7; azygous interradials more numerous, and having three plates in the second row instead of two, as in *Actinocrinus*; interaxillaries 1 to 3. Type *G. cornigerus*.

calypso, Hall, 1862, (*Actinocrinus calypso*.) 15th Rep. N. Y. St. Mus. Nat. Hist., p. 133, Ham. Gr.

cassedayi, Lyon, 1861, (*Actinocrinus cassedayi*.) Proc. Acad. Nat. Sci. Phil., p. 410, Up. Held. Gr.

cauliculus, Hall, 1862, (*Actinocrinus cauliculus*.) 15th Rep. N. Y. St. Mus. Nat. Hist., p. 132, Ham. Gr.

cornigerus, Lyon & Casseday, 1859, (*Actinocrinus cornigerus*.) Am. Jour. Sci., vol. 28, p. 238, Ham. Gr.

eucharis, Hall, 1862, (*Actinocrinus eucharis*.) 15th Rep. N. Y. St. Mus. Nat. Hist., p. 130, Ham. Gr.

kentuckiensis, Shumard, 1860, (*Actinocrinus kentuckiensis*.) Trans. St. Louis Acad. Sci., p. 345, syn. for *G. cornigerus*.

nyssa, Hall, 1862, (*Actinocrinus nyssa*.) 15th Rep. N. Y. St. Mus. Nat. Hist., p. 129, Ham. Gr.

pocillum, Hall, 1862, (*Actinocrinus pocillum*.) 15th Rep. N. Y. St. Mus. Nat. Hist., p. 134, Ham. Gr.

GLYPTASTER, Hall, 1852, Pal. N. Y., vol. 2, p. 187. [*Ety. glyptos*, sculptured; *aster*, star.] Calyx obconical, depressed between the arm bases, radial portion ridged; basals 5; subradials 5; primary radials 3x5; secondary radials 2 or more by 10; interradials 6 or more; azygous interradials more numerous; arms 10, composed of double series of plates. Type *G. brachiatus*.

brachiatus, Hall, 1852, Pal. N. Y., vol. 2, p. 187, Niagara Gr.



FIG. 311.—*Glyptaster egani*. Natural size and enlarged.

egani, S. A. Miller, 1881, Jour. Cin. Soc. Nat. Hist., vol. 4, p. 261, Niagara Gr.

inornatus, Hall, 1863, Trans. Alb. Inst., vol. 4, p. 205, and 28th Rep. N. Y. St. Mus. Nat. Hist., p. 134, Niagara Gr.

occidentalis, Hall, 1863, Trans. Alb. Inst., vol. 4, p. 204, and 28th Rep. N. Y. St. Mus. Nat. Hist., p. 134, Niagara Gr.

occidentalis var. *crebescens*, Hall, 1879, 28th Rep. N. Y. St. Mus. Nat. Hist., p. 133, Niagara Gr.

pentangularis, Hall, 1867, 20th Rep. N. Y. St. Mus. Nat. Hist., p. 369, Niagara Gr.

GLYPTOCRINUS, Hall, 1847, Pal. N. Y., vol. 1, p. 230. [*Ety. glyptos*, sculptured;



FIG. 312.—*Glyptaster occidentalis*.

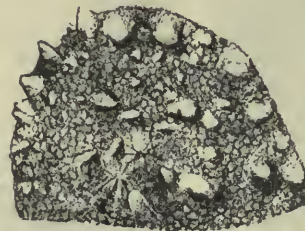


FIG. 313.—*Glyptocrinus decadactylus*. Part of vault mag. 6 diam, showing excurrent opening.

krinon, lily.] Calyx obconoidal, interradial areas flattened or depressed; surface sculptured and having radial ridges; basals 5; primary radials 3x5;

secondary radials 1 or more by 10; tertiary radials usually present; arms 10 to 20 or more, bearing pinnules; first interradial resting upon the first

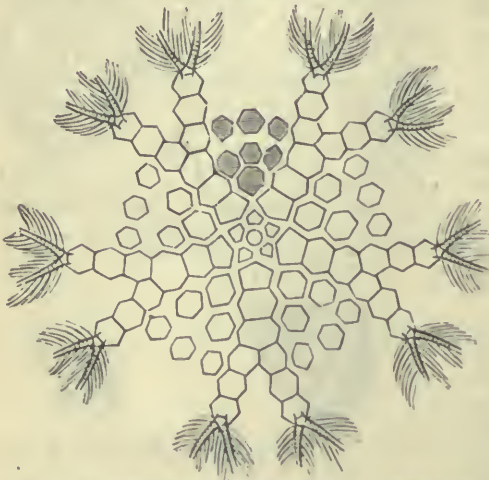


FIG. 314.—Glyptocrinus decadaetylus. Diagram.

primary radials, and followed by succeeding ranges of two or more, which graduate into the vault; vault slightly convex, with sunken interradial areas; plates becoming smaller as they approach the inner face of the arms, and becoming a somewhat granular continuous cover over the ambulacral furrows; excurrent opening subcentral on the upper face of the vault; column round, without base or roots for attachment.

Type *G. decadaetylus*.

angularis, see *Gaurocrinus angularis*.



FIG. 316.—Glyptocrinus fornshelli.

A. Miller, 1878, Jour. Cin. Soc. Nat. Hist., vol. 1, p. 103, Hud. Riv. Gr.

argutus, Walcott, 1883, 35th Rep. N. Y. St. Mus. Nat. Hist., p. 207, Trenton Gr.

armosus, see *Siphonocrinus armosus*.

baeri, see *Xenocrinus baeri*.

carleyi, see *Mariacrinus carleyi*.

cognatus, see *Gaurocrinus cognatus*.

decadaetylus, Hall, 1847, Pal. N. Y., vol. 1, p. 281, Hud. Riv. Gr.

dyeri, Meek, 1872, Proc. Acad. Nat. Sci. Phil., p. 314, and Ohio Pal., vol. 1, p. 32, Hud. Riv. Gr.

dyeri var. *sublaevis*, S.

fimbriatus, Shumard, 1855, Geo. Sur. Mo., p. 194, Trenton Gr.

forshellii, S. A. Miller, 1874, Cin. Quar. Jour. Sci., vol. 1, p. 348, Hud. Riv. Gr. *gracilis*, Wetherby, syn. for *Gaurocrinus angularis*.

harrisi, see *Compsoocrinus harrisi*.

lacunosus, see *Archæocrinus lacunosus*.

libanus, Safford, 1869, Geo. of Tenn. Not defined.

marginatus, see *Archæocrinus marginatus*.

miamiensis, S. A. Miller, 1882, Jour. Cin. Soc. Nat. Hist., vol. 5, p. 34, Hud. Riv. Gr.

nealli, see *Gaurocrinus nealli*.

nobilis, see *Siphonocrinus nobilis*.

ornatus, Billings, 1857, Rep. of Progr. Geo. Sur. Can., p. 260, and Can. Org. Rem., Decade 4, p. 60, Trenton Gr.

parvus, Hall, 1872, 24th Rep. N. Y. St. Mus. Nat. Hist., p. 207, Hud. Riv. Gr.

pattersoni, S. A. Miller, 1882, Jour. Cin. Soc. Nat. Hist., vol. 5, p. 80, Utica Slate Gr.

plumosus, Hall, 1843, (*Actinocrinus plumosus*), Geo. Rep. 4th Dist. N. Y., p. 72, and Pal. N. Y., vol. 2, p. 180, Clinton Gr. Founded upon fragments too poor for even generic determination.

priscus, Billings, 1857, Rep. of Progr. Geo. Sur. Can., p. 257, and Can. Org. Rem., Decade 4, p. 56, Black Riv. and Trenton Grs.

quinquepartitus, Billings, 1859, Can. Org. Rem., Decade 4, pl. 8, fig. 4a, 4b, Trenton Gr.

ramulosus, Billings, 1856, Can. Nat. Geo., vol. 1, and Can. Org. Rem., Decade 4, p. 57, Trenton Gr.

richardsoni, Wetherby, 1880, Jour. Cin. Soc. Nat. Hist., vol. 2, p. 245, Hud. Riv. Gr.

sculptus, S. A. Miller, 1882, Jour. Cin. Soc. Nat. Hist., vol. 5, p. 37, Hud. Riv. Gr.

shafferi, see *Pycnocrinus shafferi*.

shafferi var. *germanus*, see *Pycnocrinus germanus*.

siphonosus, Hall, 1861, syn. for *Siphonocrinus armosus*.

subglobosus, Meek, 1873, (*G. dyeri* var. *subglobosus*), Pal. Ohio, vol. 1, p. 34, Hud. Riv. Gr.

subnodosus, see *Rhaphanocrinus subnodosus*.

GLYPTOCYSTITES, Billings, 1854, Can. Jour., vol. 2, p. 215, and Can. Org. Rem., Decade 3, p. 53. [Ety. *glyptos*, sculptured; *kustis*, bladder.] Body elongate, cylindrical; four series of plates, 4 in the basal and 5 in each succeeding series; mouth in one of the plates of the second series; ambulacral orifice at the center of the summit where it receives the five ambulacral grooves; arms recumbent upon the apex of the fossil,

and grooves beset with small plates; 10 to 13 pectinated rhombs; column short, tapering to a point. Type *G. multiporus*. anatiformis, Hall, 1847, (Echinoencrinites anatiformis,) Pal. N. Y., vol. 1, p. 89, Trenton Gr.

forbesi, Billings, 1857, Rep. of Progr. Geo. Sur. Can., p. 283, and Can. Org. Rem., Decade 3, p. 59, Chazy Gr.

logani, Billings, 1857, Rep. of Progress, Geo. Sur. Can., p. 282, and Can. Org. Rem., Decade 3, p. 57, Trenton Gr.



FIG. 317.—Glyptocystites multiporus.

logani var. gracilis, Billings, 1858, Can. Org. Rem., Decade 3, p. 59, Trenton Gr. multiporus, Billings, 1854, Can. Jour., vol. 2, p. 215, and Can. Org. Rem., Decade 3, p. 54, Trenton Gr.

GOMPHOCYSTITES, Hall, 1869, 20th Rep. N. Y. St. Mus. Nat. Hist., p. 351, [Ety. *gomphos*, nail or rudder; *kustis*, bladder.] Elongate pyriform, narrow

indianensis n. sp., Niagara Gr. Upper part elliptical in outline and regularly convex; five ambulacral grooves curve spirally outward from an ambulacral orifice within the groove near the mouth, and extend below the summit; mouth round, situate between two of the ambulacral grooves; each ambulacral groove has a suture in the bottom of it, but there is no other evidence of the subdivision of the top into plates; even the mouth appears as a hole through a solid test; whole surface tuberculated, and each tubercle pierced with a pair of pores. Collected by J. F. Hammell in Jefferson County, Indiana.



FIG. 319.—Gomphocystites indianensis. Summit view.

tenax, Hall, 1864, 20th Rep. N. Y. St. Mus. Nat. Hist., p. 352, Niagara Gr.

GONIASTEROIDOCRINUS, Lyon & Casseday, 1859, Am. Jour. Sci., vol. 28, 2d series, p. 233. [Ety. like the recent genus *Goniaster*; *krinon*, lily.] Body short, cylindrical, or subglobose; basals 5; subradials 5, often protuberant; primary radials 3 x 5; secondary radials 2 to 4 x 10; arms numerous, delicate, pend-

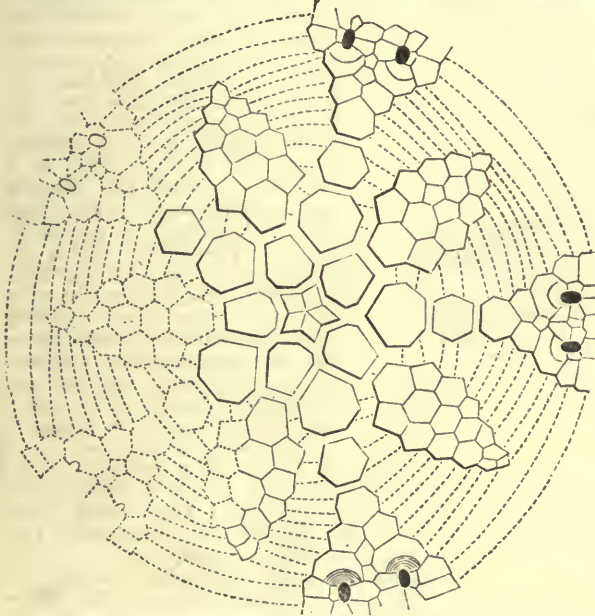


FIG. 318.—Goniasteroidocrinus fiscellus. Diagram 2 diam.

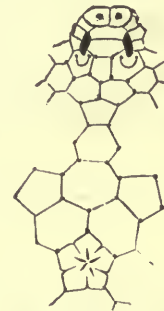


FIG. 320.—Diagrammatic view of Gilbertsocrinus bursa to show it is distinct from Goniasteroidocrinus.

below, inflated above; plates spirally arranged; ambulacral orifice central on the upper surface; mouth excentric; arms sessile, and curving from the ambulacral orifice outward to or below the point of greatest diameter. Type *G. glans*. clavus, Hall, 1864, 20th Rep. N. Y. St. Mus. Nat. Hist., p. 353, Niagara Gr. glans, Hall, 1864, 20th Rep. N. Y. St. Mus. Nat. Hist., p. 352, Niagara Gr.

ent, supporting pinnules; interradials 10 to 18 in each area; vault depressed and extending in five or six pseudo-brachial appendages star-like, which bifurcate, then spread, curve, and terminate each in a point; these brachial appendages separate the interradial areas from the dome; excurrent orifice sublateral, not protruding. Type *S. tuberosus*. There are some who use *Ollacrinus* as the

generic name, but it was not defined or established; there are others who use *Gilbertocrinus*, but it, probably, is a distinct genus, and, so far, not known in America.

fiscellus, Meek & Worthen, 1861, (*Trematocrinus fiscellus*.) Proc. Acad. Nat. Sci. Phil., p. 383, and Geo. Sur. Ill., vol. 2, p. 222, Burlington Gr.

robustus, Hall, 1860, (*Trematocrinus robustus*.) Supp. to Geo. Rep. Iowa, p. 77, Keokuk Gr.

spinigerus, Hall, 1862, (*Trematocrinus spinigerus*.) 15th Rep. N. Y. St. Mus. Nat. Hist., p. 128, Ham. Gr.

tenuiradiatus, Meek & Worthen, 1869, Proc. Acad. Nat. Sci. Phil., p. 75, and Geo. Sur. Ill., vol. 5, p. 389, Burlington Gr.

tuberculosis, Hall, 1860, (*Trematocrinus tuberculosis*.) Supp. to Geo. Rep. Iowa, p. 75, Burlington Gr.

tuberosus, Lyon & Casseday, 1859, Am. Jour. Sci., vol. 28, 2d ser., p. 233, Kaskaskia Gr.

typus, Hall, 1860, (*Trematocrinus typus*.) Supp. to Geo. Rep. Iowa, p. 73, Burlington Gr.

GRANATOCRINUS, Troost, 1850, Cat.

Foss. in Am. Jour. Sci., vol. 8, p. 420, and described by Hall, 1862, 15th Rep. N. Y. St. Mus. Nat. Hist., p. 146. [Ety. *granatos*, granular; *krinon*, lily.]

Calyx subglobose oval or elliptic; the proportions of the plates giving a very different outline to the calyx from that of a *Pentremites*; summit depressed convex; base flattened or concave; ambulacral areas like those in *Pentremites*, but narrower, and extending nearly or quite the entire length; basals 3, sunken so as not to be visible in a side view; radials and deltoids similar to those of *Pentremites* and proportionally as variable; slender, thread-like arms, or pinnules, as in *Pentremites*; ambulacra and lancet-plates in narrow sinuses; anal opening as in *Pentremites*; central opening and spiracles often closed by small plates; ten narrow hydrospiral canals open externally by either five or ten apertures. Type *G. norwoodi*.

cidariformis, Troost. Not defined.

cornutus, Meek & Worthen, 1861, (*Pentremites cornutus*.) Proc. Acad. Nat. Sci. Phil., p. 141, and Geo. Sur. Ill., vol. 2, p. 276, St. Louis Gr.

curtus, Shumard, 1855, (*Pentremites curtus*.) Geom. Rep. Mo., p. 187, Warsaw Gr.

glaber, Meek & Worthen, 1869, Proc. Acad. Nat. Sci. Phil., p. 91, and Geo. Sur. Ill., vol. 5, p. 537, St. Louis Gr.

granulatus, Roemer, 1852, (*Pentatrematites granulatus*.) Monog. Blast., p. 43, Warsaw Gr.

granulosus, Meek & Worthen, 1865, Proc. Acad. Nat. Sci. Phil., p. 165, and Geo. Sur. Ill., vol. 5, p. 508, Keokuk Gr.

leda, Hall, 1862, (*Pentremites leda*.) 15th Rep. N. Y. Mus. Nat. Hist., p. 149, Ham. Gr.

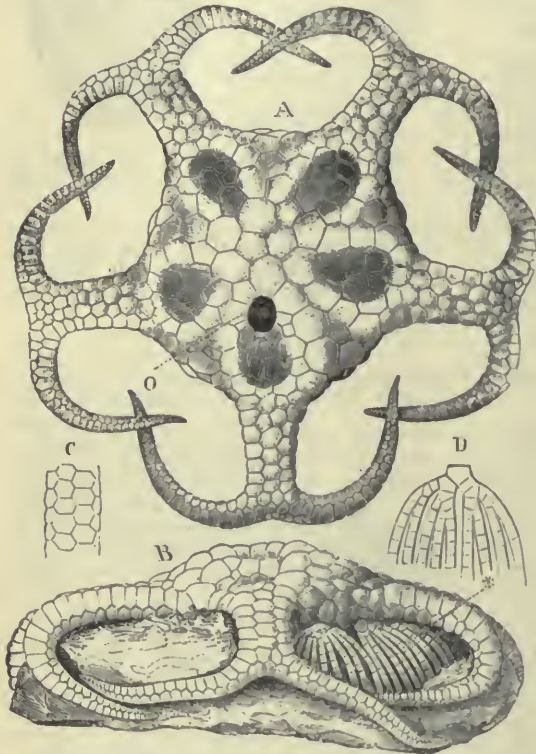


FIG. 321.—*Gonlasteroiodocrinus tuberosus*. A is the vault; O, the opening; B, side view of vault; C, under side of false arms; D, enlargement of base of arms.



FIG. 322.—Three views of *Gilbertocrinus calcaratus*, to show the genus is distinct from *Gonlasteroiodocrinus*.

obovatus, Meek & Worthen, 1869, Proc. Acad. Nat. Sci., Phil., p. 76, and Geo. Sur. Ill., vol. 5, p. 391, Burlington Gr.

papillatus, Hall, 1860, (*Trematocrinus papillatus*.) Supp. to Geo. Rep. Iowa, p. 76, Burlington Gr.

reticulatus, Hall, 1861, (*Trematocrinus reticulatus*.) Desc. New Crinoidea, p. 9, and Bost. Jour. Nat. Hist. vol. 7, p. 325, Burlington Gr.

lotoblastus, White, 1874, Rep. Invert. Foss., p. 15, and Geo. Sur. W. 100th Mer., vol. 4, p. 80, Subcarb.

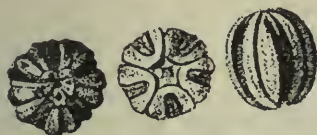


FIG. 323.—Granatocrinus melo.

melo, Owen & Shumard, 1850, (Pentremites melo,) Jour. Acad. Nat. Sci. Phil., 2d ser., vol. 2, p. 65, Burlington Gr. Etheridge & Carpenter made this species the type of a new genus, Cryptoblastus, and referred to the same genus *G. pisum*. The generic characters, however, are not apparent.

melo var. *projectus*, see *Granatocrinus projectus*.

melonoides, see *Schizoblastus melonoides*.

missouriensis, Shumard, 1866, Trans. St. Louis Acad. Sci., vol. 2, p. 375, Waverly Gr.

neglectus, Meek & Worthen, 1869, Proc. Acad. Nat. Sci. Phil., p. 90, and Geo. Sur. Ill., vol. 5, p. 471, Burlington Gr.

norwoodi, Owen & Shumard, 1850, (Pentremites norwoodi,) Jour. Acad. Nat. Sci. Phil., 2d ser., vol. 2, p. 64, Burlington Gr.

pisum, Meek & Worthen, 1869, Proc. Acad. Nat. Sci. Phil., p. 89, and Geo. Sur. Ill., vol. 5, p. 470, Burlington Gr.

projectus, Meek & Worthen, 1861, Proc. Acad. Nat. Sci. Phil., p. 42, and Geo. Sur. Ill., vol. 3, p. 496, Burlington Gr.

roemeri, Shumard, 1855, (Pentremites roemeri,) Geo. Rep. Mo., p. 186, Waverly Gr.

sayi, see *Schizoblastus sayi*.

shumardi, Meek & Worthen, 1866, Proc. Acad. Nat. Sci. Phil., p. 257, and Geo. Sur. Ill., vol. 3, p. 498, Burlington Gr.

GRAPHIOCRINUS, DeKoninck & LeHon, 1853, Rech. Crin. Carb. Belg., p. 115.

[Ety. *graphion*, writing instrument; *krinon*, lily.] The authors described this genus as having only basals and radials, but as re-defined, by Wachsmuth, there are five basals concealed by the column; subradials 5; radials 1 x 5, upper margins straight; brachials 1 x 5; sutures gaping; arms 10, long, heavy, short joints, parallel sutures; pinnules long; azygous interradial 1, small, but extending above the radials; strong ventral sac or proboscis. Type *G. encrinoides*.

carbonarius, Meek & Worthen, 1861, (Scaphiocrinus carbonarius.) Proc. Acad.

Nat. Sci. Phil., p. 140, and Geo. Sur. Ill., vol. 5, p. 562, Coal Meas.

dactylus, Hall, 1860, Supp. to Geo. Rep. Iowa, p. 80, and Geo. Sur. Ill., vol. 5, p. 559, St. Louis Gr.

longicirrifera, Wachsmuth & Springer, (in press,) Geo. Sur., Ill., vol. 8, p. 193, Kinderhook Gr.

macadamsi, Worthen, 1873, (Scaphiocrinus macadamsi,) Geo. Sur. Ill., vol. 5, p. 495, Keokuk Gr.

quatuordecembrachialis, see *Eupachyrcrinus decembrachialis*.

rudis, Meek & Worthen, 1869, (Scaphiocrinus rudis,) Proc. Acad. Nat. Sci. Phil., p. 39, and Geo. Sur. Ill., vol. 5, p. 412, Burlington Gr.

simplex, Hall, 1858, (Scaphiocrinus simplex,) Geo. Sur. Iowa, p. 551, Burlington Gr.

spinobrachiatus, Hall, 1861, (Scaphiocrinus spinobrachiatus,) New Pal. Crin., p. 8, and Bost. Jour. Nat. Hist., p. 306, Burlington Gr.

striatus, Meek & Worthen, 1869, (Scaphiocrinus striatus,) Proc. Acad. Nat. Sci. Phil., p. 142, and Geo. Sur. Ill., vol. 5, p. 418, Burlington Gr.

tortuosus, Hall, 1861, (Scaphiocrinus tortuosus,) Desc. New Crin., p. 7, and Bost. Jour. Nat. Hist., p. 309, Burlington Gr.



FIG. 325.—Graphiocrinus longicirrifera.



FIG. 326.—Graphiocrinus rudis.

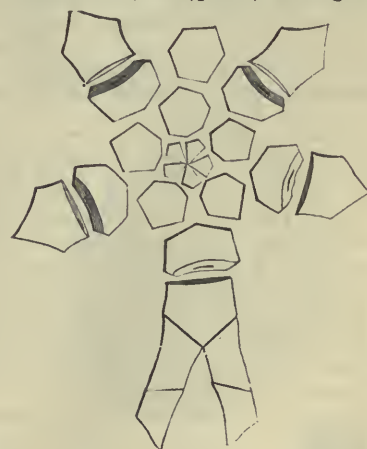


FIG. 327.—Graphiocrinus wachsmuthi. Diagram, 2 diam.

- wachsmuthi, Meek & Worthen, 1861, (Scaphiocrinus wachsmuthi,) Proc. Acad. Nat. Sci. Phil., p. 141, and Geo. Sur. Ill., vol. 3, p. 488, Burlington Gr.
- HADROCRINUS**, Lyon, 1869, Trans. Am. Phil. Soc., vol. 13, p. 445. [Ety. *adros*, full grown; *krinon*, lily.] Calyx broad, low vasiform, dome hemispherical; basals 3, hidden by the column; primary radials 2 x 5; secondary, tertiary, and higher orders of radials, having 2 in each series; arm-openings numerous, and not separated by interradians; interradials 3 or 4; column round. Type *H. plenissimus*.
- discus*, Lyon, 1869, Trans. Am. Phil. Soc., vol. 13, p. 448, Up. Held. Gr.
- pentagonus*, Lyon, 1869, Trans. Phil. Soc., vol. 13, p. 446, Up. Held. Gr.
- plenissimus*, Lyon, 1869, Trans. Phil. Soc., vol. 13, p. 445, Up. Held. Gr.
- Halysiocrinus*, Ulrich, 1886, 14th Rep. Geo. Sur. Minn., p. 110, syn. for *Deltacrinus*.
- HAPLOCRINUS**, Steinger, 1834, Bul. Soc. Geol. France, t. 8, 1st series, p. 232. [Ety. *haploos*, simple; *krinon*, lily.] Calyx small subtruncate; basals 5; radials 2 x 3 plus 1 x 2, protruding at the center of the superior face for the attachment of arms; dome convex, composed of 5 plates, having sutures from the center of the arm-openings toward the central part of the dome. Type *H. sphaeroideus*.
- clio*, Hall, 1862, 15th Rep. N. Y. St. Mus. Nat. Hist., App. C., p. 115, Marcellus shale.
- granulatus*, Troost, Not defined.
- hemisphericus*, Troost, Not defined.
- maximus*, Troost, Not defined.
- ovalis*, Troost, Not defined.
- HEMICOSMITES**, Von Buch, 1840, Monatsber. d. Berlin Akad., p. 129, and Geol. Russia, vol. 2, p. 31. [Ety. *hemi*, half; *kosmos*, sphere.] Body having four series of plates; basals 4; second series 6; third series 9; ovarian orifice between second and third series; mouth central. Type *H. malum*.
- subglobosus*, Hall, 1864, 20th Rep. N. Y. St. Mus. Nat. Hist., p. 359, Niagara Gr.
- HEMICYSTITES**, Hall, 1852, Pal. N. Y., vol. 2, p. 245. [Ety. *hemi*, half; *kustis*, bladder.] Parasitic, circular, more or less convex on the upper surface and sometimes sac-like in form; composed of numerous imbricating plates; ambulacra 5, straight, radiating from the center and composed each of a double series of alternating plates, forming part of the upper surface; aperture eccentric. Type *H. parasiticus*.
- altus*, syn. for *H. granulatus*.
- granulatus*, Hall, 1872, 24th Rep. N. Y. St. Mus. Nat. Hist., pl. 6, fig. 164, Hud. Riv. Gr.
- parasiticus*, Hall, 1852, Pal. N. Y., vol. 2, p. 246, Niagara Gr.
- stellatus*, Hall, 1866, Adv. Sheets 24th Rep. N. Y. St. Mus. Nat. Hist., p. 215, Hud. Riv. Gr.
- HETEROCRINUS**, Hall, 1847, Pal. N. Y., vol. 1, p. 278. [Ety. *heteros*, irregular; *krinon*, lily.] Calyx, small, slightly expanded; basals 5; radials irregular, two or three of the rays having two plates each, and the others only one; four radials supported on the basals; the other is smaller and rests on the azygous plate, and supports the ventral sac on one side and the brachials on the other; brachials, generally, four to each ray, the last one axillary, and supporting two arms, which sometimes branch at irregular distances; pinnules strong; azygous plate pentagonal; column pentagonal, pentapartite; attaching base small. Type *H. heterodactylus*.
- articulosus*, see *Calceocrinus articulosus*.
- bellevillensis*, W. R. Billings, Trans. No. 4, Ottawa Field Naturalists Club, p. 49, Trenton Gr.
- canadensis*, see *Ectenocrinus canadensis*.
- constrictus*, see *Ohioocrinus constrictus*.
- constrictus* var. *compactus*, see *Ohioocrinus compactus*.
- crassus*, see *Iocrinus crassus*.
- exilis*, Hall, 1866, 24th Rep. N. Y. St. Mus. Nat. Hist., p. 213, Trenton and Hud. Riv. Gr.
- exiguus*, Meek, syn. for *H. exilis*.
- gracilis*, Hall, 1847, Pal. N. Y., vol. 1, p. 280, Hud. Riv. Gr. Not properly defined.
- geniculatus*, Ulrich, 1879, Jour. Cin. Soc. Nat. Hist., vol. 2, p. 16, Utica Slate Gr.
- heterodactylus*, Hall, 1847, Pal. N. Y., vol. 1, p. 279, Hud. Riv. Gr.
- inaequalis*, see *Calceocrinus inæqualis*.
- incurvus*, see *Anomalocrinus incurvus*.
- isodactylus*, syn. for *Ohioocrinus compactus*.
- juvenis*, Hall, 1866, 24th Rep. N. Y. St. Mus. Nat. Hist., p. 212, Hud. Riv. Gr.
- laxus*, see *Ohioocrinus laxus*.
- milleri*, Wetherby, 1880, Jour. Cin. Soc. Nat. Hist., vol. 3, p. 153, Trenton Gr.
- oëhanus*, see *Ohioocrinus oëhanus*.
- pentagonus*, Ulrich, 1882, Jour. Cin. Soc. Nat. Hist., vol. 5, Hud. Riv. Gr.
- polyzo*, syn. for *Iocrinus subcrassus*.
- simplex*, see *Ectenocrinus simplex*.
- simplex* var. *grandis*, see *Ectenocrinus grandis*.
- subcrassus*, see *Iocrinus subcrassus*.
- tenuis*, Billings, 1857, Rep. of Progr. Geo. Sur. Can., p. 273, and Can. Org. Rem., Decade 4, p. 50, Trenton Gr.
- vaupei*, syn. for *H. constrictus*.



FIG. 328.—Hemicystites stellatus.



FIG. 329.—Heterocrinus juvenis.

HETEROCYSTITES, Hall, 1852, Pal. N. Y., vol. 2, p. 229. [Ety. *heteros*, irregular; *kustis*, bladder.] Basals 4, irregular in size; second series 10, large; higher plates numerous, but exact order and number undetermined. Type *H. armatus*.
armatus, Hall, 1852, Pal. N. Y., vol. 2, p. 229, Niagara Gr.

HETEROSCHISMA, Wachsmuth, 1883, Geo. Sur. Ill., vol. 7, p. 352. [Ety. *heteros*, irregular; *schisma*, slit.] It is distinguished from *Codaster* by the sunken hydro-

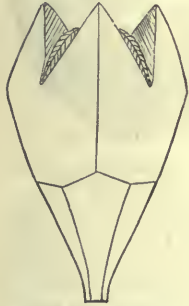


FIG. 330.—Heteroschisma gracile. Side view, 3 diam.

spiral areas and exposure of the orals, only, immediately contiguous to the mouth; the limbs are extended interradially, into pyramidal ridges, which the hydrospires enter obliquely. Type *H. gracile*.

alternatum var. *elongatum*, Wachsmuth, 1883, Geo. Sur. Ill., vol. 7, p. 354.

Founded upon a magnified view of *Codaster attenuatus*.

gracile, Wachsmuth, 1883, Geo. Sur. Ill., vol. 7, p. 354, Ham. Gr.

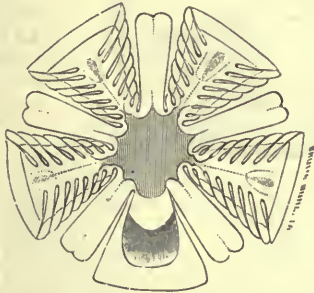


FIG. 331.—Heteroschisma gracile. Horizontal section of hydrospires, 5 diam.

Holocystites, Hall, 1864, 20th Rep. N. Y. St. Mus. Nat. Hist., p. 353. [Ety. *holos*, entire; *kustis*, bladder.] Body cylindrical, subovate or globose, free, sessile, or attaching by roots, and covered by numerous ranges or irregular series of larger and smaller poriferous plates; ambulacral opening central or subcentral; mouth excentric; smaller opening between these; arms mere spinous processes. Type *H. cylindricus*.

abnormis, Hall, 1864, 20th Rep. N. Y. St. Mus. Nat. Hist., p. 355, Niagara Gr.

alternatus, Hall, 1861, (Caryocystites *alternatus*.) Rep. of Progress Geo. Sur. Wis., p. 23, and 20th Rep. N. Y. St. Mus. Nat. Hist., p. 355, Niagara Gr.

baculus, S. A. Miller, 1879, Jour. Cin. Soc. Nat. Hist., vol. 2, p. 105, Niagara Gr.

brauni, S. A. Miller, 1878, Jour. Cin. Soc. Nat. Hist., vol. 1, p. 130, Niagara Gr.

caneus n. sp. Niagara Gr.

Body long, irregularly cylindrical; summit prolonged on the flattened side in the direction of the ambulacral orifice; plates long, polygonal, of irregular size; eight ranges may be counted in our specimen, and one or two have been broken from the lower end; the ambulacral orifice is surrounded by six plates; below this there is a range of eight plates, three of which

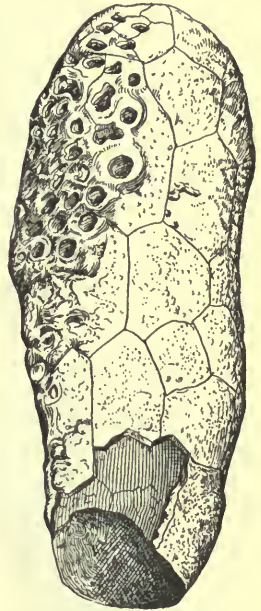


FIG. 332.—Holocystites caneus.

reach the mouth, and one of which bears the anal orifice; there are no arms, ambulacral spines, or cicatrices; there are eight plates in the next range, two of which join the mouth; the mouth in this genus is generally upon the flattened side of the specimen and opposite the posterior bulge, but not so in this species, for the ambulacral area is prolonged on the flattened side, and the bulge is opposite thereto, while the mouth is on the side of the summit between the bulge and the flattened side;

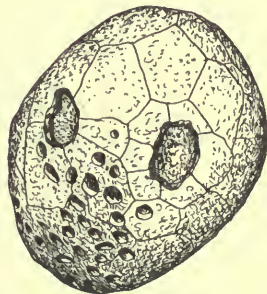


FIG. 333.—Holocystites caneus. Summitt view.

all the plates are very poriferous, the pores penetrating the plates in clusters of from two to seven instead of by pairs as is usual in this genus; the flattened

side is covered by numerous pits and a thickening of the plates; these pits do not pass through the plates, though they cover a series of plates, sutures and all; such pits have been found on different species, and it is probable they represent a disease of the test, as they seem to destroy the pores and ankylose the sutures. Collected by J. F. Hammell, of Madison, in Jefferson County, Indiana.

cylindricus, Hall, 1861, (*Caryocystites cylindricus*.) Ann. Rep. Geo. Wis., p. 23, and 20th Rep. N. Y. St. Mus. Nat. Hist., p. 354, Niagara Gr.

dyeri, S. A. Miller, 1879, Jour. Cin. Soc. Nat. Hist., vol. 2, p. 108, Niagara Gr.

elegans, S. A. Miller, 1878, Jour. Cin. Soc. Nat. Hist., vol. 1, p. 136, Niagara Gr.

faberi, n. sp. Niagara Gr. Body somewhat

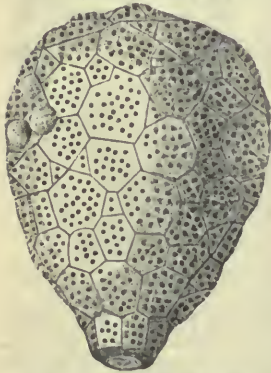


FIG. 334.—*Holocystites faberi*.

obovate; large axial canal passes down into the column; seven plates in the first range; two small intercalated plates on the posterior side between the first and second ranges; seven plates in the second range; above the second range the plates are polygonal, of all sizes, and not disposed in ranges; if they were in ranges there would be about seven below the summit; ambulacral orifice on the posterior side of the summit, elliptical, surrounded by six plates, four of which are protuberant or swollen at the orifice, but no arms ever attached, nor are there cicatrices for spines; mouth pentagonal, on the anterior side of the summit, separated from the ambulacral orifice by two plates, one of which bears the anal orifice; on the posterior side, below the summit, there are three circular pits, which do not seem to have been of any economical use; entire surface poriferous in pairs, which open through small tubercles. Collected by Charles Faber, of Cincinnati, (in whose honor I have given the specific name,) in Jefferson County, Indiana.

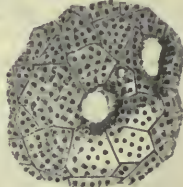


FIG. 335.—*Holocystites faberi*.

globosus, S. A. Miller, 1878, Jour. Cin. Soc. Nat. Hist., vol. 1, p. 133, Niagara Gr.

hammelli n. sp. Niagara Gr. Body subglobose, flattened on the anterior side; sessile, no perforation for a column; basals seven; between the first and second series there are five plates inserted on the posterior side; ten plates in the second series; ten in the third; nine in the fourth, and nine in the fifth, which series reaches the mouth; above these there are eight plates in the series which bore the ambulacral spines, and some smaller plates surrounding the ambulacral orifice on the summit; four cicatrices for ambulacral spines; mouth at the margin of the summit; anal opening in the plate adjoining the mouth and between it and the ambulacral orifice; all the plates poriferous in pairs; on the anterior side below the mouth there is one plate in the third series, and one in the fourth series, each bearing a prominent tubercle, with a circle of pores passing through it, giving it a radiate appearance on top; this character may not be of specific importance, but the tubercles are different from those observed on other specimens. Collected by J. F. Hammell, in Jefferson County, Indiana, in whose honor I have given the specific name.

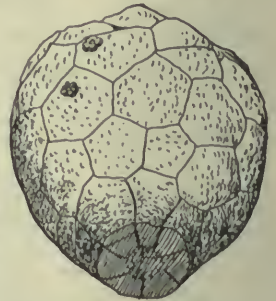


FIG. 336.—*Holocystites hammelli*. Anterior side.



FIG. 337.—*Holocystites hammelli*. Summit view; mouth on the lower side.

jolietensis, S. A. Miller, 1882, Jour. Cin. Soc. Nat. Hist., vol. 5, p. 223, Niagara Gr.

ornatus, S. A. Miller, 1878, Jour. Cin. Soc. Nat. Hist., vol. 1, p. 132, Niagara Gr.

ovatus, Hall, 1864, 20th Rep. N. Y. St. Mus. Nat. Hist., p. 357, Niagara Gr.

perlongus, S. A. Miller, 1878, Jour. Cin. Soc. Nat. Hist., vol. 1, p. 132, Niagara Gr.

plenus, S. A. Miller, 1878, Jour. Cin. Soc. Nat. Hist., vol. 1, p. 135, Niagara Gr.

pustulosus, S. A. Miller, 1878, Jour. Cin. Soc. Nat. Hist., vol. 1, p. 134, Niagara Gr.

rotundus, S. A. Miller, 1879, Jour. Cin. Soc. Nat. Hist., vol. 2, p. 107, Niagara Gr.

scutellatus, Hall, 1864, 20th Rep. N. Y. St. Mus. Nat. Hist., p. 357, Niagara Gr. sphaericus, Winchell & Marcy, 1865, Mem. Bost. Soc. Nat. Hist., vol. 1, p. 111, Niagara Gr. Not defined so as to be recognized.

subglobosus n. sp. Niagara Gr. Body globose; no axial canal, hence the species was sessile; seven plates in the first range; above this there are four ranges below the summit of fourteen plates, each with an additional plate in the third range on the posterior side; ambulacral orifice in the center of the summit, elongated transversely, surrounded by six plates, four of which, have cicatrices for attaching spines; anal orifice near a cicatrix and near the oral orifice; the whole surface is poriferous

in pairs which open on the surface in ornamental sculptured figures, somewhat like the Greek letter ω , (Omega). Collected by Charles Faber, in Jefferson County, Indiana.

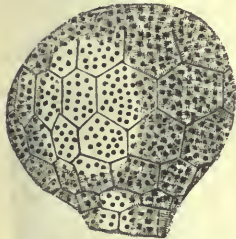


FIG. 338.—Holocystites subglobosus.

subrotundus, S. A. Miller, 1879, Jour. Cin. Soc. Nat. Hist., vol. 2, p. 107, Niagara Gr. tumidus, S. A. Miller, 1879, Jour. Cin. Soc. Nat. Hist., vol. 2, p. 104, Niagara Gr.

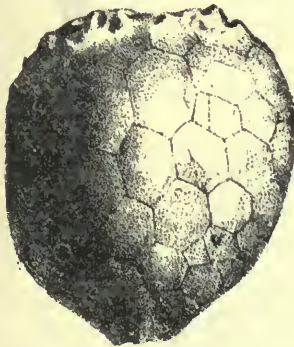


FIG. 339.—Holocystites turbinatus.

turbinatus, S. A. Miller, 1880, Jour. Cin. Soc. Nat. Hist., vol. 2, p. 259, Niagara Gr. ventricosus, S. A. Miller, 1879, Jour. Cin. Soc. Nat. Hist., vol. 2, p. 108, Niagara Gr. wetherbyi, S. A. Miller, 1878, Jour. Cin. Soc. Nat. Hist., vol. 1, p. 131 Niagara Gr. winchelli, Hall, 1864, 20th Rep. N. Y. St. Mus. Nat. Hist., p. 356, Niagara Gr. HOMOCRINUS, Hall, 1852, Pal. N. Y., vol. 2, p. 185. [Ety. *homos*, like; *krinon*, lily.] Basals 5; subradials 5; radials 1 x 5; azygous interradials 2; proboscis or ventral sac long and large; arms bifur-

cating; pinnules wanting; column round. Distinguished from Dendrocrinus by the proportionally larger basals, and absence of one radial, and from Poteriocrinus by the arrangement of the azygous plates and absence of pinnules. Type *H. parvus*.

angustatus, see *Dendrocrinus angustatus*. *crassus*, Whiteaves, 1887, Cont. to Can. Pal., vol. 1, p. 95, Ham. Gr. *cylindricus*, Hall, 1852, Pal. N. Y., vol. 2, p. 186, Niagara Gr. *parvus*, Hall, 1852, Pal. N. Y., vol. 2, p. 185, Niagara Gr.

polydactylus, see *Dendrocrinus polydactylus*. *proboscidualis*, Hall, 1859, Pal. N. Y., vol. 3, p. 38, Oriskany sandstone.

scoparius, Hall, 1859, Pal. N. Y., vol. 3, p. 102, Low. Held. Gr.

HYBOCRINUS, Worthen & Miller, 1883, Geo. Sur. Ill., vol. 7, p. 331. [Ety. *hubos*, humpbacked; *echinos*, sea-urchin.] Test flexible, subspheroidal, five ambulacral areas, with numerous ranges of interlocking plates imbricating upward, and

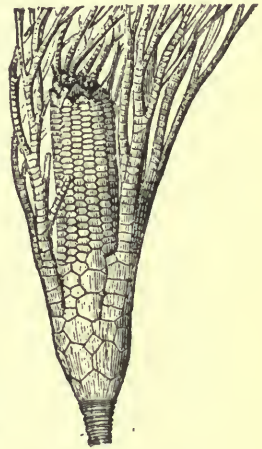


FIG. 340.—Homocrinus scoparius.

each perforated with a pair of pores; interambulacral areas narrower; plates imbricate downward; surface granular; jaws strong. Type *H. spectabilis*.

spectabilis, Worthen & Miller, 1883, Geo. Sur. Ill., vol. 7, p. 332, Kaskaskia Gr.

HYBOCRINUS, Billings, 1857, Rep. of Progr. Geo. Sur. Can., p. 274, and Can. Org. Rem., Decade 4, p. 23. [Ety. *hubos*, humpbacked; *krinon*, lily.] Calyx protuberant on the azygous side; basals 5; radials 1 x 5; azygous interradials 2; arms 5; no pinnules; column round. Type *H. conicus*.



FIG. 341.—Hyboocrinus conicus. Diagram.

conicus, Billings, 1857, Rep. of Progr. Geo. Sur. Can., p. 274, and Can. Org. Rem., Decade 4, p. 29, Trenton Gr.

pristinus, Billings, 1859, Can. Org. Rem., Decade 4, p. 23, Chazy Gr.

tumidus, Billings, 1857, Rep. of Progr. Geo. Sur. Can., p. 275, and Can. Org. Rem., Decade 4, p. 28, Trenton Gr.

HYBOCYSTITES, Wetherby, 1880, Jour. Cin. Soc. Nat. Hist., vol. 3, p. 150. [Ety. *hubos*, humpbacked; *kustis*, bladder.] Calyx like *Hybocrinus*, and order of arrangement of the two series of plates is the same, but distinguished by having three arm-like projections, and two or more recumbent arms with ambulacral opening central; from the peristome, the five ambulacra diverge; three are directed to the arm-like projections, and are supposed to pass

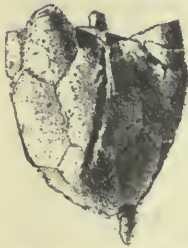


FIG. 342.—Hybocystites problematicus.

over the top of them and extend downward upon the exterior; valvular opening between the upper azygous plate and the mouth. Type H. problematicus. *problematicus*, Wetherby, 1880, Jour. Cin. Soc. Nat. Hist., vol. 3, p. 150, Trenton Gr.

HYDREIONOCRINUS, DeKoninck, 1858, Bull. Acad. Royale Belgique, vol. 8, pt. 2, p. 13. [Ety. *hydreion*, water-bucket; *krinon*, lily.] Calyx short, rounded below; basals 5; subradials 5; radials 1 x 5; brachials 1 x 4 + 2 x 1; arms as in *Zeacrinus*, and pinnules short; distinguished from *Zeacrinus* by the ventral sac, which extends beyond the arms and covers them like a roof; the upper plates are convex or spinous; respiratory pores in the sutures of the cylindrical part of the sac, which is covered, by the arms. Type H. woodanus.

acanthophorus, Meek & Worthen, 1870, (*Zeacrinus acanthophorus*.) Proc. Acad. Nat. Sci. Phil., p. 28, and Geo. Sur. Ill., vol. 5, p. 563, Up. Coal Meas.

armiger, Meek & Worthen, 1870, (*Zeacrinus armiger*.) Proc. Acad. Nat. Sci. Phil., p. 27, and Geo. Sur. Ill., vol. 5, p. 547, Kaskaskia Gr.

depressus, Troost, as defined by Hall, 1858, (*Zeacrinus depressus*.) Geo. Sur. Iowa, p. 546, Kaskaskia Gr.

discus, Meek & Worthen, 1860, (*Zeacrinus discus*.) Proc. Acad. Nat. Sci. Phil., p. 39, and Geo. Sur. Ill., vol. 2, p. 312, Up. Coal Meas.

mucrospinus, McChesney, 1859, (*Zeacrinus mucrospinus*.) Desc. New Pal. Foss., p. 10, and Trans. Chi. Acad. Sci., p. 7, and Geo. Sur. Ill., vol. 5, p. 563, Coal Meas.

verrucosus, see *Eupachycrinus verrucosus wetherbyi*, Wachsmuth & Springer, 1886, Revis. Palæocrinioidea, pt. 3, p. 245, Kaskaskia Gr.

HYPANTHOCRINITES, Phillips, 1839, Murch. Sil. Syst. [Ety. *upo*, under; *anthos*, flower; *krinon*, lily.]

cælatus, see *Eucalyptocrinus cælatus*.

decorus, see *Eucalyptocrinus decorus*.

Hystricrinus, Hinde, 1885, Ann. and Mag. Nat. Hist., p. 158, syn. for *Arthracantha carpenteri*, see *Arthracantha carpenteri*.

ICHTHYOCRINUS, Conrad, 1842, Jour. Acad. Nat. Sci. Phil., vol. 8, p. 279. [Ety. *ichthys*, fish; *krinon*, lily.] General form, including incumbent arms, ovoid or pear-shaped; calyx cup-shaped; basals 3; subradials 1 x 5; primary radials 3 or 4 x 5, short and increasing in width, upward; secondary and tertiary radials similar in form to the primaries; arms 40 to 60 or more. Type I. lævis.

burlingtonensis, Hall, 1858, Geo. Sur. Iowa, p. 557, Burlington Gr.
clintonensis, Hall, 1852, Pal. N. Y., vol. 2, p. 181, Clinton Gr.
corbis, Winchell & Marcy, 1865, Mem. Bost. Soc. Nat. Hist., vol. 1, p. 89, and Jour. Cin. Soc. Nat. Hist., vol. 4, p. 175, Niagara Gr.

lævis, Conrad, 1842, Jour. Acad. Nat. Sci., vol. 8, p. 279, and Pal. N. Y., vol. 2, p. 195, Niagara Gr.

nobilis, Wachsmuth & Springer, 1878, Proc. Acad. Nat. Sci., p. 254, Upper Burlington and Keokuk Gr.

subangularis, Hall, 1863, Trans. Alb. Inst., vol. 4, p. 207, and 11th Rep. Geo. Ind., p. 268, Niagara Gr.
tiariformis, Troost, as defined by Hall, 1858, (*Cyathocrinus tiariformis*.) Geo. Sur. Iowa, p. 558, Subcarboniferous.

Icosidactylocrinites. Not defined.
IOCRINUS, Hall, 1866, Advance sheets, 24th Rep. N. Y. St. Mus. Nat. Hist., p. 212. [Ety. *io*, in triumph; *krinon*, lily.] Calyx pentagonal, pyramidal sides deeply concave; basals 5, indented down the middle; radials 3 to 6 x 5; arms long, frequently bifurcating, but bearing no pinnules; ventral sac very long, extending beyond the arms, subcylindrical longi-



FIG. 345.—Ioerinus. Diagram; b, basals; r, radials; a, azygous plate; t, plates of tube.

furcating, but bearing no pinnules; ventral sac very long, extending beyond the arms, subcylindrical longi-



FIG. 343.—Ichthyocrinus corbis.



FIG. 344.—Ichthyocrinus lævis.

tudinally, five partite, and corrugated transversely; column sharply pentagonal. Type *I. subcrassus*.

crassus, Meek & Worthen, 1865, (Heterocrinus *crassus*.) Proc. Acad. Nat. Sci. Phil., p. 147, and Geo. Sur. Ill., vol. 3, p. 325, Hud. Riv. Gr.

polyxo, syn. for *I. subcrassus*.

subcrassus, Meek & Worthen, 1865, (Heterocrinus, *subcrassus*.) Proc. Acad. Nat. Sci. Phil., p. 148, and Geo. Sur. Ill., vol. 3, p. 325, Hud. Riv. Gr.

trentonensis, Walcott, 1884, 35th Rep. N. Y. St. Mus. Nat. Hist., p. 210, Trenton Gr.

LAMPTEROCRINUS, Roemer, 1860, Sil. Fauna West Tenn., p. 37. [Ety. *lampter*, lamp; *krinon*, lily. Calyx urn-shaped, contracted between the arm-bases, and bulged out on the azygous side; basals 5; subradials 5; primary

radials 3 x 5; secondary radials, 1 x 10; interradials 8 or 10, graduating into the vault; azygous interradials more numerous; vault unsymmetrical, and bearing a subcentral proboscis or ventral sac; arms unknown. Type *L. tennesseensis*.

inflatus, Hall, 1861, (Balanocrinus *inflatus*.) Rep. of Progr. Sur. of Wis., p. 22, and 20th Rep. N. Y. St. Mus. Nat. Hist., p. 328, Niagara Gr.

parvus, Hall, 1879, Desc. New Spec. Foss., p. 9, and 11th Rep. Geo. Nat. Hist. Ind., p. 272, Niagara Gr.

sculptus, syn. for *L. tennesseensis*.

tennesseensis, Roemer, 1860, Sil. Fauna West Tenn., p. 37, Niagara Gr.

LECANOCRINUS, Hall, 1852, Pal. N. Y., vol. 2, p. 199. [Ety. *lekane*, basin; *krinon*, lily.] Body and arms subglobose; plates heavy; basals 3; subradials 1 x 5; primary radials 2 or 3 x 5; secondary



FIG. 347.—Lampteroocrinus tennesseensis.

radials 1 to 3 x 10; azygous interradials 2; arms as in *Ichthyocrinus*; column round. Type *L. macropetalus*.

calculus, Hall, 1852, Pal. N. Y., vol. 2, p. 203, Niagara Gr.

elegans, see *Taxocrinus elegans*.

excavatus, Ringueberg, 1886, Bull. Buf. Soc. Nat. Sci., vol. 5, p. 11, Niagara Gr.

incisus, Ringueberg, Bull. Buf. Soc. Nat. Sci., vol. 5, p. 10, Niagara Gr.

laevis, see *Taxocrinus laevis*.

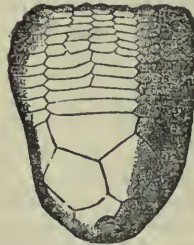


FIG. 348.—Lecanocrinus macropetalus.

macropetalus, Hall, 1852, Pal. N. Y., vol. 2, p. 199, Niagara Gr.

nitidus, Ringueberg, 1886, Bull. Buf. Soc. Nat. Sci., vol. 5, p. 9, Niagara Gr.

ornatus, Hall, 1852, Pal. N. Y., vol. 2, p. 201, Niagara Gr.

pusillus, Hall, 1863, (Cyathocrinus

pusillus.) Trans. Alb. Inst., vol. 4, p. 200, and 11th Rep. Geo. and Nat. Hist. Ind., p. 267, Niagara Gr.

pusillus, Winchell & Marcy, syn. for *L. pusillus*.

puteolus, Ringueberg, 1886, Bull. Buf. Soc. Nat. Sci., vol. 5, p. 11, Niagara Gr.

simplex, Hall, 1852, Pal. N. Y., vol. 2, p. 202, Niagara Gr.

solidus, Ringueberg, 1886, Bull. Buf. Soc. Nat. Sci., vol. 5, p. 8, Niagara Gr.

LECYTHIOCRINUS, White, 1880, Proc. U. S. Nat. Mus., vol. 2, p. 257. This name was preoccupied by Muller in 1858, and by Zittel in 1879. See *Menocrinus*.

adamsi, see *Menocrinus adamsi*.

olliculiformis, see *Menocrinus olliculiformis*.

LEPADOCRINUS, Conrad, 1840, (Lepocrinites), Ann. Rep. N. Y., p. 207. [Ety. from the resemblance to the

Lepas or Barnacle Anatafa; *krinon*, lily.] Body oblong or ovoid, consisting of four series of plates; first series 4; second series 5; third series 4; fourth series 5; pectinated rhombs 3 to 5; arms 3 or 4, recumbent, and consisting of a double series of interlocking plates, resting in shallow grooves; plates poriferous, column tapering. Type *L. gebhardi*.



FIG. 349.—Lepadocrinus gebhardi.

gebhardi, Conrad, 1840, (Lepocrinites *gebhardi*.) Ann. Rep. N. Y., p. 207, and Pal. N. Y., vol. 3, p. 127, Low. Held. Gr.

moorii, Meek, 1871, (Lepocrinites moorii,) Am. Jour. Sci., 3d series, vol. 2, p. 296, and Ohio Pal., vol. 1, p. 39, Hud. Riv. Gr.

LEPIDECHINUS, Hall, 1861, Desc. New Spec. Crinoidea, p. 18. [Ety. *lepis*, scale; *echinus*, sea-urchin.] Subspheroidal; ambulacral area having a double row of plates imbricating downward, with two pores in each plate, near the outer end; interambulacral areas wide, and having numerous ranges of plates, imbricating from below upward, and from the center outward. Type *L. imbricatus*.

imbricatus, Hall, 1861, Desc. New Crinoidea, p. 18, Burlington Gr.

rarispinus, Hall, 1867, 20th Rep. N. Y. St. Mus. Nat. Hist., p. 340, Waverly Gr.

LEPIDESTHES, Meek & Worthen, 1868, Geo. Sur. Ill., vol. 3, p. 522. [Ety. *lepis*, scale; *esthes*, garment.] Subspheroidal;

squamosus, Meek & Worthen, 1873, Geo. Sur. Ill., vol. 5, p. 478, Burlington Gr.

LEPIDODISCUS, Meek & Worthen, 1875, Geo. Sur. Ill., vol. 5, p. 573. [Ety. *lepis*, scale; *diskos*, quoit.] A proposed subgenus for *Agelacrinus*, founded upon *A. squamosus*.

Lepocrinites, Conrad, 1840. The correct orthography seems to be *Lepadocrinus*.

moorei, Meek, see *Lepadocrinus moorii*.

LICHENOCRINUS, Hall, 1866, Adv. sheets 24th Rep. N. Y. St. Mus. Nat. Hist., p. 216. [Ety. *lichen*, tree-moss; *krinon*, lily.] Body parasitic, discoid, more or less crateriform, from the center of which arises a long tapering column, each ring of which is composed of small interlocking plates; upper surface of body covered with polygonal plates, which are supported in the interior by numerous radiating lamellæ. Type *L. dyeri*.

affinis, S. A. Miller, 1882, Jour. Cin. Soc. Nat. Hist., vol. 5, p. 229, Hud. Riv. Gr.

crateriformis, Hall, 1866, Adv. sheets 24th Rep. N. Y. St. Mus. Nat. Hist., p. 217, Hud. Riv. Gr.

dubius, S. A. Miller, 1880, Jour. Cin. Soc. Nat. Hist., vol. 3, p. 234, Utica Slate Gr.

dyeri, Hall, 1866, Adv. sheets, 24th Rep. N. Y. St. Mus. Nat. Hist., p. 216, Hud. Riv. Gr.

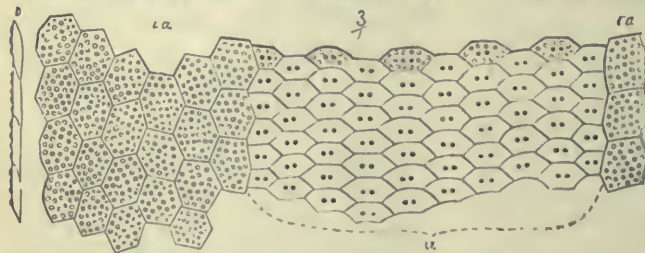


FIG. 350.—*Lepidesthes coreyi*. Diagram 3 diam.; (a.) ambulacral; (b.) section of thicm; position of interambulacral.

ambulacral areas wide, having numerous plates, and imbricating from above downward, and having two pores in each plate, nearly central; interambulacral areas narrow, plates imbricating from below upward, as well as outward from the middle; jaws well developed; surface granular. Type *L. coreyi*.

colletti, White, 1878, Proc. Acad. Nat. Sci. Phil., p. 33, and Cont. to Pal., No. 8, p. 163, Keokuk Gr.

coreyi, Meek & Worthen, 1868, Geo. Sur. Ill., vol. 3, p. 525. Keokuk Gr.

formosus, S. A. Miller, 1879, Jour. Cin. Soc. Nat. Hist., vol. 2, p. 41, Keokuk Gr.

LEPIDOCIDARIS, Meek & Worthen, 1873, Geo. Sur. Ill., vol. 5, p. 478. Ety. *lepis*, scale; *Cidaris*, a genus.] Body large, globose, eight or more rows of imbricating plates in the middle of each interambulacral area, but only two reach the oral apertures; plates hexagonal or pentagonal; tubercles for the support of primary spines smooth and in the center of each plate; pustules near the outer edge of the plates for the secondary spines; ambulacra narrow; plates slightly imbricating in the opposite direction from the interambulacral series, and each pierced by two pores; jaws strong. Type *L. squamosus*.

St. Mus. Nat. Hist., p. 216, Hud. Riv. Gr.



FIG. 351.—*Lichenocrinus tuberculatus*; one specimen shows the radiating lamellæ.

pattersoni, S. A. Miller, 1879, Jour. Cin. Soc. Nat. Hist., vol. 2, p. 118, Utica Slate Gr.

tuberculatus, S. A. Miller, 1874, Cin. Quar. Jour. Sci., vol. 1, p. 346, Hud. Riv. Gr.

LYRIOCINUS, Hall, 1852, Pal. N. Y., vol. 2, p. 197.

[Ety. *lyrion*, small lyre; *krinon*, lily.] Calyx hemispherical; basals 5; subradials 5; primary radials 3 x 5; secondary radials 2 x 10; interradial areas 4 or 5, which are in closed above by the secondary radials;



FIG. 352.—*Lyrlocrinus dactylus*. Side view.

azygous area similar to the regular interradial areas; vault almost flat, depressed interradially, composed of small plates; opening excentric; arms 10, composed of a double series of interlocking plates. Type *L. dactylus*.

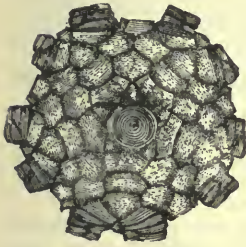


FIG. 353.—*Lyrlocrinus dactylus*. Basal view.

198, and 11th Rep. Geo. and Nat. Hist. Ind., p. 269, Niagara Gr.

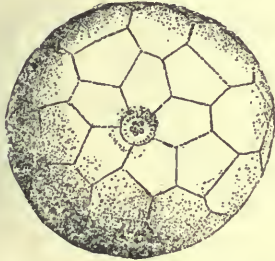


FIG. 354.—*Lyrlocrinus melissa*. Basal view.

sculptilis, Hall, 1864, 20th Rep. N. Y. St. Mus. Nat. Hist., p. 368, Niagara Gr.

sculptus, see *Archæocrinus sculptus*.

LYSO CYSTITES, n. gen. [Ety. *lysis*, setting free; *kustis*, bladder.] Body subspheroidal, composed of four ranges of plates; basal plates probably 4, succeeded by two ranges of 5 plates each and dome plates; mouth central; ovarian aperture lateral. Type *L. nodosus*. This generic name is proposed instead of



FIG. 355.—*Macrostylocrinus fusibrachiatus*.

Echinocystites, Hall, which was preoccupied. The genus is known only from casts.

nodosus, Hall, 1864, (*Echinocystites nodosus*, 20th Rep. N. Y. Mus. Nat. Hist., p. 360, Niagara Gr.

MACROSTYLOCRINUS, Hall, 1852, Pal. N. Y., vol. 2, p. 203. [Ety. *makros*, long; *stylos*, an arm; *krinon*, lily.] Calyx urn-shaped; basals 3; primary radials 3 x 5; secondary radials 1 or more by 10; regular interradials 3; azygous interradials 4; arms 10. Type *M. ornatus*.

fasciatus, Hall, 1876, (*Cyathocrinus fasciatus*), 28th Rep. N. Y. St. Mus. Nat. Hist., p. 130, Niagara Gr. Probably a syn. for *M. meeki*.

fusibrachiatus, Ringuenberg, 1882, Jour. Cin. Soc. Nat. Hist., vol. 5, p. 119, Niagara Gr.

meeki, Lyon, 1861, (*Actinocrinus meeki*), Proc. Acad. Nat. Sci. Phil., p. 411, Niagara Gr.

ornatus, Hall, 1852, Pal. N. Y., vol. 2, p. 204, Niagara Gr.

striatus, Hall, 1868, Trans. Alb. Inst., vol. 4, p. 207, and 20th Rep. N. Y. St. Mus. Nat. Hist., p. 327, Niagara Gr.

striatus var. *granulosus*, Hall, 1879, 28th Rep. N. Y. St. Mus. Nat. Hist., p. 129, Niagara Gr.



FIG. 356.—*Macrostylocrinus striatus*.

MALOCYSTITES, Billings, 1858, Can. Org. Rem., Decade 3, p. 66. [Ety. *malum*, apple; *kustis*, bladder.] Body ovate or globular; plates nonporiferous and in very irregular series; first series 3; second series 10 or 12, and in all the series 40 or 50; mouth apical; ambulacral orifice near the upper part; arms recumbent, 8 or more. Type *M. purchisoni*.

barrandi, Billings, 1858, Can. Org. Rem., Decade 3, p. 67, Chazy Gr. *murchisoni*, Billings, 1858, Can. Org. Rem., Decade 3, p. 66, Chazy Gr.



FIG. 357.—*Malocystites purchisoni*.

MARIACRINUS, Hall, 1859, Pal. N. Y., vol. 3, p. 104. [Ety. *Maria*, proper name; *krinon*, lily.] Body obconoidal, interradial areas depressed, surface ornamented; basals 4; primary radials 3 x 5;

secondary radials 3 x 10; tertiary radials 1 or more by 20; interradials 3 to 10, the first one supported by the first radials; azygous area large and plates numerous; vault inflated, plates small; arms composed of a double series of interlocking plates, and not unfrequently bearing armlets consisting also of a double series of interlocking plates; column round. Type *M. nobilissimus*.

carleyi, Hall, 1862, (Glyptocrinus carleyi,) Trans. Alb. Inst., vol. 4, p. 203, and 11th Rep. Geo. and Nat. Hist. Ind., p. 261, Niagara Gr.



FIG. 358.—Marliacrinus carleyi.

macropetalus, Hall, 1859, Pal. N. Y., vol. 3, p. 111, Low. Held. Gr.

nobilissimus, Hall, 1859, Pal. N. Y., vol. 3, p. 105, Low. Held. Gr.

pachydaetylus, Conrad, 1841, (Astrocrinites pachydaetylus,) Ann. Rep. N. Y., p. 34, and Pal. N. Y., vol. 3, p. 107, Low. Held. Gr. Syn. (?) for M. polydaetylus.

paucidaetylus, Hall, 1859, Pal. N. Y., vol. 3, p. 109, Low. Held. Gr.

plumosus, Hall, 1859, Pal. N. Y., vol. 3, p. 110, Low. Held. Gr.

polydaetylus, Bonny, 1837, (Actinocrinus polydaetylus,) Am. Jour., vol. 31, syn. for M. pachydaetylus?

ramosus, Hall, 1859, Pal. N. Y., vol. 3, p. 147, Low. Held. Gr.

stoloniferus, Hall, 1859, Pal. N. Y., vol. 3, p. 112, Low. Held. Gr.

warreni, Ringuenberg, 1888, Proc. Acad. Nat. Sci. Phil., p. 133, Niagara Gr.

MARSUPIOCRINUS, Phillips, 1839, Murch. Sil. Syst., p. 672. [Ety. marsupos, bag; krinon, lily.] Basals 3; primary radials 2 x 5; secondary radials 2 x 5; arms 20; distinguished from Platycrinus by the higher order of radials, by the round column, instead of elliptic, and by having a larger canal. Type M. caelatus.

dactylus, see Lyriocrinus dactylus.

tennesseensis, Roemer, 1860, (Platycrinus (tennesseensis,) Sil. Fauna West Tenn., p. 35, Niagara Gr.

tentaculatus, Hall, 1861, (Platycrinus tentaculatus,) Pal. N. Y., vol. 3, p. 116, Low. Held. Gr.

MEGISTOCRINUS, Owen & Shumard, 1852, Geo. Sur. Wis., Iowa, and Minn., p. 594. [Ety. megistos, very great; krinon, lily.] Body basin-shaped; basals 3; primary radials 3 x 5; secondary radials 1 x 10; tertiary radials 1 or more x 20; inter-radials numerous; first azygous plate like the first radials, and resting on the basals, succeeded by three plates, and these by numerous smaller ones; arms in double series of short plates, bifurcating and bearing pinnules; vault convex; orifice excentric or lateral; column round. Type M. evansi.

abnormis, Lyon, 1857, (Actinocrinus abnormis,) Geo. Sur. Ky., vol. 3, p. 479, Up. Held. Gr.

concauus, Wachsmuth, 1885, Proc. Dav. Acad. Sci. vol. 4, p. 96, Ham. Gr.

brevicornis, Hall, 1858, (Actinocrinus brevicornis,) Geo. Sur. Iowa, p. 571, Burlington Gr.

crassus, White, 1862, Proc. Bost. Soc. Nat. Hist., vol. 9, p. 17, Burlington Gr.

depressus, Hall, 1862, 15th Rep. N. Y. St. Mus. Nat. Hist., p. 134, Hamilton Gr.

evansi, Owen & Shumard, 1850, (Actinocrinus evansi,) Jour. Acad. Nat. Sci. vol. 1, pt. 2, p. 68, and Geo. Sur. Wis., Iowa, and Minn., p. 594, Burlington Gr.

farnsworthi, White, 1876, Proc. Acad. Nat. Sci., p. 29, Ham. Gr.

infelix, see Saccocrinus infelix.

knappi, Lyon & Casseday, 1857, Proc. Acad. Nat. Sci. Phil., p. 412, Up. Held. Gr.

latus, Hall, 1858, Geo. Sur. Iowa, vol. 1, pt. 2, p. 480, Ham. Gr.

marcouanus, see Saccocrinus marcouanus.

nevis, see Saccocrinus nevis.

nobilis, Wachsmuth & Springer, (in press.) Geo. Sur. Ill., vol. 8, p. 169, Waverly or Kinderhook Gr.

nodosus, Barris, 1879, Proc. Dav. Acad. Nat. Sci., vol. 2, p. 285, Up. Held. Gr.

nodosus var. multidecoratus, Barris, 1885, Proc. Dav. Acad. Nat. Sci., vol. 4, p. 98, Ham. Gr.

nodosus var. multidecoratus, Barris, 1885, Proc. Dav. Acad. Nat. Sci., vol. 4, p. 98, Ham. Gr.

nodosus var. multidecoratus, Barris, 1885, Proc. Dav. Acad. Nat. Sci., vol. 4, p. 98, Ham. Gr.

nodosus var. multidecoratus, Barris, 1885, Proc. Dav. Acad. Nat. Sci., vol. 4, p. 98, Ham. Gr.

nodosus var. multidecoratus, Barris, 1885, Proc. Dav. Acad. Nat. Sci., vol. 4, p. 98, Ham. Gr.

nodosus var. multidecoratus, Barris, 1885, Proc. Dav. Acad. Nat. Sci., vol. 4, p. 98, Ham. Gr.

ontario, Hall, 1862, 15th Rep. N. Y. St. Mus. Nat. Hist., p. 136, Ham. Gr.

parvirostris, syn. for M. plenus.

parvus, Wachsmuth & Springer, (in press.) Geo. Sur. Ill., vol. 8, p. 171, Kinderhook Gr.

parvus, Wachsmuth & Springer, (in press.) Geo. Sur. Ill., vol. 8, p. 171, Kinderhook Gr.

parvus, Wachsmuth & Springer, (in press.) Geo. Sur. Ill., vol. 8, p. 171, Kinderhook Gr.

parvus, Wachsmuth & Springer, (in press.) Geo. Sur. Ill., vol. 8, p. 171, Kinderhook Gr.

parvus, Wachsmuth & Springer, (in press.) Geo. Sur. Ill., vol. 8, p. 171, Kinderhook Gr.

parvus, Wachsmuth & Springer, (in press.) Geo. Sur. Ill., vol. 8, p. 171, Kinderhook Gr.

parvus, Wachsmuth & Springer, (in press.) Geo. Sur. Ill., vol. 8, p. 171, Kinderhook Gr.

parvus, Wachsmuth & Springer, (in press.) Geo. Sur. Ill., vol. 8, p. 171, Kinderhook Gr.

parvus, Wachsmuth & Springer, (in press.) Geo. Sur. Ill., vol. 8, p. 171, Kinderhook Gr.

parvus, Wachsmuth & Springer, (in press.) Geo. Sur. Ill., vol. 8, p. 171, Kinderhook Gr.

parvus, Wachsmuth & Springer, (in press.) Geo. Sur. Ill., vol. 8, p. 171, Kinderhook Gr.

parvus, Wachsmuth & Springer, (in press.) Geo. Sur. Ill., vol. 8, p. 171, Kinderhook Gr.

parvus, Wachsmuth & Springer, (in press.) Geo. Sur. Ill., vol. 8, p. 171, Kinderhook Gr.

parvus, Wachsmuth & Springer, (in press.) Geo. Sur. Ill., vol. 8, p. 171, Kinderhook Gr.

parvus, Wachsmuth & Springer, (in press.) Geo. Sur. Ill., vol. 8, p. 171, Kinderhook Gr.

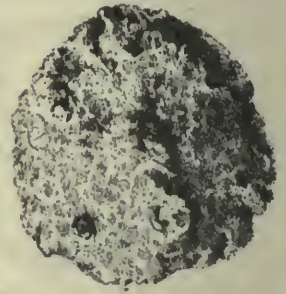


FIG. 359.—Megistocrinus pileatus. View of vault.

1862, 15th Rep. N. Y. St. Mus. Nat. Hist., p. 136, Ham. Gr.

parvirostris, syn. for M. plenus.

parvus, Wachsmuth & Springer, (in press.) Geo. Sur. Ill., vol. 8, p. 171, Kinderhook Gr.

parvus, Wachsmuth & Springer, (in press.) Geo. Sur. Ill., vol. 8, p. 171, Kinderhook Gr.

parvus, Wachsmuth & Springer, (in press.) Geo. Sur. Ill., vol. 8, p. 171, Kinderhook Gr.

parvus, Wachsmuth & Springer, (in press.) Geo. Sur. Ill., vol. 8, p. 171, Kinderhook Gr.

parvus, Wachsmuth & Springer, (in press.) Geo. Sur. Ill., vol. 8, p. 171, Kinderhook Gr.

parvus, Wachsmuth & Springer, (in press.) Geo. Sur. Ill., vol. 8, p. 171, Kinderhook Gr.

parvus, Wachsmuth & Springer, (in press.) Geo. Sur. Ill., vol. 8, p. 171, Kinderhook Gr.

parvus, Wachsmuth & Springer, (in press.) Geo. Sur. Ill., vol. 8, p. 171, Kinderhook Gr.

parvus, Wachsmuth & Springer, (in press.) Geo. Sur. Ill., vol. 8, p. 171, Kinderhook Gr.

parvus, Wachsmuth & Springer, (in press.) Geo. Sur. Ill., vol. 8, p. 171, Kinderhook Gr.

parvus, Wachsmuth & Springer, (in press.) Geo. Sur. Ill., vol. 8, p. 171, Kinderhook Gr.

parvus, Wachsmuth & Springer, (in press.) Geo. Sur. Ill., vol. 8, p. 171, Kinderhook Gr.

parvus, Wachsmuth & Springer, (in press.) Geo. Sur. Ill., vol. 8, p. 171, Kinderhook Gr.

parvus, Wachsmuth & Springer, (in press.) Geo. Sur. Ill., vol. 8, p. 171, Kinderhook Gr.

parvus, Wachsmuth & Springer, (in press.) Geo. Sur. Ill., vol. 8, p. 171, Kinderhook Gr.

pileatus, S. A. Miller, 1879, Jour. Cin. Soc. Nat. Hist., vol. 2, p. 114, Up. Held. Gr.

plenus, White, 1862, Proc. Bost. Soc. Nat. Hist., vol. 9, p. 16, Burlington Gr.

rugosus, Lyon & Casseday, 1859, Am. Jour. Sci., vol. 28, p. 243, Up. Held. Gr.

spinulosus, Lyon, 1861, Jour. Acad. Nat. Sci. Phil., p. 413, Up. Held. Gr.

whitii, Hall, 1861, Jour. Bost. Soc. Nat. Hist., vol. 7, p. 271, Burlington Gr.

Melocrinus, Goldfuss, 1826, Petref. Germ., p. 197. [Ety. *melo*, melon; *krinon*, lily.]



FIG. 361.—*Melocrinus bainbridgensis*.

Body obconoidal; surface ornamented; interradial areas depressed; basals 4; radials 3x5; secondary radials 2 or 3x10; tertiary radials 2 or 3x20; interradians 8

to 12; azygous plates more numerous; vault convex, with orifice excentric. Type *M. hieroglyphicus*.

bainbridgensis, Hall & Whitfield, 1875, (*Ctenocrinus bainbridgensis*), Ohio Pal., vol. 2, p. 158, Portage Gr.

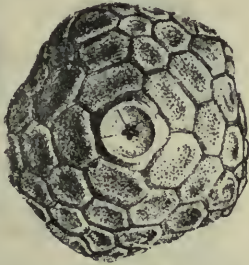


FIG. 362.—*Melocrinus bainbridgensis*. Basal view.

breviradiatus, Hall & Whitfield, 1875, (*Ctenocrinus breviradiatus*), Ohio Pal., vol. 2, p. 160, Ham. Gr.

clarkii, Williams, 1882, Proc. Acad. Nat. Sci., p. 31, Chemung Gr.

lævis Roemer, 1860, (*Cytocrinus lævis*), Sil. Fauna W. Tenn., p. 56, Niagara Gr.

nodosus Hall, 1861, Geo. Rep. Wis., p. 19, Devonian.

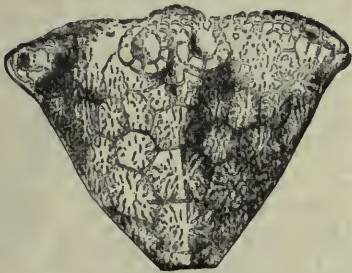


FIG. 363.—*Melocrinus obconicus*.

obconicus, Hall, 1863, Trans. Alb. Inst., vol. 4, p. 206, Niagara Gr.

obpyramidalis, Winchell & Marcy, 1865, (*Actinocrinus obpyramidalis*), Mem. Bost. Soc. Nat. Hist., vol. 1, p. 87, Niagara Gr.

pratteni, McChesney, 1860, (*Forbesocrinus pratteni*), New Pal. Foss., p. 29, and Trans. Chi. Acad. Sci., p. 22, Warsaw Gr.

sculptus, Hall, 1852, Pal. N. Y., vol. 2, p. 228, Niagara Gr.

verneuili, Troost, 1850, (*Actinocrinus verneuili*) and Hall, 20th Rep. N. Y. St. Mus. Nat. Hist., p. 327, Niagara Gr.

Melocrinus, Owen & Norwood, 1846, Am. Jour. Sci., 2d series, vol. 2, p. 225.

[Ety. *melon*, melon; *lithos*, stone.] Test spheroidal, divided into five convex ambulacral and five convex interambulacral areas, resembling in form a melon, with ten ribs or convex elevations and as many sharply defined depressions; plates of the interambulacral areas large, thick, hexagonal, not overlapping, arranged in series, 8 or 10 of which cover the wider part, but not more than two reach the apical disk; ambulacral areas covered with about 8 or 10 rows of plates, each plate having two pores, so arranged that the pores of the central two ranges are at the ends most distant from the median line; ocular plates, without pores, and

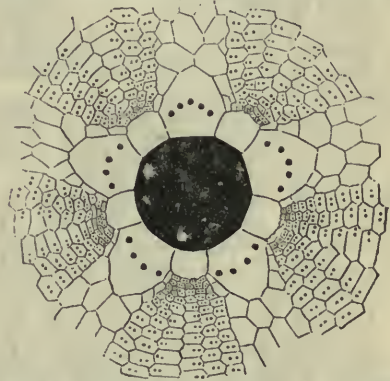


FIG. 364.—*Melonites multiporus*. Apical disk, genital and ocular pores.

much smaller than the genital, which have numerous pores that differ, in number, in the same species; jaws very strong. Type *M. multiporus*.

crassus, Hambach, 1834, Trans. St. Louis Acad. Sci., vol. 4, p. 548, St. Louis Gr.

danzæ, see *Oligoporus danzæ*.

irregularis, Hambach, 1834, Trans. St. Louis Acad. Sci., vol 4, p. 548, St. Louis Gr.

multiporus, Owen & Norwood, 1846, Am. Jour. Sci., 2d ser., vol. 2, p. 225, St. Louis Gr.

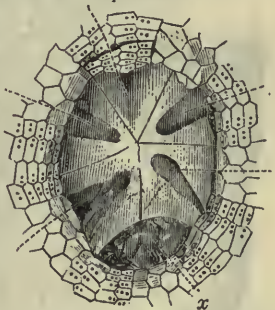


FIG. 365.—*Melonites multiporus*. Oral opening and jaws, displaced at x so as to leave an opening.

stewarti, Safford, 1869, Geo. of Tenn., p. 346, St. Louis Gr.

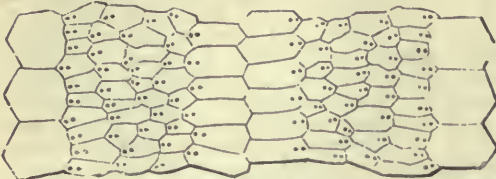


FIG. 366.—*Melonites multiporus*. Diagram, showing pores in ambulacral area, 2 diam.

MENOCRINUS, n. gen. Ety. *menos*, strength of body; *krinon*, lily.] Calyx somewhat globular; basals 3; subradials 1 x 5; radials 1 x 5; azygous and interradials 0; which distinguishes the genus from *Platyocrinus*. Type *M. olliculiformis*. This generic name is proposed as a substitute for *Lecythiocrinus*, White, 1880, because that name was preoccupied by Muller in 1858, and by Zittel in 1879.

adamsi, Worthen, 1882, (*Lecythiocrinus adamsi*.) Bull. No. 1, Ill. St. Mus. Nat. Hist., p. 37, and Geo. Sur. Ill., vol. 7, p. 317, Coal Meas.

olliculiformis, White, 1880, (*Lecythiocrinus olliculiformis*.) Proc. U. S. Nat. Mus., vol. 2, p. 257, and Cont. to Pal., No. 6, p. 124, Up. Coal Meas.

MEROCRINUS, Walcott, 1883, 35th Rep. N. Y. St. Mus. Nat. Hist., p. 208. [Ety. *meros*, hip-joint; *krinon*, lily.] Basals 5, pentangular, low, broad; subradials 5, hexagonal, short, broad; radials pentagonal, four support upon the upper truncate face of each a row of six or seven brachials, and the azygous plate from the same level, the fifth radial; right posterior radial like the azygous plate, but having an angular upper side, giving off, on one side, the ventral tube, and on the other a row of brachials; arms long, bifurcating, without pinnules. Type *M. typus*.

curtus, Ulrich, 1879, (*Dendrocrinus curtus*.) Cin. Soc. Nat. Hist., vol. 2, p. 18, Utica Slate Gr.

corroboratus, Walcott, 1883, 35th Rep. N. Y. St. Mus. Nat. Hist., p. 210, Trenton Gr.

typus, Walcott, 1883, 35th Rep. N. Y. St. Mus. Nat. Hist., p. 209, Trenton Gr.

MESPILOCINUS, DeKoninck & LeHon, 1854, Rech. Crin. Terr. Carb. Belg., p. 111. [Ety. *mespilum*, medlar; *krinon*, lily.] Body small, with arms globular or pyriform; basals 3; subradials 5;

radials 3 x 5; arms 10, which divide once, taper rapidly, infold and incline

obliquely from left to right; azygous plate 1, resting upon the larger basal; column round. Type *M. forbesanus*.

konincki, Hall, 1860, Supp. to Geo. Sur. Iowa, p. 69, Burlington Gr.

scitulus, Hall, 1861, Desc. New Crinoidea, p. 9, Burlington Gr.

MYELODACTYLUS, Hall, 1852, Pal. N. Y., vol. 2, p. 191. [Ety. *myelos*, the inside pith; *dactylus*, finger.]

Body consisting of a coil rolled, in the same plane, with finger-like processes, from each coil, overlapping the next inner one; coil and processes perforated so as to form connecting channels. Type *M. convolutus*. *brachiatus*, Hall, 1852, Pal. N. Y., vol. 2, p. 232, Niagara Gr.

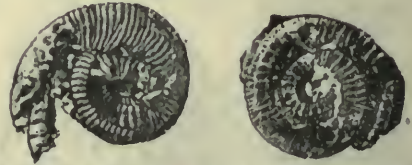


FIG. 368.—*Myelodactylus bridgportensis*.

bridgportensis, S. A. Miller, 1880, Jour. Cin. Soc. Nat. Hist., vol. 3, p. 141, Niagara Gr.

convolutus, Hall, 1852, Pal. N. Y., vol. 2, p. 192, Niagara Gr.

MYRTILLOCINUS, Sandberger, 1856, Verster Rhein. Schi. Syst. in Nassau. [Ety. *myrtillus*, myrtle; *krinon*, lily.] Body subglobose or ovoid; basals 5; subradials 5; radials 1 x 5; dome consisting of 5 plates alternating with the radials; arms 5; columnar canal, quadrangular. Type *M. elongatus*.

americanus, Hall, 1862, 15th Rep. N. Y. St. Mus. Nat. Hist., App. C., p. 114, Up. Held. Gr.

Nematocrinus, Meek & Worthen, 1866, Proc. Acad. Nat. Sci. Phil., p. 251, syn. for *Catillocrinus*.

NIPTEROCINUS, Wachsmuth, 1868, Proc. Acad. Nat. Sci. Phil., p. 341. [Ety. *nipter*, washing vessel; *krinon*, lily.]

Calyx basin-shaped; basals 3, nearly hidden by the column; subradials 1 x 5; radials 3 or 4 x 5, the first one very large; arms bifurcating; column round. Type *N. wachsmuthi*.

arboreus, Worthen, 1863, Geo. Sur. Ill., vol. 5, p. 436, Burlington Gr.

wachsmuthi, Meek & Worthen, 1868, Proc. Acad. Nat. Sci. Phil., p. 341, and Geo. Sur. Ill., vol. 5, p. 435, Burlington Gr.

NUCLEOCINUS, Conrad, 1842, Jour. Acad. Nat. Sci. Phil., vol. 8, p. 280. [Ety. *nucleus*, a little nut; *krinon*, lily.] Calyx ellipsoidal; basals 3, small, hidden within the columnar cavity; radials 5, forming a small cup, deeply scalloped



FIG. 367.—*Meroocrinus curtus*.

for receiving the bases of the narrow, elongate ambulacra, and having projecting lips forming a quinquepod; deltoid plates 6, elongate, forming three-fourths of the calyx; a narrow intercalated plate, on the azygous side, reaches from the aperture to the radial, and divides the deltoid into two narrow curving plates; sinuses narrow, extending the entire length of the calyx; ambulacra narrow; lancet plates long and very narrow; side plates numerous; hydrospires pendent, two tubes or elongated sacs on each side of an ambulacrum; spiracles in five pairs, which notch the deltoid plates; mouth large, covered normally with plates; azygous opening large. Types *N. elegans* and *N. verneuili*.

angularis, Lyon, 1857, (*Olivanites angularis*.) *Geo. Sur. Ky.*, vol. 3, p. 492, Ham. Gr.

canadensis, Montgomery, 1881, *Can. Nat. and Geol. Vol. 10*, p. 83, Ham. Gr.

conradi, Hall, 1862, 15th Rep. N. Y. St. Mus. Nat. Hist., App. C., p. 121, Up. Held. Gr.

elegans, Conrad, 1842, *Jour. Acad. Nat. Sci. Phil.*, p. 280, Ham. Gr.

halli, syn. for *Nucleocrinus elegans*.

kirkwoodensis, Shumard, 1863, (*Eleacrinus kirkwoodensis*.) *Trans. St. Louis Acad. Sci.*, vol. 2, p. 113, St. Louis Gr.

lucina, Hall, 1862, 15th Rep. N. Y. St. Mus. Nat. Hist., App. C., p. 120, Ham. Gr.



FIG. 369.—*Nucleocrinus obovatus*. Cross section of hydrospires, 2 diam.

verneuili, Troost, 1841, (*Pentremites verneuili*.) 6th Rep. on the *Geo. of Tenn.*, p. 14, and *Geo. Sur. Ky.*, vol. 3, p. 488, Up. Held. Gr.

verneuili var. pomum, Etheridge & Carpenter, is simply a rounded form very common among other specimens, and without varietal characters.



FIG. 370.—*Nucleocrinus verneuili*.

OHIOCRINUS, Wachsmuth & Springer, 1885, *Palæocrinoidea*, pt. 3, p. 208. [Ety. proper name; *krinon*, lily.] Plates of calyx arranged as in *Heterocrinus*;

arms 10, bearing bifurcating pinnules; ventral tube large, having a spiral form somewhat like the cast of a *Murchisonia*, and covered with hexagonal plates; column pentagonal and pentapartite. Type *O. laxus*.



FIG. 371. *Ohiocrinus compactus*.

compactus, Meek, 1873, (*Heterocrinus constrictus* var. *compactus*.) *Ohio Pal.*, vol. 1, pl. 11, Hud. Riv. Gr.

constrictus, Hall, 1866, (*Heterocrinus constrictus*.) 24th Rep. N. Y. St. Mus. Nat. Hist., p. 210, Hud. Riv. Gr.

laxus, Hall, 1866, (*Heterocrinus laxus*.) 24th Rep. N. Y. St. Mus. Nat. Hist., p. 211, Hud. Riv. Gr.

cehanus, Ulrich, 1882, (*Heterocrinus cehanus*.) *Jour. Cin. Soc. Nat. Hist.*, vol. 5, p. 175, Hud. Riv. Gr.



FIG. 372. *Ohiocrinus constrictus*.

OLIGOPORUS, Meek & Worthen, 1860, *Proc. Acad. Nat. Sci. Phil.*, p. 474.

[Ety. *oligos*, few; *poros*, passage.] In form like *Melonites*, but distinguished by having only four rows of ambulacral plates, and four double rows of pores in each ambulacral area. Type *O. danæ*. Desor used the name *Oligopores*, in 1858, for a section of the *Cidaridæ*, and Prof. Meek said if desirable to change *Oligoporus*, for that reason he would suggest *Melonopsis* in its place.

coreyi, Meek & Worthen, 1870, *Proc. Acad. Nat. Sci. Phil.*, p. 34, Keokuk Gr.

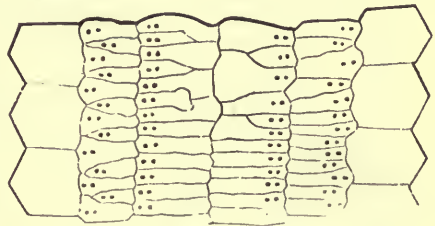


FIG. 373.—*Oligoporus danæ*; 2 diam.

danæ, Meek & Worthen, 1860, (*Melonites danæ*.) *Proc. Acad. Nat. Sci. Phil.*, p. 397, and *Geo. Sur. Ill.*, vol. 2, p. 249, Keokuk Gr.

nobilis, Meek & Worthen, 1868, *Proc. Acad. Nat. Sci. Phil.*, p. 358, and *Geo. Sur. Ill.*, vol. 5, p. 476, Burlington Gr.

parvus, Hambach, 1884, *Trans. St. Louis Acad. Sci.*, vol. 4, p. 548, Keokuk Gr.

Olivanites, syn. for *Nucleocrinus*.

angularis, see *Nucleocrinus angularis*.
verneuili, see *Nucleocrinus verneuili*.

Ollacrinus, Cumberland, 1826, Appendix to Reliquiæ Conservata. Figured without description, and subsequently declared by DeKoninck & LeHon to be a *Rhodocrinus*. Wachsmuth & Springer claim priority for this name over *Goniasteroidocrinus*, without good reason, however, as shown by Meek in Ill. Geo. Sur., vol. 2, p. 217.

ONYCHASTER, Meek & Worthen, 1868, Geo. Sur. Ill., vol. 3, p. 526. [Ety. *onyx*, claw; *aster*, star.] A small sub-discoid body, with five long, slender, rounded, flexible rays; dorsal side of disk composed of an outer circle of five pairs of plates each, pierced with an ovarian pore, and two inner circles of five pairs each, non poriferous, and surrounding a central anal opening; out-

side the pore plates, each pair is followed by two or three pairs of interlocking transverse plates, connecting with the dorsal side of the rays; farther there are lanceolate plates, furrowed and having pores between the inner ends. Type *O. flexilis*.

barrisi, Hall, 1861, (*Protaster barrisi*.) Desc. New. Crinoidea, p. 18, and Geo. Sur. Ill., vol. 5, p. 476, Burlington Gr.



FIG. 374.—*Onychaster flexilis*.

like the talons of a fowl; basals 3; subradials 5; radials 4 to 7 x 5; arms short, branching; interradians 3 to 20; vault depressed; column large. Type *O. exculptus*.

asteriformis, Hall, 1861, (*Forbesiocrinus asteriformis*.) Desc. New Crin., p. 9, and Geo. Sur. Ill., vol. 2, p. 243, Keokuk Gr.

distensus, Worthen, 1882, Bull. No. 1, Ill. St. Mus. Nat. Hist., p. 31, and Geo. Sur. Ill., vol. 7, p. 307, Kaskaskia Gr.

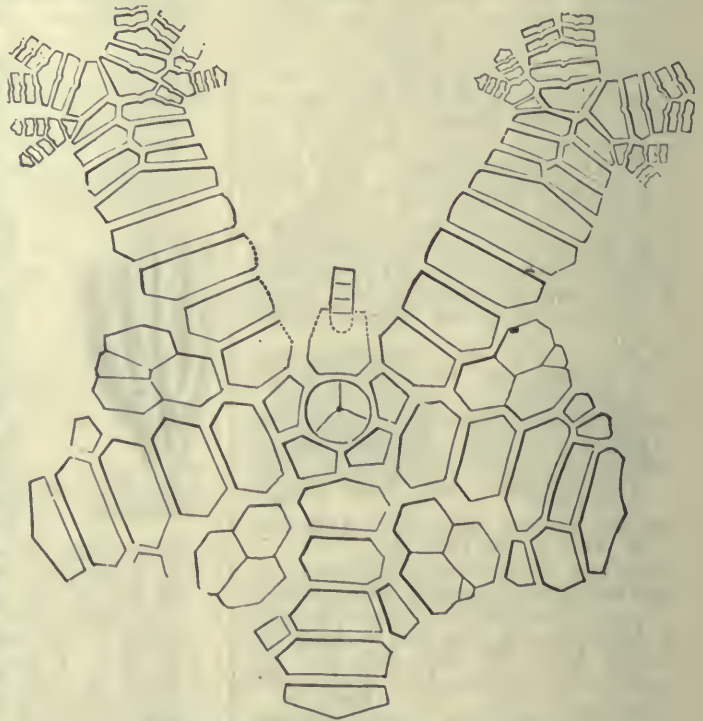


FIG. 375.—*Onychocrinus diversus*. Diagram.

diversus, Meek & Worthen, 1866, Proc. Acad. Nat. Sci. Phil., p. 256, and Geo. Sur. Ill., vol. 3, p. 492, Burlington Gr.

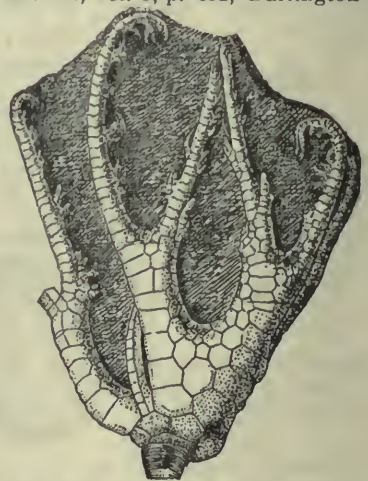


FIG. 376.—*Onychocrinus exculptus*. *exculptus*, Lyon & Casseday, 1859, Am. Jour. Sci. and Arts, vol. 29, p. 78, Keokuk Gr.

magnus, Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 520, St. Louis Gr.
 monroensis, Meek & Worthen, 1861, (Forbesiocrinus monroensis,) Proc. Acad. Nat. Sci. Phil., p. 130, and Geo. Sur. Ill., vol. 2, p. 244, Keokuk Gr.

basal as in Dendrocrinus, and from which it is distinguished only by the arrangement of the plates on the azygous side. Type *O. typus*.
 typus, W. R. Billings, 1887, Ottawa Nat. Club, vol. 1, p. 49, Trenton Gr.

PACHYCRINUS, Billings, 1859, Can. Org. Rem., Decade 4, p. 22. [Ety. *pachys*, thick; *krinon*, lily.] Calyx saucer-shaped; basals 1 x 5; radials 1 x 5. Type *P. crassibasalis*.

crassibasalis, Billings, 1859, Can. Org. Rem., Decade 4, p. 22, Chazy Gr.

Pachylocrinus, Wachsmuth & Springer, 1879, Proc. Acad. Nat. Sci. Phil., p. 115. Proposed for a division of *Poteriocrinus* of less than generic importance, but later the same authors referred their type to *Woodocrinus*.

PALÆASTER, Hall, 1852, Pal. N. Y., vol. 2, p. 247. [Ety. *palaïos*, ancient; *aster*, star.] Stellate, disk small; two ranges of plates in each ambulacral groove, and two on either side, adambulacral and marginal; four ranges of pores in each groove; oral plates in pairs at the base of the rays; dorsal plates polygonal, sometimes spinous, madreporic tubercle. Type *P. niagarensis*.

antiqua, Locke, 1846, (*Asterias antiqua*), Proc. Acad. Nat. Sci. Phil., vol. 3, p. 38, Hud. Riv. Gr. Too poorly defined for determination.

antiquus, Troost, 1835, (*Asterias antiqua*), Trans. Geo. Soc. Penn., vol. 1, p. 232, Hud. Riv. Gr.

clarkanus, S. A. Miller, 1880, Jour. Cin. Soc. Nat. Hist., vol. 3, p. 236, Hud. Riv. Gr.

clarki, S. A. Miller, Jour. Cin. Soc. Nat. Hist., vol. 1, p. 102, see *Palæaster clarkanus*.

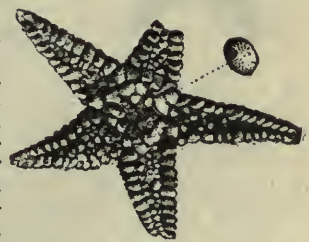


FIG. 379.—*Palæaster crawfordsvillensis*, showing madreporiform tubercle.

crawfordsvillensis, S. A. Miller, 1880, Jour. Cin. Soc. Nat. Hist., vol. 2, p. 256, Keokuk Gr.

dubius, Miller & Dyer, 1878, Cont. to Pal., No. 2, p. 256, Utica Slate Gr.

dyeri, Meek, 1872, Am. Jour. Sci., 3d series, vol. 3, p. 257, and Ohio Pal., vol. 1, p. 58, Hud. Riv. Gr.

eucharis, Hall, 1868, 20th Rep. N. Y. St. Mus. Nat. Hist., p. 330, Ham. Gr.



FIG. 377.—*Onychocrinus exculptus*. Diagram.

norwoodi, Meek & Worthen, 1860, (Forbesiocrinus norwoodi,) Proc. Acad. Nat. Sci. Phil., p. 389, and Geo. Sur. Ill., vol. 2, p. 245, syn for *O. exculptus*.

ramulosus, Lyon & Casseday, 1859, (Forbesiocrinus ramulosus,) Am. Jour. Sci. and Arts, vol. 28, p. 235, Keokuk Gr.

Orophocrinus was proposed by von Seebach, in 1864, in Nachr. k. Gesellsch. Wissensch. Göttingen, p. 110, for Pentremites stelliformis, Owen & Shumard. The definition was very imperfect, and was made in a foreign language, in a foreign country, and in a journal having no circulation in America, where the fossil occurs. The definition was so obscure, its application to the species was not noticed until Ludwig discovered it in 1878, and probably never would have been, had Meek & Worthen not described the genus, under the name of *Codonites*, in 1869, and illustrated it in their great work on the Geology of Illinois. Neither the publication or definition of von Seebach is such as to allow *Orophocrinus* to stand in preference to *Codonites*.



OTTAWACRINUS, W. R. Billings, 1887, Ottawa Nat. Club, vol. 1, p. 49. [Ety. propername; *krinon*, lily.] Calyx obcon-

FIG. 378.—*Ottawacrinus typus*.

ical, basals 5; subradials 1 x 5; radials 1 x 5; arms 5; azygous plate rests on a

- exculptus, S. A. Miller, 1881, Jour. Cin. Soc. Nat. Hist., vol. 4, p. 69, Hud. Riv. Gr.
- finit, Ulrich, 1879, Jour. Cin. Soc. Nat. Hist., vol. 2, p. 19, Utica Slate Gr.
- granti, Spencer, 1884, Bull. No. 1, Mus. Univ. St. Mo., p. 53, Clinton Gr.
- granulosus, Hall, 1868, 20th Rep. N. Y. St. Mus. Nat. Hist., p. 327, Hud. Riv. Gr.
- harrisi, S. A. Miller, 1879, Jour. Cin. Soc. Nat. Hist., vol. 2, p. 117, Hud. Riv. Gr.
- incomptus, Meek, 1872, Am. Jour. Sci., 3d series, vol. 3, p. 275, and Ohio Pal., vol. 1, p. 64, Hud. Riv. Gr.
- jamesi, Dana, 1863, (Palæsterina (?) jamesi,) Am. Jour. Sci., 2d series, vol. 35, p. 295, Hud. Riv. Gr.
- longibrachiatus, S. A. Miller, 1878, Jour. Cin. Soc. Nat. Hist., vol. 1, p. 102, Hud. Riv. Gr.
- magnificus, S. A. Miller, 1884, Jour. Cin. Soc. Nat. Hist., vol. 7, p. 16, Hud. Riv. Gr.
- matutinus, Hall, 1847, (Asterias matutina,) Pal. N. Y., vol. 1, p. 91, Trenton Gr.
- miamiensis, S. A. Miller, 1880, Jour. Cin. Soc. Nat. Hist., vol. 3, p. 143, Hud. Riv. Gr.
- parviusculus, Billings, 1860, Can. Nat. and Geo., vol. 5, p. 69, and Acad. Geol., p. 594, Mid. Sil.
- niagarensis, Hall, 1852, Pal. N. Y., vol. 2, p. 247, Niagara Gr.
- pulchellus, see Stenaster pulchellus.
- shafferi, Hall, 1868, 20th Rep. N. Y. St. Mus. Nat. Hist., p. 326, Hud. Riv. Gr.



FIG. 380.—Palæaster simplex.

- simplex, S. A. Miller, 1878, Jour. Cin. Soc. Nat. Hist., vol. 1, p. 29, Hud. Riv. Gr.
- spinulosus, Miller & Dyer, 1878, Jour. Cin. Soc. Nat. Hist., vol. 1, p. 32, Hud. Riv. Gr.
- wilberianus, Meek & Worthen, 1861, (Petraster wilberianus,) Proc. Acad. Nat. Sci. Phil., p. 142, Hud. Riv. Gr.
- PALÆASTERINA, McCoy, 1851, Brit. Pal. Foss., p. 59, but first defined, by Salter, 1857, Ann. Mag. Nat. Hist. [Ety. *palaios*, ancient; *aster*, star; *inus*, resemblance.] Pentagonal, depressed, with plated disk that fills up the angles, leaving the rays but slightly produced; ambulacra shallow, bordered by subquadrate plates. Type P.
- approximata, Miller & Dyer, 1878, Jour. Cin. Soc. Nat. Hist., vol. 1, p. 30, Hud. Riv. Gr.
- fimbriata, see Schaenaster fimbriatus.
- jamesi, see Palæaster jamesi.
- rigida, see Petraster rigidus.

- rugosa, Billings, 1857, Rep of Progr. Geo. Sur. Can., p. 291, and Can. Org. Rem. Dec. 3, p. 77, Hud. Riv. Gr.

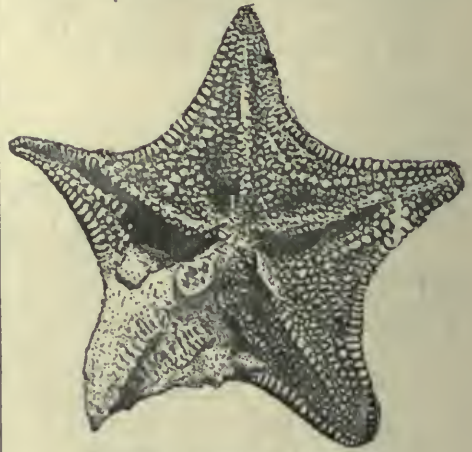


FIG. 381.—Palæasterina speciosa.

- speciosa, Miller & Dyer, 1878, Jour. Cin. Soc. Nat. Hist., vol. 1, p. 30, Hud. Riv. Gr.
- stellata, Billings, 1857, Rep. of Progr. Geo. Sur. Can., p. 290, and Can. Org. Rem., Decade 3, p. 76, Trenton Gr.
- PALÆCHINUS, McCoy, 1844, Carb. Foss. Ireland, p. 172. [Ety. *palaios*, ancient; *echinus*, sea-urchin.] Large, oval or spheroidal; plates spinous; 5 to 8 ranges of plates in the interambulacral areas; 2 ranges in the ambulacral areas, each plate perforated at the outer end by two pores. Type P. koenigi.
- burlingtonensis, Meek & Worthen, 1860, Proc. Acad. Nat. Sci. Phil., p. 396, and Geo. Sur. Ill., vol. 2, p. 230, Burlington Gr.

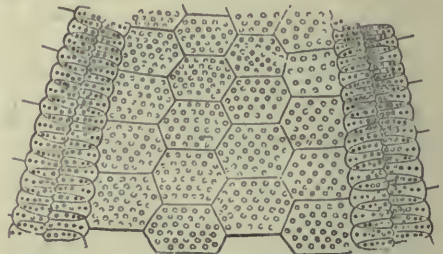


FIG. 382.—Palæchinus burlingtonensis, 2 diam.

- gracilis, Meek & Worthen, 1869, Proc. Acad. Nat. Sci. Phil., p. 82, and Geo. Sur. Ill., vol. 5, p. 473, Burlington Gr.
- PALÆOCOMA, Salter, 1857, Ann. and Mag. Nat. Hist., 2d series, vol. 17. [Ety. *palaios*, ancient; *coma*, hair.] Disk small, plates spinous, rays shallow, and having ambulacral, adambulacral, and marginal plates, the latter bearing spines, inclined toward the extremity of the ray. Type P. marstoni.

cylindrica, see *Tæniaster cylindricus*.
princeps, Hall, 1868, (*Ptilonaster princeps*), 20th Rep. N. Y. St. Mus. Nat. Hist., p. 334, Chemung Gr.

spinosa, see *Tæniaster spinosus*.

PALÆOCRINUS, Billings, 1859, Can. Org. Rem., Decade 4, p. 24. [Ety. *palaïos*, ancient; *krinon*, lily.] Calyx oval or pyriform; basals 5; radials 1 x 5; azygous interradials 1 to 3; calycinal ambulacra 5, radiating from the center to the bases of the arms. Type *P. striatus*.



FIG. 383.—Palæocrinus striatus.

angulatus, Billings, 1857, (*Dendrocrinus angulatus*), Rep. of Prog. Geo. Sur. Can., p. 269, and Can. Org. Rem., Decade 4, p. 24, Trenton Gr.

pulchellus, Billings, 1859, Can. Org. Rem., Decade 4, p. 45, Trenton Gr.

rhomboferus, Billings, 1859,

Can. Org. Rem., Decade 4, p. 45, Trenton Gr.

striatus, Billings, 1859, Can. Org. Rem., Decade 4, p. 25, Chazy Gr.
sulcatus, Safford. Not defined.

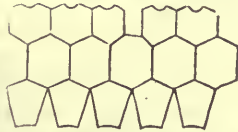


FIG. 384.—Palæocrinus striatus. Diagram.

PALÆOCYSTITES, Billings, 1858, Can. Org. Rem., Decade 4, p. 68. [Ety. *palaïos*, ancient; *kustis*, bladder.] Body oval or pyriform; plates numerous and poriferous at the margins. Type *P. tenuiradiatus*.

chapmani, Billings, 1858, Can. Org. Rem., Decade 3, p. 71, Chazy Gr.

dawsoni, Billings, 1858, Can. Org. Rem., Decade 3, p. 70, Chazy Gr.

pulcher, Billings, 1859, Can. Nat. Geo., vol. 4, p. 430, Chazy Gr.

tenuiradiatus, Hall, 1847, (*Actinocrinus tenuiradiatus*), Pal. N. Y., vol. 1, p. 18, Chazy Gr.

Parisocrinus, Wachsmuth & Springer, 1879, Proc. Acad. Nat. Sci. Phil., p. 115.

[Ety. *parisos*, resembling; *krinon*, lily.] A division of *Poteriocrinus* of less than generic value, with *P. perplexus* as the type, and including *P. nereus*, *P. salignoides*, *P. tenuibrachiatus*, and *Cyathocrinus intermedius*.

Pentacrinites hamptoni, Emmons, 1842, Geo. Rep. N. Y., Trenton Gr. This is merely the plate of a crinoid column.

Pentagonites, proposed by Rafinesque for a crinoid column.

PENTREMITES, Sav, 1820, Am. Jour. Sci., vol. 2, p. 36. [Ety. *pente*, five; *remos*, a board or plate.] Calyx globose, ovoid, or pyriform; base never distinctly trilobate, nor excavated in the middle line; section more or less triangular; basals 3, forming a small cup; radials or fork plates 1 x 5, long, forming the greater part of the calyx; limbs

long, with flat or concave sides and truncated above; sinus, subpetaloid; deltoid plates 1 x 5, small; ambulacra subpetaloid, resting in the sinuses or forks of the radials; lancet plates resting below on under lancet plates, and forming about a third the width of the ambulacra; side plates numerous and abutting the lancet plates; hydrosphere or ambulacral pores partially excavated out of the sides of the sinuses; pinules attached between the pores; hydrospheres from 3 to 9, pendent, but partially contained within the substance of the radials near their distal ends; spiracles or apertures single or double, partially excavated in the deltoid plates; posterior spiracles confluent with the azygous opening; peristome covered by minute polygonal plates; column round. Type *P. godoni*.

abbreviatus, Hambach, 1880, Trans. St. Louis Acad. Sci., vol. 4, p. 155, Kaskaskia Gr.

angularis, Lyon, 1860, Trans. St. Louis Acad. Sci., vol. 1, p. 631, Kaskaskia Gr.

basilaris, Hambach, 1880, Trans. St. Louis Acad. Sci., vol. 4, p. 145, Kaskaskia Gr.

bipyramidalis, Hall, 1858, see *Troostocrinus bipyramidalis*.

bradleyi, Meek, 1873, 6th Rep. Geo. Sur. Terr., p. 470. Not satisfactorily defined.

broadheadi, Hambach, 1880, Trans. St. Louis Acad. Sci., vol. 4, p. 145, Kaskaskia Gr.

burlingtonensis, Meek & Worthen, 1870, Proc. Acad. Nat. Sci. Phil., and Geo. Sur. Ill., vol. 5, p. 461, Burlington Gr.

calyce, Hall, 1862, 15th Rep. N. Y. St. Mus. Nat. Hist., p. 122, Ham. Gr.

calycinus, Lyon, 1860, Trans. St. Louis Acad. Sci., vol. 1, p. 628, Kaskaskia Gr.

cervinus, Hall, 1858, Geo. Sur. Iowa, p. 690, Kaskaskia Gr.

cherokeus, Troost, 1850, Catal. Proc. Am. Assoc. Ad. Sci. and Geo. Sur. Iowa, p. 691, Kaskaskia Gr.

chesterensis, Hambach, 1880, Trans. St. Louis Acad. Sci., vol. 4, p. 145, Kaskaskia Gr.

clavatus, Hambach, 1880, Trans. St. Louis Acad. Sci., vol. 4, Kaskaskia Gr.

conoideus, Hall, 1858, Trans. Alb. Inst., vol. 4, p. 5, and Geo. Sur. Iowa, p. 655, Warsaw Gr.

cornutus, see *Granatocrinus cornutus*.

curtus, see *Granatocrinus curtus*.

decussatus, Shumard, 1858, Trans. St. Louis Acad. Sci., vol. 1, p. 243, Keokuk Gr.

elegans, Lyon, 1860, Trans. St. Louis Acad. Sci., vol. 1, p. 632, Kaskaskia Gr.

elongatus, Shumard, 1855, Geo. Rep. Mo., p. 187, Burlington Gr.

florealis, Schlotheim, 1820, syn. for *P. godoni*.

gemmiformis, Hambach, 1884, Trans. St. Louis Acad. Sci., vol. 4, p. 548, Kaskaskia Gr.

globosus, Say, as identified by Troost, 1850, probably *Pentremites sulcatus*.

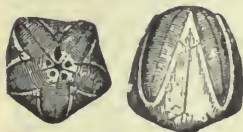


FIG. 385.—*Pentremites godoni*.

godoni, DeFrance, 1818, Dict. Sci. Nat., t. 14, p. 467, Kaskaskia Gr.

granulatus, see *Granatocrinus granulatus*.

grosvenori, Shumard, see *Troostocrinus grosvenori*.

hemisphericus, Hambach, 1880, Trans. St. Louis Acad. Sci., vol. 4, p. 145, Kaskaskia Gr.

kentuckiensis, see *Codaster kentuckiensis*.
koninckanus, Hall, 1858, Trans. Alb. Inst., vol. 4, p. 4, and Geo. Sur. Iowa, p. 656, Warsaw Gr.

laterniformis, Owen & Shumard, 1850, Jour. Acad. Nat. Sci., 2d series, vol. 2, p. 66, Kaskaskia Gr.

leda, Hall, see *Granatocrinus leda*.

lineatus, see *Troostocrinus lineatus*.
longicostalis, Hall, 1860, Supp. to Geo. Iowa, p. 85, Warsaw Gr. Not satisfactorily defined.

lycorias, Hall, 1863, 16th Rep. N. Y. St. Mus. Nat. Hist., p. 123, Ham. Gr.

maia, Hall, 1862, 15th Rep. N. Y. St. Mus. Nat. Hist., p. 122, Ham. Gr.

melo, see *Granatocrinus melo*.

missouriensis, Swallow, 1863, Trans. St. Louis Acad. Sci., vol. 2, p. 81, Kaskaskia Gr.

nodosus, Hambach, 1880, Trans. St. Louis Acad. Sci., vol. 4, p. 145, Kaskaskia Gr.

norwoodi, see *Granatocrinus norwoodi*.

obesus, Lyon, 1857, Geo. Sur. Ky., vol. 3, p. 469, Kaskaskia Gr.

obliquatus, see *Tricelocrinus obliquatus*.

ovalis, Owen. Not defined.

potteri, Hambach, 1880, Trans. St. Louis Acad. Sci., vol. 4, p. 156, Burlington Gr.

pyriformis, Say, 1825, Jour. Acad. Nat. Sci. Phil., vol. 4, p. 294, Kaskaskia Gr.

reinwardti, Troost, see *Troostocrinus reinwardti*.

robustus, Lyon, 1860, Trans. St. Louis Acad. Sci., vol. 1, p. 629, Kaskaskia Gr.

roemeri, see *Granatocrinus roemeri*.

sampsoni, Hambach, 1884, Trans. St. Louis Acad. Sci., vol. 4, p. 548, Choteau or Waverly Gr.

sayi, see *Schizoblastus sayi*.

sirius, White, 1862, Proc. Bost. Soc. Nat. Hist., vol. 9, p. 20, Burlington Gr.

spinus, Hambach, 1880, Trans. St. Louis Acad. Sci., vol. 4, p. 145, Kaskaskia Gr.
stelliformis, see *Orophocrinus stelliformis*.
subconoidus, Meek, 1873, Hayden's Geo. Sur. Terr., p. 471, Subcarb.

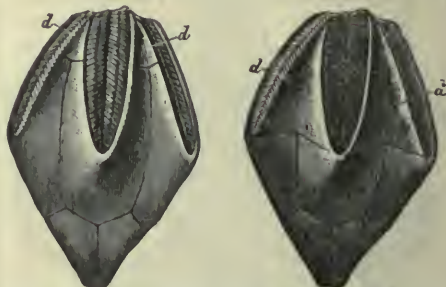


FIG. 387.—*Pentremites pyriformis*. One shows the deltoid plates extended to the summit.

subcylindricus, see *Troostocrinus subcylindricus*.

subtruncatus, see *Troostocrinus subtruncatus*.

sulcatus, Roemer, 1852, Monog. Blas-toid., p. 354, Kaskaskia Gr.

symmetricus, Hall, 1858, Geo. Rep. Iowa, p. 694, Kaskaskia Gr.

tennesseea, Troost. Not defined.

troosti, Shumard, 1866, Trans. St. Louis Acad. Sci., vol. 2, p. 386, Kaskaskia Gr.

truncatus, Conrad, 1843, Proc. Acad. Nat. Sci. Phil., vol. 1, p. 334, Warsaw Gr.

varsouviensis, see *Tricelocrinus varsouviensis*.

verneuili, see *Nucleocrinus verneuili*.

whitii, Hall, 1862, 15th Rep. N. Y. St. Mus. Nat. Hist., p. 122, Ham. Gr.

woodmani, see *Tricelocrinus woodmani*.

wortheni, see *Tricelocrinus wortheni*.

PENTREMITEIDA D'ORBIGNY, 1849, Prodr. d. Paléont., t. 1, p. 102. [Ety. from *Pentremites*.] Number and disposition of plates as in *Pentremites*, but the deltoids are inconspicuous, confined to the summit, rarely visible in a side view; spiracles large. It is also closely connected with *Troostocrinus*, and is of doubtful generic value. Type *P. schultzi*.

americana, Barris, 1883, Geo. Sur. Ill., vol. 7, p. 363, Ham. Gr.

filosa, Whiteaves, 1887, Cont. to Can. Pal., vol. 1, p. 104, Ham. Gr.

PERISCHODOMUS, McCoy, 1849, Ann. Nat. Hist., vol. 3, p. 251. [Ety. *perischos*, inclosing; *domus*, house.] Spheroidal, subpentagonal; ambu-lacra narrow, two rows of small plates imbricat-ing downward, each

pierced by one pair of simple pores; interambulacra wide, with five rows of



FIG. 388.—*Pentremiteida americana*; 2 diam.

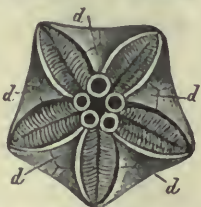


FIG. 386.—*Pentremites pyriformis*. Ventral surface; d, deltoid plates.

plates imbricating upward, and from the center outward; primary spines on the rows adjoining the ambulacra, the supporting tubercle being small, perforated, but not crenulated, and surrounded by a double ring; ovarian plates having 6 pores; mouth and anal openings small, central. Type *P. biserialis*.

illinoisensis, Worthen & Miller, 1883, *Geo. Sur. Ill.*, vol. 7, p. 333, Kasakia Gr.

Pereiococrinus, Austin, 1843, *Ann. and Mag. Nat. Hist.*, vol. 11, p. 203. Not defined so as to be recognized, though some authors use it instead of *Saccocrinus*.

PETRASTER, Billings, 1858, *Can. Org. Rem.*, Decade 3, p. 79. [Ety. *petros*, stone; *aster*, star.] Closely related to *Palæaster*, and having both marginal and adambulacral plates, with a few disk-plates, on the ventral side. Type *P. rigidus*.



FIG. 389.—*Petraster bellulus*.

bellulus, Billings, 1865, *Pal. Foss.*, vol. 1, p. 393, Niagara Gr.

rigidus, Billings, 1857, (*Palæasterina rigidus*.) *Rep. of Progr. Geo. Sur. Can.*, p. 291, and *Can. Org. Rem.*, Decade 3, p. 80, Trenton Gr.

wilberianus, see *Palæaster wilberanus*.

Philocrinus, Koninck, 1863. [Ety. *philos*, favorite; *krinon*, lily.]

pelvis, Meek & Worthen, 1865, *Am. Jour. Sci.*, 2d series, vol. 39, syn. for *Erisocrinus typus*.

PHOLIDOCIDARIS, Meek & Worthen, 1869, *Proc. Acad. Nat. Sci. Phil.*, p. 77. [Ety. *pholidos*, scale; *kideris*, turban.] Interambulacra thin, irregular, imbricating upward and laterally; five or more rows; only two reaching the extremities; marginal rows and those on the lower side having primary tubercles, showing a pit in the top, and being surrounded by two rings; ambulacral areas wide, with six or more rows of plates imbricating downward, each plate pierced by two pores, and the larger ones having additional pores. Type *P. irregularis*.

irregularis, Meek & Worthen, 1869, *Proc. Acad. Nat. Sci. Phil.*, p. 78, and *Geo. Sur. Ill.*, vol. 5, p. 512, Keokuk Gr.

PHYSETOCRINUS, Meek & Worthen, 1869, *Proc. Acad. Nat. Sci. Phil.*, p. 158.

[Ety. *physetos*, inflated; *krinon*, lily.] Distinguished from *Actinocrinus*, in the form and construction of the vault, which has no proboscis, and has pores along the radial portions of the dome; and, also, in having no hook-like projections along the pinnules. Type *P. ventricosus*.

asper, Meek & Worthen, 1869, *Proc. Acad. Nat. Sci. Phil.*, p. 161, and *Geo. Sur. Ill.*, vol. 5, p. 351, Burlington Gr.

copei, S. A. Miller, 1881, (*Actinocrinus copei*.) *Jour. Cin. Soc. Nat. Hist.*, vol. 4, p. 310, Burlington Gr.

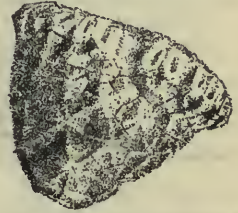


FIG. 390.—*Physetocrinus copei*.

dilatatus, Meek & Worthen, 1869, (*Strotocrinus dilatatus*.) *Proc. Acad. Nat. Sci. Phil.*, p. 162, and *Geo. Sur. Ill.*, vol. 5, p. 363, Burlington Gr.

ornatus, Hall, 1858, (*Actinocrinus ornatus*.) *Geo. Sur. Iowa*, p. 583, Burlington Gr.

reticulatus, Hall, 1861, (*Actinocrinus reticulatus*) *Desc. New Crin.*, p. 3, Burlington Gr.

subventricosus, McChesney, 1860, (*Actinocrinus subventricosus*.) *Desc. New Crin. Pal. Foss.*, p. 21, and *Trans. Chi. Acad. Sci.*, p. 16, Burlington Gr.

ventricosus, Hall, 1858, (*Actinocrinus ventricosus*.) *Geo. Sur. Iowa*, p. 595, Burlington Gr.

ventricosus var. *cancellatus*, Hall, 1861, (*Actinocrinus ventricosus* var. *cancellatus*.) *Bost. Jour. Nat. Hist.*, vol. 7, p. 279, Burlington Gr.

ventricosus var. *internodus*, Hall, 1861, (*Actinocrinus ventricosus* var. *internodus*.) *Bost. Jour. Nat. Hist.*, vol. 7, p. 278, Burlington Gr.

PISOCRINUS, DeKoninck, 1858, *Bull. Acad. Roy. Belgique*, 2me ser., tome 3, p. 24.

[Ety. *pisos*, pea; *krinon*, lily.] Calyx round globular; basals 5, forming a triangle; these are followed by three large plates, forming nearly the entire calyx; one of these supports two small plates, and a small plate is supported, in a notch, between the other two larger plates; arms 5; column round.

Type *P. pilula*.

gemmaformis, S. A. Miller, 1879, *Jour. Cin. Soc. Nat. Hist.*, vol. 2, p. 113, Niagara Gr.

globosus, Ringueberg, 1884, (*Triacrinus globosus*.) *Proc. Acad. Nat. Sci. Phil.*, p. 146, Clinton Gr.

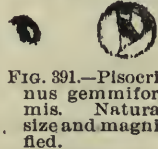


FIG. 391.—*Pisocrinus gemmaformis*. Natural size and magnified.

- pyriformis, Ringuenberg, (*Triacrinus pyriformis*.) Proc. Acad. Nat. Sci. Phil., p. 145, Clinton Gr.
- PLATYCRINUS**, Miller, 1821, Nat. Hist. Crinoidea, p. 73. [Ety. *platys*, flat; *krinos*, lily.] Calyx bowl-shaped; basals 3; primary radials 2x5; regular interradials 1x4; azygous interradials, 1 large and 3 small; dome elevated; arms 10 to 35, bearing pinnules; column large and twisted. Type *P. lævis*.
- aequalis*, Hall, 1861, Desc. New Crin., p. 117, and Geo. Sur. Ill., vol. 5, p. 456, Burlington Gr.
- americanus*, Owen & Shumard, 1850, Jour. Acad. Nat. Sci. Phil., 2d ser., vol. 2, p. 89, Burlington Gr.
- andixoni*, Troost. Not defined.



FIG. 392.—*Platyacrinus asper*. Diagram.

- asper*, Meek & Worthen, 1861, Proc. Acad. Nat. Sci. Phil., p. 129, and Geo. Sur. Ill., vol. 3, p. 468, Burlington Gr.
- bedfordensis*, Hall & Whitfield, 1875, Ohio Pal., vol. 2, p. 161, Erie Shales.
- bloomfieldensis*, S. A. Miller, 1880, Jour. Cin. Soc. Nat. Hist., vol. 2, p. 257, Keokuk Gr.
- bonoensis*, White, 1878, Proc. Acad. Nat. Sci. Phil., p. 30, and Cont. to Pal., No. 6, p. 160, Keokuk Gr.
- brevinodus*, Hall, 1861, Desc. New Crinoidea, p. 4, and Bost. Jour. Nat. Hist., vol. 7, p. 286, Keokuk Gr.
- burlingtonensis*, Owen & Shumard, 1850, Jour. Acad. Nat. Sci., 2d ser., vol. 2, p. 60, Burlington Gr.
- calyculus*, Hall, 1861, Desc. New Crin., p. 16, Burlington Gr.
- canaliculatus*, Hall, 1858, Geo. Sur. Iowa, vol. 1, pt. 2, p. 539, Burlington Gr.
- cavus*, Hall, 1858, Geo. Sur. Iowa, p. 527, Burlington Gr.
- clytis*, Hall, 1861, Desc. New Crin., p. 4, and Bost. Jour. Nat. Hist., vol. 7, p. 285, Burlington Gr.
- contritus*, Hall, 1863, 17th Rep. N. Y. St. Mus. Nat. Hist., p. 54, and Ohio Pal., vol. 2, p. 166, Waverly Gr.
- corporiculus*, Ringuenberg, 1886, Bull. Buf. Soc. Nat. Sci., vol. 5, p. 12, Niagara Gr. Not properly defined.

- corrugatus*, Owen & Shumard, 1850, Jour. Acad. Nat. Sci., vol. 2, p. 59, Burlington Gr.
- depressus*, Owen. Not defined.
- discoideus*, Owen & Shumard, 1850, Jour. Acad. Nat. Sci., 2d ser., vol. 2, p. 58, Burlington Gr.
- eboracensis*, Hall, 1862, 15th Rep. N. Y. St. Mus. Nat. Hist., p. 119, Ham. Gr.
- elegans*, Hall, 1861, Desc. New Crin., p. 4, and Bost. Jour. Soc. Nat. Hist., vol. 7, p. 285, Burlington Gr.
- eminulus*, Hall, 1861, Desc. New Crin., p. 17, Burlington Gr.
- eriensis*, Hall, 1862, 15th Rep. N. Y. St. Mus. Nat. Hist., p. 119, Ham. Gr.
- excavatus*, Hall, 1861, Desc. New Crin., p. 4, and Bost. Jour. Nat. Hist., vol. 7, p. 286, Burlington Gr.
- exsertus*, Hall, 1858, Geo. Sur. Iowa, p. 539, Burlington Gr.

- faberi*, n. sp. Calyx bowl-shaped; sub-cylindrical above; attaching point for column projecting below; base marked by three keels, corresponding with the sutures between the basal plates, and along which the sutures may be distinguished; radials large, width a little greater than height; cicatrix for attachment of arms in the center of the upper face of each radial, and occupying about one-third of the width of the plate; surface marked by a row of tubercles radiating on each

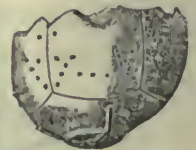


FIG. 393.—*Platyacrinus faberi*, x 2.

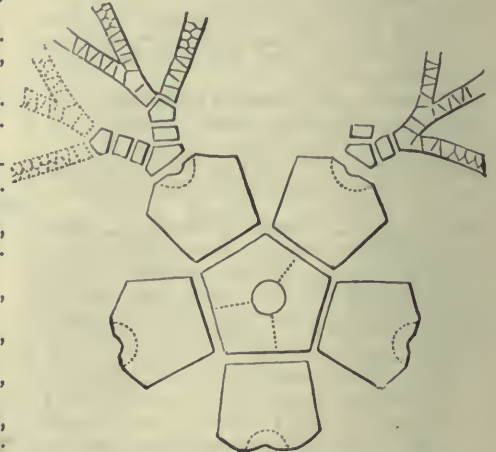


FIG. 394.—*Platyacrinus hemisphericus*. Diagram.

- plate from the angle of union of basal and radial plates, and also a few scattering tubercles; collected in Scott County, West Va., in the St. Louis or Kaskaskia Gr.

georgii, Hall, 1860, Supp. to Geo. Sur. Iowa, p. 82, Warsaw Gr.
 glyptus, Hall, 1861, Desc. New Crin., p. 16, Burlington Gr.
 graphicus, Hall, 1863, 17th Rep. N. Y. St. Mus. Nat. Hist., p. 55, and Ohio Pal., vol. 2, p. 166, Waverly Gr.
 halli, Shumard, 1866, Trans. St. Louis Acad. Sci., vol. 2, p. 388, and Geo. Sur. Ill., vol. 5, p. 454, Burlington Gr.
 haydeni, Meek, 1872, Hayden's Geo. Sur. Terr., p. 469, and Cont. to Pal., No. 6, p. 122, Subcarboniferous.



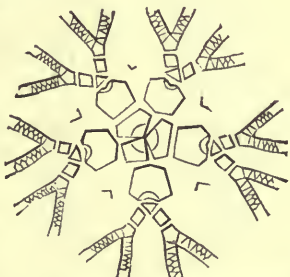
FIG. 395.—*Platyercinus hemisphericus*.

hemisphericus, Meek & Worthen, 1865, Proc. Acad. Nat. Sci. Phil., p. 16, and Geo. Sur. Ill., vol. 3, p. 511, Keokuk Gr.
huntsvillæ, Troost. Not defined.
 incomptus, White, 1863, Jour. Bost. Soc. Nat. Hist., vol. 7, p. 503, and Geo. Sur. Ill., vol. 5, p. 459, Burlington Gr.
inornatus, syn. for *P. burlingtonensis*.
insculptus, Troost. Not defined.
 leai, Lyon, 1869, Trans. Am. Phil. Soc., vol. 13, p. 459, Up. Held. Gr.

lodensis, Hall & Whitfield, 1875, Ohio Pal., vol. 2, p. 168, Waverly Gr.
 monroensis, Worthen, 1882, Bull. No. 1, Ill. St. Mus. Nat. Hist., p. 30, and Geo. Sur. Ill., vol. 7, p. 306, St. Louis Gr.
montanensis, see *Eucladocrinus montanensis*.
 multibrachiatus, Meek & Worthen, 1861, Proc. Acad. Nat. Sci. Phil., p. 135, Warsaw Gr.

niotensis, Meek & Worthen, 1865, Proc. Acad. Nat. Sci. Phil., p. 162, and Geo. Sur. Ill., vol. 3, p. 513, Keokuk Gr.

nodobrachiatus, Hall, 1858, Geo. Sur. Iowa, Fig. 396.—*Platyercinus niotensis*.



nodulosus, Hall, 1858, Geo. Sur. Iowa, p. 541, Burlington Gr.

nucleiformis, Hall, 1858, Geo. Sur. Iowa, p. 540, Burlington Gr.
 olla, Hall, 1861, Desc. New Crin. The name was preoccupied. See *P. halli*.
 ornigranulus, McChesney, 1860, Desc. New Pal. Foss., p. 5, and Trans. Chi. Acad. Sci., p. 3, Burlington Gr.
 oweni, Meek & Worthen, 1861, Proc. Acad. Nat. Sci. Phil., p. 120, Burlington Gr.
 parvinodus, Hall, 1861, Desc. New Crinoidea, p. 17, Burlington Gr.
 parvulus, Meek & Worthen, 1865, Proc. Acad. Nat. Sci. Phil., p. 163, and Geo. Sur. Ill., vol. 5, p. 555, Kaskaskia Gr.
parvus, see *Cordylocrinus parvus*.
 penicillus, Meek & Worthen, 1860, Proc. Acad. Nat. Sci. Phil., p. 380, and Geo. Sur. Ill., vol. 2, p. 266, St. Louis Gr.
 perasper, Meek & Worthen, 1865, Proc. Acad. Nat. Sci. Phil., p. 161, Burlington Gr.
 pileiformis, Hall, 1858, Geo. Sur. Iowa, p. 529, Burlington Gr.
 planus, Owen & Shumard, 1850, Jour. Acad. Nat. Sci. Phil., 2d ser., vol. 2, p. 57, Burlington Gr.
 plenus, Meek & Worthen, 1860, Proc. Acad. Nat. Sci. Phil., p. 380, and Geo. Sur. Ill., vol. 2, p. 267, St. Louis Gr.
pleurovimineus, see *Eucladocrinus pleurovimineus*.
plumosus, see *Cordylocrinus plumosus*.
 pocilliformis, Hall, 1858, Geo. Sur. Iowa, p. 528, Burlington Gr.
 poculum, S. A. Miller, 1881, Jour. Cin. Soc. Nat. Hist., vol. 4, p. 311, Burlington Gr.
polydactylus, Troost. Not defined.
 præmaturus, Hall & Whitfield, 1875, Ohio Pal., vol. 2, p. 124, Niagara Gr.
 prænuntius, Wachsmuth & Springer, 1878, Proc. Acad. Nat. Sci. Phil., p. 249, Burlington Gr.
 prattenanus, Meek & Worthen, 1860, Proc. Acad. Nat. Sci. Phil., p. 379, and Geo. Sur. Ill., vol. 2, p. 264, St. Louis Gr.
 pratteni, Worthen, 1860, Trans. St. Louis Acad. Sci., vol. 1, p. 69, Burlington Gr.
 pumilus, Hall, 1860, Supp. to Geo. Sur. Iowa, p. 82, Warsaw Gr.
 quinquenodus, White, 1862, Proc. Bost. Soc. Nat. Hist., vol. 9, p. 18, Burlington Gr.
ramulosus, see *Cordylocrinus ramulosus*.
 regalis, Hall, 1861, Desc. New Crinoidea, p. 16, Burlington Gr.
 richfieldensis, Hall & Whitfield, 1875, Ohio Pal., vol. 2, p. 167, Waverly Gr.
 saffordi, Troost, 1850, Hall, 1858, Geo. Sur. Iowa, p. 634, Keokuk Gr.
 saræ, Hall, 1858, Geo. Sur. Iowa, p. 673, St. Louis Gr.
 scobina, Meek & Worthen, 1861, Proc. Acad. Nat. Sci. Phil., p. 129, and Geo. Sur. Ill., vol. 3, p. 466, Burlington Gr.
 sculptus, Hall, 1858, Geo. Sur. Iowa, p. 536, Burlington Gr.

shumardanus, Hall, 1858, Geo. Sur. Iowa, vol. 1, pt. 2, p. 532, Burlington Gr.
siluricus, Hall, 1879, Desc. New Spec. Foss., p. 9, and 11th Rep. Geo. Sur. Ind., p. 256, Niagara Gr.



FIG. 397.—*Platyerlinus scobina*. Diagram.

striobrachiatus, Hall, 1861, Desc. New Crinoidea, p. 4, and Bost. Jour. Nat. Hist., vol. 7, p. 287, Burlington Gr.
subspinosus, Hall, 1858, Geo. Sur. Iowa, p. 536, Burlington Gr.
subspinulosus, Hall, 1860, Supp. to Geo. Sur. Iowa, p. 81, Burlington Gr.
symmetricus, Wachsmuth & Springer, (in press,) Geo. Sur. Ill., vol. 8, p. 186, Waverly of Kinderhook Gr.
tennesseensis, see *Marsupiocrinus tennesseensis*.
tentaculatus, see *Marsupiocrinus tentaculatus*.
tenuibrachiatus, Meek & Worthen, 1869, Proc. Acad. Nat. Sci. Phil., p. 16, and Geo. Sur. Ill., vol. 5, p. 450, Burlington Gr.
truncatulus, Hall, 1858, Geo. Sur. Iowa, p. 538, Burlington Gr.
truncatus, Hall, 1858, Geo. Sur. Iowa, p. 537, Burlington Gr.
tuberosus, Hall, 1858, Geo. Sur. Iowa, p. 534, Burlington Gr.
verrucosus, White, 1863, Jour. Bost. Soc. Nat. Hist., vol. 7, p. 502, Burlington Gr.
vexabilis, White, 1875, U. S. Sur. W. 100th Meridian, vol. 4, p. 81, Sub. Carb.
wortheni, Hall, 1858, Geo. Sur. Iowa, p. 530, Burlington Gr.
yandelli, Owen & Shumard, 1850, Jour. Acad. Nat. Sci., 2d ser., vol. 2, p. 58, Burlington Gr.

PLATYCYSTITES, n. gen. [Ety. *platys*, flat; *kustis*, bladder.] General form compressed elliptical, or like the kernel of a peach-seed, with a narrow rim on the border; axial canal passes down into the column; three plates in the first range, one of them bending around the rim and the other two having the dividing suture in the rim itself; there are five large plates in the second range, and above these there are three large plates, on the azygous side, with six or more smaller ones on the border; the whole surface is granular and every plate full of minute pores. Type *P. faberi*.

faberi, n. sp. Basal plates hexagonal, longer than wide, one of them bending around the bordered rim, and the other two uniting at the middle of the rim; a large subcentral hexagonal plate in the second range on the azygous side rests upon the upper side of the plate, which is separated by a suture in the rim from an adjoining basal plate, but does not reach the other basal; this large hexagonal plate joins two plates in the second range with its under sloping sides; three large plates rest upon the three upper faces of this large hexagonal plate; the one upon the superior face is octagonal, resting between the other two large plates and having five smaller ones joining its upper faces. The specimen is worn at the upper edge so as to destroy the orifices. It was received by Charles Faber among a lot of fossils from the Kaskaskia Group in the southern part of West Virginia, but as no cystideans have ever been found above the Lower Devonian, and as the specimen is worn as if it had been drifted, the probability is that it belongs to the Silurian rocks.



FIG. 398. *Platycestites faberi*.

PLEUROCYSTITES, Billings, 1854, Can. Jour., vol. 2, p. 250. [Ety. *pleuron*, side; *kustis*, bladder.] Body oval, flat; dorsal side with large plates, ventral with smaller ones; two free arms: mouth at the base on the left side; small orifice near the apex; three pectinated rhombs, two in the upper half and one in the lower; column short. Type *P. squamosus*.



FIG. 399.—*Pleurocystites squamosus*.

anticostiensis, Billings, 1857, Rep. of Progr. Geo. Sur. Can., p. 288, and Can. Org. Rem., Decade 3, p. 52, Hud. Riv. Gr.
elegans, Billings, 1857, Rep. of Progr. Geo. Sur. Can., p. 287, and Can. Org. Rem., Decade 3, p. 51, Trenton Gr.
exornatus, Billings, 1857, Rep. of Progr. Geo. Sur. Can., p. 287, Trenton Gr.
filitextus, Billings, 1854, Can. Jour., vol. 2, p. 252, and Can. Org. Rem., Decade 3, p. 48, Trenton Gr.
robustus, Billings, 1854, Can. Jour., vol. 2, p. 252, and Can. Org. Rem., Decade 3, p. 49, Trenton Gr.

squamosus, Billings, 1854, Can. Jour., vol. 2, p. 251, and Can. Org. Rem., Decade 3, p. 49, Trenton Gr.

POROCRINUS, Billings, 1857, Rep. of Progr. Geo. Sur. Can., p. 279. [Ety. from the perforiferous areas similar to pectinated rhombs.] Calyx conical; basals 5; sub-radials 1 x 5; radials 1 x 5; azygous interradials 2; pectinated rhombs numerous. Type P. conicus.

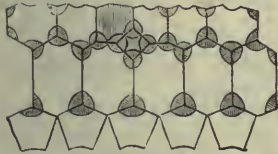


FIG. 400.—Poroocrinus conicus. Diagram.

conicus, Billings, 1857, Rep. of Progr. Geo. Sur. Can., p. 279, and Can. Org. Rem., Decade 4, p. 34, Trenton Gr.



FIG. 401.—Poroocrinus crassus. Diagram.

crassus, Meek & Worthen, 1865, Proc. Acad. Nat. Sci. Phil., p. 115, and Geo. Sur. Ill., vol. 3, p. 330, Hud. Riv. Gr.

pentagonus, Meek & Worthen, 1865, Proc. Acad. Nat. Sci. Phil., p. 146, and Geo. Sur. Ill., vol. 3, p. 332, Trenton Gr.

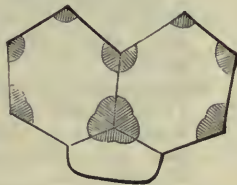


FIG. 402.—Poroocrinus crassus. One basal and two subradials enlarged.

smithi, Grant, 1881, Trans. Ottawa Field Naturalists' Club, No. 2, p. 42, Trenton Gr.

POTEROCRINUS, Miller, 1821, Nat. Hist. Crinoidea, p. 68. [Ety. *poterion*, goblet; *krinon*, lily.] Calyx obconical; basals 5; sub-radials 5; radials 1 x 5, with a variable number of smaller ones, the azygous ray often having more than the others; azygous plates 3 or 4, within the calyx, succeeded by smaller ones that form part of the ventral sac; vault produced in a long sac or proboscis; arms simple or branching and bearing pinnules. Type P. crassus.

aequalis, Hall, 1860, Supp. to Geo. Sur. Iowa, p. 63, Burlington Gr.

alternatus, see Dendrocrinus alternatus.

anomalos, Wetherby, 1880, Jour. Cin. Soc. Nat. Hist., vol. 3, p. 158, Kaskaskia Gr.

arachniformis, Worthen, 1882, Bull. No. 1, Ill. St. Mus. Nat. Hist., p. 13, and Geo. Sur. Ill., vol. 7, p. 281, Keokuk Gr.

asper, Worthen, 1882, Bull. No. 1, Ill. St. Mus. Nat. Hist., p. 11, and Geo. Sur. Ill., vol. 7, p. 278, Keokuk Gr.

asperatus, Worthen, 1882, Bull. No. 1, Ill. St. Mus. Nat. Hist., p. 12, and Geo. Sur. Ill., vol. 7, p. 280, Keokuk Gr.

barrisi, see Cyathocrinus barrisi.

bayensis, see Scaphiocrinus bayensis.

bisselli, Worthen, 1873, Geo. Sur. Ill., vol. 5, p. 546, Kaskaskia Gr.

briareus, see Scaphiocrinus briareus.

buffaloensis, Worthen, (in press,) Geo. Sur. Ill., vol. 8, p. 89, Ham. Gr.

burkети, see Scaphiocrinus burkети.

bursiformis, White, 1862, Proc. Bost. Soc. Nat. Hist., vol. 9, p. 10, Burlington Gr.

caduceus, see Dendrocrinus caduceus.

calyculus, Hall, 1858, Geo. Sur. Iowa, p. 553, Burlington Gr.

calyx, Hall, 1879, Desc. New Spec. Foss., p. 10, and 11th Rep. Geo. Sur. Ind., p. 266, Niagara Gr.

carbonarius, see Graphiocrinus carbonarius.

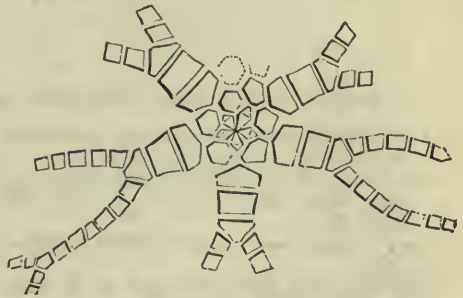


FIG. 403.—Poteroocrinus carinatus. Diagram.

carinatus, Meek & Worthen, 1861, Proc. Acad. Nat. Sci. Phil., p. 139, and Geo. Sur. Ill., vol. 3, p. 486, Burlington Gr.

clarkii, Williams, 1882, Proc. Acad. Nat. Sci. Phil., p. 21, Chemung Gr.

claytonensis, Worthen, 1882, Bull. No. 1, Ill. St. Mus. Nat. Hist., p. 18, and Geo. Sur. Ill., vol. 7, p. 288, Warsaw Gr.

clytis, Worthen, 1882, Bull. No. 1, Ill. St. Mus. Nat. Hist., p. 16, and Geo. Sur. Ill., vol. 7, p. 294, St. Louis Gr.

columbiensis, Worthen, 1882, Bull. No. 1, Ill. St. Mus. Nat. Hist., p. 22, and Geo. Sur. Ill., vol. 7, p. 293, Kaskaskia Gr.

concinus, Meek & Worthen, 1870, Proc. Acad. Nat. Sci. Phil., p. 26, and Geo. Sur. Ill., vol. 5, p. 490, Keokuk Gr.

coreyi, Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 516, Keokuk Gr.

cornellanus, Williams, 1882, Proc. Acad. Nat. Sci. Phil., p. 18, Chemung Gr.

corycia, Hall, 1863, 17th Rep. N. Y. St. Mus. Nat. Hist., p. 57, and Ohio Pal., vol. 2, p. 173, Waverly Gr.
 coxanus, see Scaphiocrinus coxanus.
 crineus, Hall, 1863, 17th Rep. N. Y. St. Mus. Nat. Hist., p. 56, and Ohio Pal., vol. 2, p. 172, Waverly Gr.
 cultidactylus, see Scaphiocrinus cultidactylus.

hoveyi, Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 516, Keokuk Gr.
 illincisensis, Worthen, 1882, Bull. No. 1, Ill. St. Mus. Nat. Hist., p. 19, and Geo. Sur. Ill., vol. 7, p. 289, Warsaw Gr.
 indentus, Hall, 1862, 15th Rep. N. Y. St. Mus. Nat. Hist., p. 122, Ham. Gr.
 indianensis, Meek & Worthen, 1865, Proc. Acad. Nat. Sci. Phil., p. 155, and Geo. Sur. Ill., vol. 3, p. 515, Keokuk Gr.

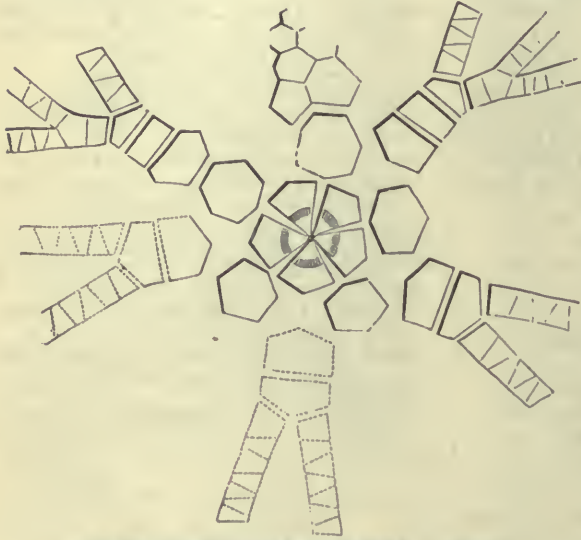


FIG. 404.—Poteriocrinus indianensis. Diagram.

iowensis, see Scaphiocrinus iowensis.
 jesupi, Whitfield, 1881, Bull. No. 1, Am. Nat. Hist., p. 7, syn. for *P. swalovi*.
 kaskaskiensis, see Scaphiocrinus kaskaskiensis.
 keokuk, Hall, 1860, Supp. to Geo. Sur. Iowa, p. 64, Keokuk Gr.
 lasallensis, Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 526, Coal Meas.
 latidactylus, see Scaphiocrinus latidactylus.
 lepidus, Hall, 1861, Desc. New Crin., p. 6, and Bost. Jour. Nat. Hist., vol. 7, p. 304, Burlington Gr.
 longidactylus, Shumard, 1855. The name was preoccupied. See *P. missouriensis*.
 macoupinensis, Worthen, 1873, Geo. Sur. Ill., vol. 5, p. 561, Up. Coal Meas.
 mammiformis, Worthen, (in press.) Geo. Sur. Ill., vol. 8, p. 91, Warsaw Gr.
 manifoldis, see Zeacrinus manifoldis.
 meekanus, Shumard, 1855, Geo. Rep. Mo., p. 188, Burlington Gr.
 milleri, Wetherby, 1880, Jour. Cin. Soc. Nat. Hist., vol. 3, p. 330, Kaskaskia Gr.
 missouriensis, Shumard, 1857, Trans. St. Louis Acad. Sci., p. 80, and Geo. Sur. Iowa, p. 669, St. Louis Gr.
 montanensis, see Scaphiocrinus montanensis.
 municipalis, Troost. Not defined.
 nassa, Hall, 1862, 15th Rep. N. Y. St. Mus. Nat. Hist., p. 120, Ham. Gr.
 nauvoensis, see Scaphiocrinus nauvoensis.
 nereus, Hall, 1862, 15th Rep. N. Y. St. Mus. Nat. Hist., p. 121, Ham. Gr.
 nettlerothanus, S. A. Miller, 1882, Jour. Cin. Soc. Nat. Hist., vol. 5, p. 227, Up. Held. Gr.
 nodobasalis, Worthen, (in press.) Geo. Sur. Ill., vol. 8, p. 89, St. Louis Gr.

cylindricus, Lyon, 1860, Trans. Am. Phil. Soc., vol. 13, p. 458, Up. Held. Gr.
 davisanus, S. A. Miller, 1882, Jour. Cin. Soc. Nat. Hist., vol. 5, p. 226, Up. Held. Gr.
 decadactylus, see Scaphiocrinus decadactylus.
 diffusus, Hall, 1862, 15th Rep. N. Y. Mus. Nat. Hist., p. 121, Ham. Gr.
 dilatatus, see Caeliocrinus dilatatus.
 divaricatus, Hall, 1860, Supp. to Geo. Sur. Iowa, p. 65, Warsaw Gr.
 elsahensis, Worthen, (in press.) Geo. Sur. Ill., vol. 8, p. 88, Kinderhook Gr.
 enormis, see Cyathocrinus enormis.
 florealis, see Zeacrinus florealis.
 fountainensis, Worthen, 1882, Bull. No. 1, Ill. Mus. Nat. Hist., p. 17, and Geo. Sur. Ill., vol. 7, p. 286, St. Louis Gr.
 fusiformis, Hall, 1861, Desc. New Crinoidea, p. 6, and Bost. Jour. Nat. Hist., vol. 7, p. 302, Burlington Gr.
 gracilis, see Dendrocrinus gracilis.
 grarius, Williams, 1882, Proc. Acad. Nat. Sci. Phil., p. 22, Chemung Gr.
 hamiltonensis, Worthen, 1882, Bull. No. 1, Ill. St. Mus. Nat. Hist., p. 7, and Geo. Sur. Ill., vol. 7, p. 273, Keokuk Gr.
 hardinensis, Worthen, 1873, Geo. Sur. Ill., vol. 5, p. 533, St. Louis Gr.
 hemisphericus, see Eupachycrinus hemisphericus.

press.) Geo. Sur. Ill., vol. 8, p. 91, Warsaw Gr.
 manifoldis, see Zeacrinus manifoldis.
 meekanus, Shumard, 1855, Geo. Rep. Mo., p. 188, Burlington Gr.
 milleri, Wetherby, 1880, Jour. Cin. Soc. Nat. Hist., vol. 3, p. 330, Kaskaskia Gr.
 missouriensis, Shumard, 1857, Trans. St. Louis Acad. Sci., p. 80, and Geo. Sur. Iowa, p. 669, St. Louis Gr.
 montanensis, see Scaphiocrinus montanensis.
 municipalis, Troost. Not defined.
 nassa, Hall, 1862, 15th Rep. N. Y. St. Mus. Nat. Hist., p. 120, Ham. Gr.
 nauvoensis, see Scaphiocrinus nauvoensis.
 nereus, Hall, 1862, 15th Rep. N. Y. St. Mus. Nat. Hist., p. 121, Ham. Gr.
 nettlerothanus, S. A. Miller, 1882, Jour. Cin. Soc. Nat. Hist., vol. 5, p. 227, Up. Held. Gr.
 nodobasalis, Worthen, (in press.) Geo. Sur. Ill., vol. 8, p. 89, St. Louis Gr.



FIG. 405.—Poteriocrinus missouriensis.

norwoodi, Meek & Worthen, 1865, Proc. Acad. Nat. Sci. Phil., p. 159, Kaskaskia Gr.
 nycteus, Hall, 1862, 15th Rep. N. Y. St. Mus. Nat. Hist., p. 120, Ham. Gr.
 obuncus, White, 1862, Proc. Bost. Soc. Nat. Hist., p. 10, Burlington Gr.
occidentalis, Owen & Shumard, see Agassizocrinus *occidentalis*.
occidentalis, Worthen, see Scaphiocrinus *occidentalis*.
okawensis, see Scaphiocrinus *okawensis*.
orestes, see Scaphiocrinus *orestes*.
otterensis, Worthen, 1882, Bull. No. 1, Ill. St. Mus. Nat. Hist., p. 14, and Geo. Sur. Ill., vol. 7, p. 283, Keokuk Gr.
peculiaris, Worthen, 1882, Bull. No. 1, Ill. St. Mus. Nat. Hist., p. 25, and Geo. Sur. Ill., vol. 7, p. 298, Kaskaskia Gr.
penicilliformis, Worthen, 1882, Bull. No. 1, Ill. St. Mus. Nat. Hist., p. 9, and Geo. Sur. Ill., vol. 7, p. 276, Keokuk Gr.
perplexus, Meek & Worthen, 1869, Proc. Acad. Nat. Sci. Phil., p. 138, and Geo. Sur. Ill., vol. 5, p. 405, Burlington Gr.
pisiformis, see Arachnocrinus *pisiformis*.
pleias, Hall, 1863, 17th Rep. N. Y. St. Mus. Nat. Hist., p. 57, and Ohio Pal., vol. 2, p. 173, Waverly Gr.
popensis, see Scaphiocrinus *popensis*.
posticus, see Dendrocinus *posticus*.
proboscidiatis, Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 518, St. Louis Gr.
propinquus, see Scaphiocrinus *propinquus*.
rhombiferus, see Barycinus *rhombiferus*.
richfieldensis, Worthen, 1882, Bull. No. 1, Ill. St. Mus. Nat. Hist., p. 15, and Geo. Sur. Ill., vol. 7, p. 285, Kinderhook Gr.
rowleyi, Worthen, (in press,) Geo. Sur. Ill., vol. 8, p. 90, Kaskaskia Gr.
rugosus, Shumard, 1858, Trans. St. Louis Acad. Sci., vol. 1, p. 223, Coal Meas.
saliginoides, White, 1862, Proc. Bost. Soc. Nat. Hist., vol. 9, p. 10, Burlington Gr.
salteri, see Scaphiocrinus *salteri*.
sculptus, Worthen, 1882, Bull. No. 1, Ill. St. Mus. Nat. Hist., p. 21, and Geo. Sur. Ill., vol. 7, p. 292, Kaskaskia Gr.

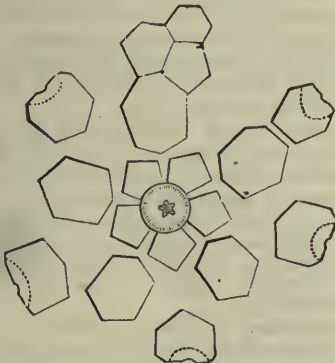
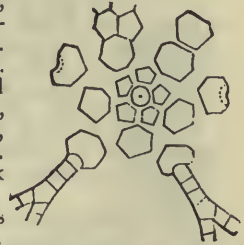


FIG. 406.—Poteriocrinus subimpressus.

similis, Worthen, 1882, Bull. No. 1, Ill. St. Mus. Nat. Hist., p. 23, and Geo. Sur. Ill., vol. 7, p. 295, Keokuk Gr.

simplex, Lyon, 1869, Trans. Am. Phil. Soc., vol. 13, p. 458, Up. Held. Gr.
solidus, Meek & Worthen, 1861, Proc. Acad. Nat. Sci. Phil., p. 140, Burlington Gr.
spinobrachiatus, Scaphiocrinus *brachiatus*.
spinuliferus, Worthen, 1884, Bull. No. 2, Ill. St. Mus. Nat. Hist., p. 27, and Geo. Sur. Ill., vol. 8, p. 86, Kaskaskia Gr.
spinuliferus, Worthen, (in press,) see Zeacrinus *spinuliferus*.
spinosus, see Zeacrinus *spinosus*.
subimpressus, Meek & Worthen, 1861, Proc. Acad. Nat. Sci. Phil., p. 13, and Geo. Sur. Ill., vol. 3, p. 485, Burlington Gr.
subramulosus, Worthen, 1882, Bull. No. 1, Ill. St. Mus. Nat. Hist., p. 14, and Geo. Sur. Ill., vol. 7, p. 284, Keokuk Gr.
subtunidus, Meek & Worthen, 1865, Proc. Acad. Nat. Sci. Phil., p. 159, Kaskaskia Gr.
swalлови, Meek & Worthen, 1860, Proc. Acad. Nat. Sci. Phil., p. 394, and Geo. Sur. Ill., vol. 2, p. 183, Burlington Gr.
talboti, Worthen, 1882, Bull. No. 1, Ill. St. Mus. Nat. Hist., p. 7, and Geo. Sur. Ill., vol. 7, p. 287, St. Louis Gr.
tentaculatus, Worthen, 1882, Bull. No. 1, Ill. St. Mus. Nat. Hist., p. 10, and Geo. Sur. Ill., vol. 7, p. 277, Keokuk Gr.
tenuibrachiatus, Meek & Worthen, 1861, Proc. Acad. Nat. Sci. Phil., p. 138, and Geo. Sur. Ill., vol. 3, p. 484, Burlington Gr.
tenuidactylus, Meek & Worthen, see Scaphiocrinus *tenuidactylus*.



tenuidactylus, Worthen, 1882, Bull. No. 1, Ill. St. Mus. Nat. Hist., p. 6, and Geo. Sur. Ill., vol. 7, p. 271, Keokuk Gr.
 Wachemuth says this is a Scaphiocrinus, and he has proposed to call it Scaphiocrinus *obscurus*.

FIG. 407.—Poteriocrinus tenuibrachiatus. Diagram.

ulrichi, Worthen, (in press,) Geo. Sur. Ill., vol. 8, p. 87, Keokuk Gr.
tumidus, see Agassizocrinus *tumidus*.
validus, Worthen, 1882, Bull. No. 1, Ill. St. Mus. Nat. Hist., p. 18, and Geo. Sur. Ill., vol. 7, p. 287, Warsaw Gr.
vanhornei, Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 517, St. Louis Gr.
varsowiensis, see Scaphiocrinus *varsowiensis*.
ventricosus, see Caeliocrinus *ventricosus*.
venustus, see Scaphiocrinus *venustus*.



FIG. 408.—Poteriocrinus ulrichi.

verticillus, Hall, 1862, 15th Rep. N. Y. St. Mus. Nat. Hist., p. 94, Ham. Gr.
wachsmuthi, Meek & Worthen, see *Graphiocrinus wachsmuthi*.
wachsmuthi, Wetherby, 1880, (*Scytalocrinus wachsmuthi*), Jour. Cin. Soc. Nat. Hist., vol. 3, p. 155, Kaskaskia Gr.
wetherbyi, S. A. Miller, 1879, Jour. Cin. Soc. Nat. Hist., vol. 2, p. 36, Kaskaskia Gr.
zethus, Williams, 1882, Proc. Acad. Nat. Sci., p. 27, Chemung Gr.

PROTASTER, Forbes, 1849, Mem. Geo. Sur. Great Britain, Decade 1. [Ety. *protos*, first; *aster*, star.] Disk circular, composed of squamiform plates; rays flexuous, composed of two series of ambulacral plates, bordered by spinous adambulacral ones; oral plates five. Type *P. miltoni*.

barrisi, see *Onychaster barrisi*.



FIG. 409.—*Protaster flexuosus*.

flexuosus, Miller & Dyer, 1878, Jour. Cin. Soc. Nat. Hist., vol. 1, p. 31, Utica Slate & Hud. Riv. Gr.
forbesi, Hall, 1859, Pal. N. Y., vol. 3, p. 134, Low. Held. Gr.
granuliferus, Meek, 1872, Am. Jour. Sci., 3d ser., vol. 3, p. 274, and Ohio Pal., vol. 1, p. 68, Hud. Riv. Gr.
gregarius, Meek & Worthen, 1869, Proc. Acad. Nat. Sci. Phil., p. 169, and Geo. Sur. Ill., vol. 5, p. 509, Keokuk Gr.
miamiensis, S. A. Miller, 1882, Jour. Cin. Soc. Nat. Hist., vol. 5, p. 116, Hud. Riv. Gr.
stellifer, Ringuenberg, 1886, Bull. Buff. Soc. Nat. Sci., vol. 5, p. 7, Niagara Gr.

Protasterina, syn. for *Protaster*.

fimbriata, syn. for *Protaster flexuosus*.

PTEROTOCRINUS, Lyon & Casseday, 1860, Am. Jour. Sci., vol. 29, p. 68. [Ety. *pterotos*, feathered; *krinon*, lily.] Calyx saucer-shaped, wider than high; vault high, with five wing-like processes that characterize this genus; basals 2; radials 1 or 2 x 5, the second being small; secondary radials 1 x 10; tertiary radials 2 or 3 x 20; azygous interradial 1; arms 20, reaching only to the vault; column round. Type *P. capitalis*.

acutus, Wetherby, 1879, Jour. Cin. Soc. Nat. Hist., vol. 2, p. 134, Kaskaskia Gr.

bifurcatus, Wetherby, 1879, Jour. Cin. Soc. Nat. Hist., vol. 2, p. 136, Kaskaskia Gr.



FIG. 410.—*Pterotocrinus chesterensis*. Diagram.

capitalis, Lyon, 1857, (*Astrocrinus capitalis*), Geo. Sur. Ky., vol. 3, p. 472, Kaskaskia Gr.

chesterensis, Meek & Worthen, 1860, (*Actinocrinus chesterensis*), Proc. Acad. Nat. Sci. Phil., p. 383, and Geo. Sur. Ill., vol. 2, p. 292, Kaskaskia Gr.

coronarius, Lyon, 1857, (*Asterocrinus coronarius*), Geo. Sur. Ky., vol. 3, p. 476, Kaskaskia Gr.

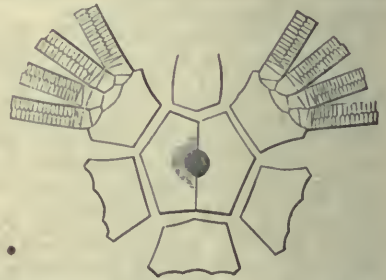


FIG. 411.—*Pterotocrinus crassus*. Diagram.

crassus, Meek & Worthen, 1860, (*Dichoerinus crassus*), Proc. Acad. Nat. Sci. Phil., p. 382, and Geo. Sur. Ill., vol. 2, p. 290, Kaskaskia Gr.

depressus, Lyon & Casseday, 1860, Am. Jour. Sci., vol. 29, p. 68, and Geo. Sur. Ill., vol. 5, p. 559, Kaskaskia Gr.

protuberans, Hall, 1858, (*Dichoerinus protuberans*), Geo. Sur. Iowa, p. 689, Kaskaskia Gr.

pyramidalis, Lyon & Casseday, 1860, Am. Jour. Sci., vol. 29, p. 69, Kaskaskia Gr.

rugosus, Lyon & Casseday, 1860, Am. Jour. Sci., vol. 29, p. 71, Kaskaskia Gr.

sexlobatus, see *Talarocrinus sexlobatus*.

spatulatus, Wetherby, 1879, Jour. Cin. Soc. Nat. Hist., vol. 2, p. 137, Kaskaskia Gr.

Ptilonaster, Hall, 1868, syn. for *Palaeocoma*.

princeps, see *Palaeocoma princeps*.

Ptychocrinus, Wachsmuth & Springer, 1886, Revis. Palaeocriinoidea, pt. 3, p. 99, syn. for *Gaurocrinus*.

PYCNOCRINUS, S. A. Miller, 1883, Jour. Cin. Soc. Nat. Hist., vol. 6, p. 231. [Ety. *puknos*, dense; *krinon*, lily.] Calyx small, cup-shaped; basals 5; radials 3 x 5; regular interradials 3; arms 10, sometimes dividing after becoming free. Type *P. shafferi*.

germanus, S. A. Miller, 1880, (*Glyptocrinus shafferi* var. *germanus*), Jour. Cin. Soc. Pycnocrinus Nat. Hist., vol. 3, p. 233, Hud. Riv. Gr.

shafferi, S. A. Miller, 1875, (*Glyptocrinus shafferi*), Cin. Quar. Jour. Sci., vol. 2,



FIG. 412.

p. 277, and Jour. Cin. Soc. Nat. Hist., vol. 3, p. 233, Hud. Riv. Gr.



FIG. 413.—Pycnoerinus shafferi.



FIG. 414.—Pycnoerinus shafferi. Enlarged $\frac{2}{3}$ diam.



FIG. 415. Pycnoerinus shafferi. Column coiled around a column of Glyptocrinus.

Pygorhynchus gouldi. Not recognized.

RETIOCRINUS, Billings, 1858, Can. Org. Rem., Decade 4, p. 63. [Ety. *retium*, net; *krinon*, lily.] Calyx basin-shaped; radial ridges very prominent; basals 5, large; subradials 5, large; primary radials 4x5; secondary radials 4 to 6x10; plates in interradial areas, numerous, with a large central row in the azygous area extending up the side of a ventral tube; column round. Type *R. stellaris*.

fimbriatus, Billings, 1859, Can. Org. Rem., Decade 4, p. 65, Hud. Riv. Gr.

gracilis, Wetherby, syn. for *Gaurocrinus angularis*.



FIG. 416.—Retioerinus stellaris.

stellaris, Billings, 1859, Can. Org. Rem., Decade 4, p. 64, Trenton Gr.

RHAPHANOCRINUS, Wachsmuth & Springer, 1885, Revis. Palaeocrinoidea, pt. 3, p. 98. [Ety. *raphanos*, radish; *krinon*, lily.] Calyx short; basals 5, small; subradials 5; primary radials 3x5; interradials numerous; column round. Type *R. subnodosus*.

subnodosus, Walcott, 1883, Glyptocrinus subnodosus, 35th Rep. N. Y. St. Mus. Nat. Hist., p. 208, Trenton Gr.

RHODOCRINUS, Miller, 1821, Nat. Hist., Crinoidea, p. 106. [Ety. *rhodon*, rose; *krinon*, lily.] Body subglobose, often wider than high, constricted near the arm bases; basals 5, small; subradials 5; primary radials 3 to 4x5; secondary radials 1 to 3x10; arms widely separated, and composed of two rows of interlocking plates; interradial areas wide, plates large; vault depressed; orifice excentric and protruding; column round. Type *R. verus*.

asperatus, Billings, 1859, Can. Org. Rem., Decade 4, p. 27, Chazy Gr.

barrisi, Hall, 1861, Desc. New Crin., p. 9, and Jour. Bost. Soc. Nat. Hist., vol. 7, p. 322, Burlington Gr.

barrisi var. *divergens*, Hall, 1861, Desc. New Crin., p. 9, and Jour. Bost. Soc. Nat. Hist., vol. 7, p. 322, Burlington Gr.

coxanus, Worthen, 1882, Bull. No. 1, Ill. St. Mus. Nat. Hist., p. 29, and Geo. Sur. Ill., vol. 7, P. 305, Keokuk Gr.

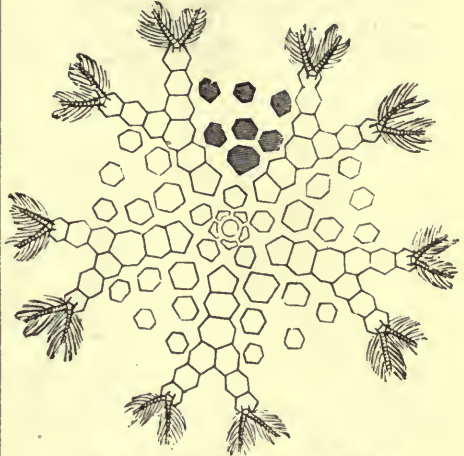


FIG. 417.—Rhodocrinus. Diagram.

gracilis, Hall, 1862, 15th. Rep. N. Y. Mus. Nat. Hist., p. 127, Ham. Gr.

halli, Lyon, 1861, Proc. Acad. Nat. Sci. Phil., p. 412, Low. Held. Gr.

kirbyi, Wachsmuth & Springer, (in press,) (Geo. Sur. Ill., vol. 8, p. 180, Kinderhook Gr.

melissa, see *Lyriocrinus melissa*.

microbasalis, see *Archaeocrinus microbasalis*.

nanus, Meek & Worthen, 1866, Proc. Acad. Nat. Sci. Phil.,



nanus, Meek & Worthen, 1866, Proc. Acad. Nat. Sci. Phil.,

FIG. 418.—Rhodocrinus nanus.

nanus, Meek & Worthen, 1866, Proc. Acad. Nat. Sci. Phil.,

nanus, Meek & Worthen, 1866, Proc. Acad. Nat. Sci. Phil.,

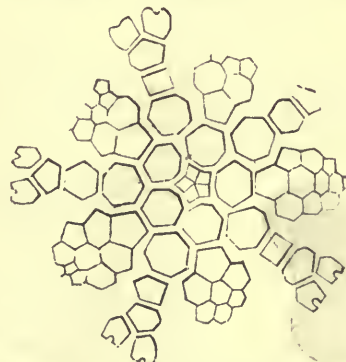


FIG. 419.—Rhodocrinus nanus. Diagram.

p. 254, and Geo. Sur. Ill., vol. 3, p. 476, Burlington Gr.

nodulosus, Hall, 1862, 15th Rep. N. Y. Mus. Nat. Hist., p. 126, Ham. Gr.
 pyriformis, see Archæocrinus pyriformis.
 rectus, Hall, 1867, 20th Rep. N. Y. Mus. Nat. Hist., p. 368, Niagara Gr.
 spinosus, Hall, 1862, 15th Rep. N. Y. Mus. Nat. Hist., p. 127, Ham. Gr.
 varsoviensis, Hall, 1860, Supp. to Geo. Sur. Iowa, p. 80, Warsaw Gr.
 vesperalis, White, 1880, Proc. U. S. Nat.

wortheni, Hall, 1858, Geo. Sur. Iowa, p. 556, Burlington Gr.
 SACCOCRINUS, Hall, 1852, Pal. N. Y., vol. 2, p. 205. [Ety. *sakkos*, bag; *krimon*, lily.] Calyx large, urn-shaped; basals 3; primary radials 3x5; secondary radials 1 to 4x10; tertiary radials, in some species; regular interradials 10 to 17; vault depressed, opening subcentral; arms 10 to 30; column round. Type *S. speciosus*.

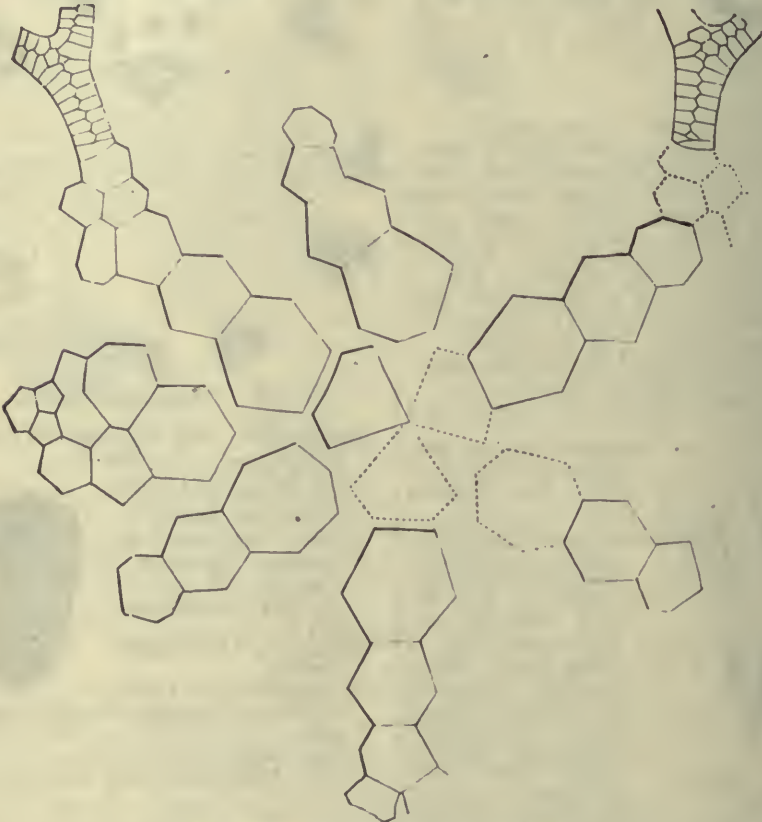


FIG. 420.—Saccocrinus amplus. Diagram.

Mus., vol. 2, p. 259, and Cont. to Pal. No. 6, p. 129, Up. Coal Meas.
 wachsmuthi, Hall, 1861, Desc. New Crin., p. 18, Burlington Gr.



FIG. 421—Rhodoerinus waterslanus.

waterslanus, wachsmuth & Springer, (in press,) Geo. Sur. Ill., vol. 8, p. 184, Kinderhook, Gr.
 whitii, Hall, 1861, Desc. New Crin., p. 9, and Jour. Bost. Soc. Nat. Hist., vol. 7, p. 324, Burlington Gr.
 whitii var. burlingtonensis, Hall, 1861, Desc. New Crin., p. 9, and Jour. Bost. Soc. Nat. Hist., vol. 7, p. 325, Burlington Gr.

amplus, Meek & Worthen, 1861, (Actinocrinus amplus,) Proc. Acad. Nat. Sci. Phil., p. 133, and Geo. Sur. Ill., vol. 3, p. 470, Burlington Gr.
 christyi, Hall, 1863, (Actinocrinus christyi,) Trans. Alb. Inst., vol. 4, p. 196, and 28th Rep. N. Y. Mus. Nat. Hist., p. 127, Niagara Gr.



egani, S. A. Miller, 1881, Jour. Cin. Soc. Nat. Hist., vol. 4, p. 173, Niagara Gr.

infelix, Winchell & Marcy, 1865, (Megistocrinus infelix,) Mem. Bost. Soc. Nat. Hist., p. 110, Niagara Gr.

FIG. 422.—Saccocrinus christyi.

marcouanus, Winchell & Marcy, 1865, (Megistocrinus marcouanus,) Mem. Bost. Soc. Nat. Hist., p. 87, Niagara Gr.

necis, Winchell & Marcy, 1865, (Megistocrinus necis,) Mem. Bost. Soc. Nat. Hist., p. 110, Niagara Gr.

ornatus, Hall & Whitfield, 1875, Ohio Pal., vol. 2, p. 126, Niagara Gr.

pyriformis, S. A. Miller, 1882, Jour. Cin. Soc. Nat. Hist., vol. 5, p. 81, Niagara Gr.

semiradiatus, Hall, 1867, 20th Rep. N. Y. St. Mus. Nat. Hist., p. 370, Niagara Gr.

speciosus, Hall, 1852, Pal. N. Y., vol. 2, p. 205, Niagara Gr.

tennesseensis, Troost, Ms., Hall & Whitfield, 1875, Ohio Pal., vol. 2, p. 125, Niagara Gr.

urniformis, S. A. Miller, 1881, Jour. Cin. Soc. Nat. Hist., vol. 4, p. 170, Niagara Gr.

whitfieldi, Hall, 1867, synonym for *Saccocrinus christyi*.

SCAPHIOCRINUS, Hall, 1858, Geo. Sur. Iowa, p. 550. [Ety. *scaphion*, skiff; *krinon*, lily.] Calyx obovoidal; basals 5; subradials 5; radials 2x5; regular interradials 0; azygous interradials 1 to 6; arms 10, simple or bifurcating, plates projecting laterally; sutures gaping. Type *S. simplex*. Wachsmuth & Springer refer the type to *Graphiocrinus* and substitute, as the type *S. dichotomus*.

abnormis, Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 519, St. Louis Gr.

ægina, Hall, 1863, 17th Rep. N. Y. Mus. Nat. Hist., p. 57, Waverly Gr.

æqualis, Hall, 1861, Desc. New Crin. p. 8, and Geo. Sur. Ill., vol. 5, p. 494, Keokuk Gr.

bayensis, Meek & Worthen, 1865, Proc. Acad. Nat. Sci. Phil., p. 157, and Geo. Sur. Ill., vol. 5, p. 550, Kaskaskia Gr.

briareus, Worthen, 1882, (Poteriocrinus briareus,) Bull. No. 1, Ill. St. Mus. Nat. Hist., p. 12, and Geo. Sur. Ill., vol. 7, p. 279, Keokuk Gr.

burketi, Worthen, 1882, (Poteriocrinus burketi,) Bull. No. 1, Ill. St. Mus. Nat. Hist., p. 5, and Geo. Sur. Ill., vol. 7, p. 270, Keokuk Gr.

carbonarius, see *Graphiocrinus carbonarius*.

carinatus, Hall, 1861, Desc. New Crin., p. 8, and Jour. Bost. Soc. Nat. Hist., vol. 7, p. 310, Burlington Gr.

clio, Meek & Worthen, 1869, Proc. Acad. Nat. Sci. Phil., p. 144, and Geo. Sur. Ill., vol. 5, p. 408, Burlington Gr.

coreyi, Meek & Worthen, 1869, Proc. Acad. Nat. Sci. Phil., p. 148, and Geo. Sur. Ill., vol. 5, p. 494, Keokuk Gr.

coxanus, Worthen, 1882, (Poteriocrinus coxanus,) Bull. No. 1, Ill. St. Mus. Nat. Hist., p. 43, and Geo. Sur. Ill., vol. 7, p. 269, Keokuk Gr.

cultidactylus, Hall, 1860, (Poteriocrinus cultidactylus,) Supp. to Geo. Sur. Iowa, p. 62, and Geo. Sur. Ill., vol. 7, p. 301, Burlington Gr.

dactyliformis, Hall, 1858, Geo. Sur. Iowa, p. 670, St. Louis Gr.

decabrachiatus, Hall, 1858, Geo. Sur. Iowa, p. 679, St. Louis Gr.

decadactylus, Meek & Worthen, 1860, (Poteriocrinus decadactylus,) Proc. Acad. Nat. Sci. Phil., p. 394, and Geo. Sur. Ill., vol. 2, p. 238, Keokuk Gr.

delicatus, Meek & Worthen, 1869, Proc. Acad. Nat. Sci. Phil., p. 144, and Geo. Sur. Ill., vol. 5, p. 407, Burlington Gr.

depressus, Meek & Worthen, 1870, Proc. Acad. Nat. Sci. Phil., p. 27, and Geo. Sur. Ill., vol. 5, p. 492, Keokuk Gr.

dichotomus, Hall, 1858, Geo. Sur. Iowa, p. 553, Burlington Gr.

divaricatus, Hall, 1860, Supp. to Geo. Sur. Iowa, p. 65, Burlington Gr.

doris, Hall, 1861, Desc. New Crin., p. 7, and Jour. Bost. Soc. Nat. Hist., vol. 7, p. 312, Burlington Gr.

elegantulus, Wachsmuth & Springer, (in press) Geo. Sur. Ill., vol. 8, p. 195, Kinderhook Gr.

extensus, Wachsmuth & Springer, 1886, Revis. Palæocrinoidea pt. 3, p. 237. Proposed instead of *Poteriocrinus asper*, Worthen, but the latter name was not preoccupied.

fiscellus, Meek & Worthen, 1869, Proc. Acad. Nat. Sci. Phil., p. 146, and Geo. Sur. Ill., vol. 5, p. 424, Burlington Gr.

gibsoni, White, 1878, Proc. Acad. Nat. Sci. Phil., p. 31, and Cont. to Pal., No. 8, p. 161, Keokuk Gr.

globosus, Wachsmuth & Springer, (in press) Geo. Sur. Ill., vol. 8, p. 196, Kinderhook Gr.

gurleyi, White, 1878, Proc. Acad. Nat. Sci. Phil., p. 32, and Cont. to Pal.,

No. 8, p. 162, Keokuk Gr.

halli, Hall, 1861, Desc. New Crin., p. 7, and Jour. Bost. Soc. Nat. Hist., vol. 7, p. 308, Burlington Gr.



FIG. 423.—Scaphiocrinus decadactylus. Diagram.



FIG. 424.—Scaphiocrinus elegantulus.



FIG. 425.—Scaphiocrinus globosus.

huntsvillæ, Worthen, 1873, *Geo. Sur. Ill.*, vol. 5, p. 534, St. Louis Gr.
internodius, Hall, 1858, *Geo. Sur. Iowa*, p. 679, St. Louis Gr.
iowensis, Worthen, 1882, (*Poteroicrinus iowensis*.) *Bull. No. 1, Ill. St. Mus. Nat. Hist.*, p. 6, and *Geo. Sur. Ill.*, vol. 7, p. 272, Keokuk Gr.
juvenis, Meek & Worthen, 1869, *Proc. Acad. Nat. Sci. Phil.*, p. 146, and *Geo. Sur. Ill.*, vol. 5, p. 417, Burlington Gr.
kaskaskiensis, Worthen, 1882, (*Poteroicrinus kaskaskiensis*.) *Bull. No. 1, Ill. St. Mus. Nat. Hist.*, p. 27, and *Geo. Sur. Ill.*, vol. 7, p. 300, Kaskaskia Gr.
latidactylus, Worthen, 1882, (*Poteroicrinus latidactylus*.) *Bull. No. 1, Ill. St. Mus. Nat. Hist.*, p. 8, and *Geo. Sur. Ill.*, vol. 7, p. 275, Keokuk Gr.
liliiformis, Meek & Worthen, 1869, *Proc. Acad. Nat. Sci. Phil.*, p. 138, Burlington Gr.
liriope, Hall, 1863, 17th Rep. N. Y. Mus. *Nat. Hist.*, p. 58, Waverly Gr.
longidactylus, McChesney, 1860, *New Pal. Foss.*, p. 7, Kaskaskia Gr.
macadamisi, see *Graphioicrinus macadamisi*.
macrodactylus, Meek & Worthen, 1869, *Proc. Acad. Nat. Sci. Phil.*, p. 140, and *Geo. Sur. Ill.*, vol. 5, p. 415, Burlington Gr.
montanensis, Meek, 1872, (*Poteroicrinus montanensis*.) *Hayden's Geo. Sur. Terr.*, p. 469, and *Cont. to Pal.*, No. 6, p. 128, Subcarboniferous.
nanus, Meek & Worthen, 1869, *Proc. Acad. Nat. Sci. Phil.*, p. 141, and *Geo. Sur. Ill.*, vol. 5, p. 423, Burlington Gr.
navooensis, Worthen, 1882, (*Poteroicrinus navooensis*.) *Bull. No. 1, Ill. St. Mus. Nat. Hist.*, p. 13, and *Geo. Sur. Ill.*, vol. 7, p. 282, Keokuk Gr.
nodobrachiatus, Hall, 1861, *Desc. New Crin.*, p. 8, and *Jour. Bost. Soc. Nat. Hist.*, vol. 7, p. 314, Keokuk Gr.
notabilis, Meek & Worthen, 1869, *Proc. Acad. Nat. Sci. Phil.*, p. 148, and *Geo. Sur. Ill.*, vol. 5, p. 410, Burlington Gr.
obscurus, Wachsmuth & Springer, 1886, *Revis. Palæocrinoidea*, pt. 3, p. 236, Keokuk Gr.
occidentalis, Worthen, 1882, (*Poteroicrinus occidentalis*.) *Bull. No. 1, Ill. St. Mus. Nat. Hist.*, p. 10, and *Geo. Sur. Ill.*, vol. 7, p. 278, Keokuk Gr.
okawensis, Worthen, 1882, (*Poteroicrinus okawensis*.) *Bull. No. 1, Ill. St. Mus. Nat. Hist.*, p. 24, and *Geo. Sur. Ill.*, vol. 7, p. 296, Kaskaskia Gr.
orbicularis, see *Eupachycrinus orbicularis*.
orestes, Worthen, 1882, (*Poteroicrinus orestes*.) *Bull. No. 1, Ill. St. Mus. Nat. Hist.*, p. 7, and *Geo. Sur. Ill.*, vol. 7, p. 273, Keokuk Gr.

penicillus, Meek & Worthen, 1869, *Proc. Acad. Nat. Sci. Phil.*, p. 142, and *Geo. Sur. Ill.*, vol. 5, p. 414, Burlington Gr.
popensis, Worthen, 1882, (*Poteroicrinus popensis*.) *Bull. No. 1, Ill. St. Mus. Nat. Hist.*, p. 23, and *Geo. Sur. Ill.*, vol. 7, p. 296, Kaskaskia Gr.
propinquus, Worthen, 1882, (*Poteroicrinus propinquus*.) *Bull. No. 1, Ill. St. Mus. Nat. Hist.*, p. 26, and *Geo. Sur. Ill.*, vol. 7, p. 299, Kaskaskia Gr.
ramulosus, Hall, 1861, *Desc. New Crin.*, p. 7, and *Jour. Bost. Soc. Nat. Hist.*, vol. 7, p. 307, Burlington Gr.
randolphensis, Worthen, 1873, *Geo. Sur. Ill.*, vol. 5, p. 551, Kaskaskia Gr.
robustus, Hall, 1861, *Desc. New Crin.*, p. 7, and *Jour. Bost. Soc. Nat. Hist.*, vol. 7, p. 315, Keokuk Gr.
rudis, see *Graphioicrinus rudis*.
rusticellus, White, 1863, *Proc. Bost. Soc. Nat. Hist.*, vol. 7, p. 505, Burlington Gr.
salteri, Worthen, 1882, (*Poteroicrinus salteri*.) *Bull. No. 1, Ill. St. Mus. Nat. Hist.*, p. 13, and *Geo. Sur. Ill.*, vol. 7, p. 291, Kaskaskia Gr.
scalaris, Meek & Worthen, 1869, *Proc. Acad. Nat. Sci. Phil.*, p. 145, and *Geo. Sur. Ill.*, vol. 5, p. 421, Burlington Gr.
scoparius, Hall, 1858, *Geo. Sur. Iowa*, p. 680, Kaskaskia Gr.
simplex, see *Graphioicrinus simplex*.
spinifer, Wetherby, 1880, *Jour. Cin. Soc. Nat. Hist.*, vol. 3, p. 157, Kaskaskia Gr.
spinobrachiatus, see *Graphioicrinus spinobrachiatus*.
spinobrachiatus, Worthen, 1882, (*Poteroicrinus spinobrachiatus*.) *Bull. No. 1, Ill. St. Mus. Nat. Hist.*, p. 20, and *Geo. Sur. Ill.*, vol. 7, p. 290, Kaskaskia Gr.
striatus, see *Graphioicrinus striatus*.
subcarinatus, Hall, 1863, 17th Rep. N. Y. *Mus. Nat. Hist.*, p. 58, Waverly Gr.



FIG. 426.—*Scaphioicrinus tenuidactylus*. Diagram.

subtortuosus, Hall, 1863, 17th Rep. N. Y. *Mus. Nat. Hist.*, p. 59, Waverly Gr.
tenuidactylus, Meek & Worthen, 1865, *Proc. Acad. Nat. Sci. Phil.*, p. 156, and *Geo. Sur. Ill.*, vol. 3, p. 490, Burlington Gr.

tethys, Meek & Worthen, 1869, Proc. Acad. Nat. Sci. Phil., p. 143, and Geo. Sur. Ill., vol. 5, p. 419, Burlington Gr.

tortuosus, see Graphiocrinus tortuosus.

unicus, Hall, 1861, Desc. New Crin., p. 8, and Geo. Sur. Ill., vol. 5, p. 493, Keokuk Gr.

varsoviensis, Worthen, 1882, (Poteriocrinus varsoviensis,) Bull. No. 1, Ill. St. Mus. Nat. Hist., p. 20, and Geo. Sur. Ill., vol. 7, p. 290, Warsaw Gr.

venustus, Worthen, 1882, (Poteriocrinus venustus,) Bull. No. 1, Ill. St. Mus. Nat. Hist., p. 24, and Geo. Sur. Ill., vol. 7, p. 297, Kaskaskia Gr.

wachsmuthi, see Graphiocrinus wachsmuthi.

whitii, Hall, 1861, Desc. New Crin., p. 7, and Jour. Bost. Soc. Nat. Hist., vol. 7, p. 306, Burlington Gr.

SCHIZOBLASTUS, Etheridge & Carpenter, 1882, Ann. & Mag. Nat. Hist., vol. 9, p. 243. [Ety. *schiza*, cleft; *blastos*, bud.] Calyx in form like Granatocrinus; basals confined to the base, sometimes visible, in a side view; deltoids always visible in a side view; ambulacra narrow and sublinear, extending the height of the calyx; lancet-plates nearly concealed by the side plates; latter from 20 to 80 in number; 1 to 4 hydrosphere folds on each side of an ambulacrum; spiracles minute linear slits between the lancet-plate and the deltoid ridges; surface ornamented with striae. Type *S. sayi*.

melonoides, Meek & Worthen, 1869, (Granatocrinus melonoides,) Proc. Acad. Nat. Sci. Phil., p. 88, and Geo. Sur. Ill., vol. 5, p. 468, Burlington Gr.

sayi, Shumard, 1855, (Pentremites sayi,) Geo. Rep. Mo., p. 185, Burlington Gr.



FIG. 427.—Schizocrinus nodosus.

SCHIZOCRINUS, Hall, 1847, Pal. N. Y., vol. 1, p. 81. [Ety. *schiza*, cleft; *krinon*, lily.] Basals 5; primary radials 3 x 5; secondary radials 2 x 10; interradials 5 or more; arms short, branching, bearing pinnules; column round. Type *S. nodosus*.

nodosus, Hall, 1847, Pal. N. Y., vol. 1, p. 81, Trenton Gr.

striatus, Hall, 1847, Pal. N. Y., vol. 1, p. 316, Trenton Gr. Probably belongs to another genus.

SCHENASTER, Meek & Worthen, 1860, Proc. Acad. Nat. Sci., p. 449, and Geo. Sur. Ill., vol. 2, p. 277. [Ety. *schoinos*, rope;

aster, star.] Pentagonal disk, with angles produced into rays; margins between rays concave and spinous; plates alternating on dorsal side of rays, and on ventral side of disk imbricating inward and laterally toward the ambulacra; furrows wide, deep, bordered with a single row of adambulacrals, which become the marginal plates of the free rays. Type *S. fimbriatus*.

fimbriatus, Meek & Worthen, 1860, (Palæasterina fimbriata,) Proc. Acad. Nat. Sci. Phil., p. 449, and Geo. Sur. Ill., vol. 2, p. 278, St. Louis Gr.

wachsmuthi, Meek & Worthen, 1866, Proc. Acad. Nat. Sci. Phil., p. 259, and Geo. Sur. Ill., vol. 3, p. 499, Burlington Gr.

Scyphocrinus, Hall, 1847, Pal. N. Y., vol. 1. Preoccupied, by Zenker, in 1839. See Cupulocrinus.

heterocostalis, see Cupulocrinus heterocostalis.

Scytalocrinus, Wachsmuth & Springer, 1879, Proc. Acad. Nat. Sci. Phil. A division of Poteriocrinus of less than generic importance, with *P. robustus* as the type.

wachsmuthi, see Poteriocrinus wachsmuthi.

SIPHONOCRINUS, S. A. Miller, 1888, Am. Geol., vol. 1, p. 263. [Ety. *siphon*, bent tube; *krinon*, lily.] Basals 3 (?) small.

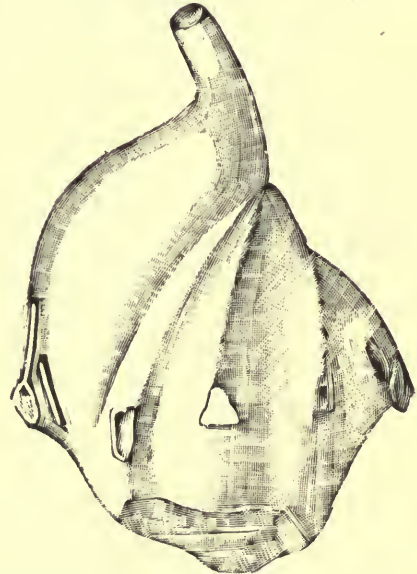


FIG. 428.—Siphonocrinus nobilis; internal view of an internal cast.

Wachsmuth says there are 5; primary radials 3 x 5; first interradials nearly as large as primary radials, and succeeded by two smaller ones, and

these by three or more; first azygous plate as large as the primaries; it rests upon the basals and is succeeded by three plates; the following ranges have more plates and cover an expanded azygous side; vault very large, high, and bears a proboscis either projected upward or recumbent; surface of plates ornamented. Type *S. nobilis*.

armosus, McChesney, 1861, (*Eucalyptocrinus armosus*.) New. Pal. Foss., p. 95, and 20th Rep. N. Y. St. Mus. Nat. Hist., p. 373, Niagara Gr.

nobilis, Hall, 1861, (*Glyptocrinus nobilis*.) Geo. Sur. Wis., p. 21, and 20th Rep. N. Y. St. Mus. Nat. Hist., p. 328, Niagara Gr.

Sphaerocrinus, Meek & Worthen, 1866. The name was preoccupied, by Roemer. See *Cælocrinus*.

SPHEROCYSTITES, Hall, 1859, Pal. N. Y., vol. 3, p. 130. [Ety. *sphaira*, sphere; *kystis*, bladder.] Spheroidal, wider than high; arms, in two principal pairs, with numerous bifurcations; brachial sulci obliquely lobed; mouth apical; opening subapical; ovarian opening on the summit; basal plates 4, others unknown. Type *S. multifasciatus*.

multifasciatus, Hall, 1859, Pal. N. Y., vol. 3, p. 130, Low. Held. Gr.

Squamaster, Ringueberg, 1886, Bull. Buf. Soc. Nat. Hist., vol. 5, p. 5.

STEGANOCRINUS, Meek & Worthen, 1866, Geo. Sur. Ill., vol. 2, p. 195. [Ety. *steganos*, covered; *krinon*, lily.] General form like *Actinocrinus*; basals 3; primary

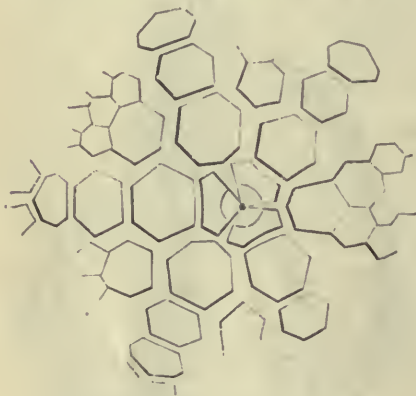


FIG. 429.—*Steganoocrinus concinnus*.

radials 3 x 5; secondary radials 1 x 2 x 5, in each ray; regular interradials 3 to 6 x 4; azygous interradials 3 to 10 or more; vault elevated, with long subcentral tube; arms bifurcating; column round. Type *S. pentagonus*.

araneolus, Meek & Worthen, 1860, (*Actinocrinus araneolus*.) Proc. Acad. Nat. Sci. Phil., p. 387, and Geo. Sur. Ill., vol. 2, p. 198, Burlington Gr.

concinnus, Shumard, 1855, (*Actinocrinus concinnus*.) Geo. Sur. Mo., p. 189, Burlington Gr.

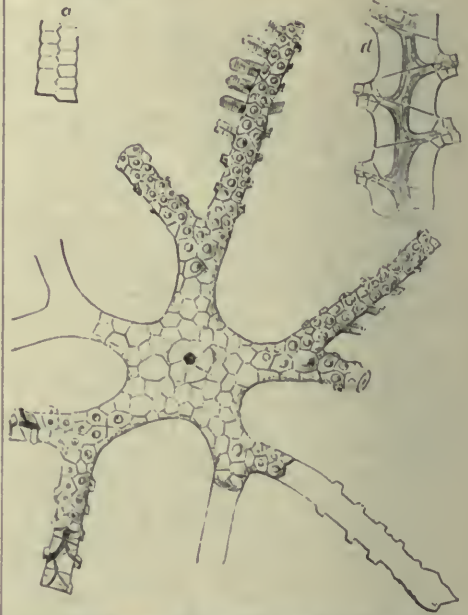


FIG. 430.—*Steganoocrinus pentagonus*. Vault and part of the rays; *a* and *d* showing structure of the rays.

pentagonus, Hall, 1858, (*Actinocrinus pentagonus*.) Geo. Sur. Iowa, p. 577, Burlington Gr.

sculptus, Hall, 1858, (*Actinocrinus sculptus*.) Geo. Sur. Iowa, p. 582, Burlington Gr.

STEMMATOCRINUS, Trautschold, 1867, Crin. d. jungeren Bergkalkes b. Moskau, p. 28. [Ety. *stemma*, wreath; *krinon*, lily.] Calyx low, cup-shaped; basals 5, anchylosed; subradials 5; radials twice as wide as high; brachials 1 x 5; arms heavy. Type *S. cornuus*. This is closely related to *Eriscocrinus* and *Eupachycrinus*.

trautscholdi, Wachs-muth & Springer, 1886, Revis. Palæocrinoidea, pt. 3, p. 256, Keokuk Gr.

STENASTER, Billings, 1858, Can. Org. Rem., Decade 3, p. 77. [Ety. *stenos*, narrow; *aster*, star.] Disk small, rays extended, flexible; dorsal side covered with small

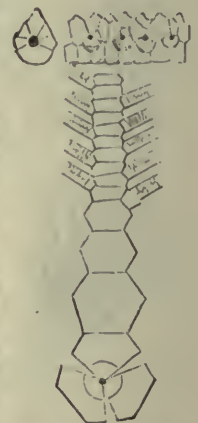


FIG. 431.—*Steganoocrinus sculptus*. Diagram of a ray and transverse sections.

plates; adambulacrals square or oblong; orals 10. Type *S. salteri*.



FIG. 432.—*Stenaster grandis*.

grandis, Meek, 1872, Am. Jour. Sci., 3d ser., vol. 3, p. 258, and Ohio Pal., vol. 1, p. 66, Hud. Riv. Gr.

huxleyi, Billings, 1865, Pal. Foss., vol. 1, p. 213, Quebec Gr.

pulchellus, Billings, 1857, (Palæaster *pulchellus*.) Geo. Sur. Can., p. 292, and Can. Org. Rem., Decade 3, p. 79, Trenton Gr.

salteri, Billings, 1858, Can. Org. Rem., Decade 3, p. 78, Trenton Gr.

Stenocrinus, Wachsmuth & Springer, 1885, Palæocrinoidea, pt. 3, p. 207, syn. for *Heterocrinus*.

STEPHANOCRINUS, Conrad, 1842, Jour. Acad. Nat. Sci., vol. 8, p. 278. [Ety. *stephanos*, coronet; *krinon*, lily.] A blastoid, with 3 basals, 5 fork pieces or radials, and 5 orals; aperture subcentral; ambulacrals appendages, but thus far the hydrospires are unknown. Type *S. angulatus*. Some authors refer this genus to the Palæocrinoidea.



FIG. 433.—*Stephanocrinus angulatus*.

angulatus, Conrad, 1842, Jour. Acad. Nat. Sci., vol. 8, p. 279, and Pal. N. Y., vol. 2, p. 212, Niagara Gr.

gemmaformis, Hall, 1852, Pal. N. Y., vol. 2, p. 215, Niagara Gr.

osgoodensis, S. A. Miller, 1879, Jour. Cin. Soc. Nat. Hist., vol. 2, p. 116, Niagara Gr. Wachsmuth has said this species was described from internal casts, but it was not.

pentalobus, Hall, 1879, (Codaster *pentalobus*.) Desc. New Spec. Foss., p. 13, and 11th Rep. Geo. Sur. Ind., p. 280, Niagara Gr.



FIG. 434.—*Stephanocrinus pulchellus*, instead of Codaster *pulchellus*, as shown by fig. 268.

pulchellus, Miller & Dyer, 1878, (Codaster

pulchellus, Jour. Cin. Soc. Nat. Hist. vol. 1, p. 35, Niagara Gr.

STEREOCRINUS, Barris, 1879, Proc. Dav. Acad. Sci., vol. 2, p. 282. [Ety. *stereos*, firm; *krinon*, lily.] Distinguished from *Dolatocrinus* by having 2x5 instead of 3x5 primary radials; one large interradial succeeded by a smaller one, and this by smaller ones, within the depressions, between the arm bases. Type *S. triangulatus*.

triangulatus, Barris, 1879, Proc. Dav. Acad. Sci., vol. 2, p. 283, Up. Held. Gr.



FIG. 435.—*Strotocrinus perumbrosus*. Under side of canopy with calyx broken away.

triangulatus var. *liberatus*, Barris, 1879, Proc. Dav. Acad. Sci., vol. 2, p. 284, Up. Held. Gr.

STROBILOCYSTITES, White, 1876, Proc. Acad. Nat. Sci. Phil., p. 28. [Ety. *strobilos*, pine cone; *kystis*, bladder.] Subspherical; 3 pectinated rhombs, two above the middle and one below; ovarian aperture below the summit; 4 principal arm grooves extending below the middle, and 4 secondary grooves. Type *S. calvini*.

calvini, White, 1876, Proc. Acad. Nat. Sci. Phil., p. 23, Devonian.

STROTOCRINUS, Meek & Worthen, 1866, Geo. Sur. Ill., vol. 2, p. 188. [Ety. *strotos*, spread; *krinon*, lily.] Calyx bowl-shaped, with vault spreading beyond like a canopy; basals 3; primary radials 3x5; secondary radials 1 or 2x10, succeeded by tertiary and other divisions, which, with the interaxillaries and interbrachials, unite to form the under side of a greatly expanded hor-

izontal disk, completely isolating the azygous and interradial areas, from the vault, and supporting the free, ascend-

ectypus, Meek & Worthen, 1869, Proc. Acad. Nat. Sci. Phil., p. 159, and Geo. Sur. Ill., vol. 5, p. 353, Burlington Gr.

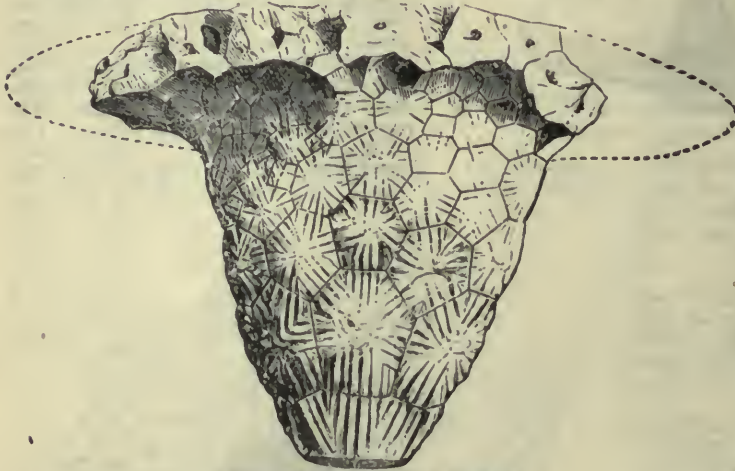


FIG. 436.—Strotocrinus regalis.

ing arms around its margin; interradials 9 or 10 or more; azygous interradials 9 to 13 or more, the first one resting on the basals; vault depressed, opening subcentral; arms 30 to 72 or more; column round. Type *S. perumbrosus*.

asperrimus, Meek & Worthen, 1869, Proc. Acad. Nat. Sci. Phil., p. 160, and Geo. Sur. Ill., vol. 5, p. 349, Burlington Gr.

Ill., vol. 2, p. 192, Burlington Gr. *umbrosus*, Hall, 1858, (*Actinocrinus umbrosus*), Geo. Sur. Iowa, p. 590, Burlington Gr.

SYNBATHOCRINUS, Phillips, 1836, Geol. Yorkshire, pt. 2, p. 206. [Ety. *syn*, together; *bathos*, depth; *krinon*, lily.] Calyx small; arms large and of great length; basals 3; radials 2 x 5; azygous plates 1,

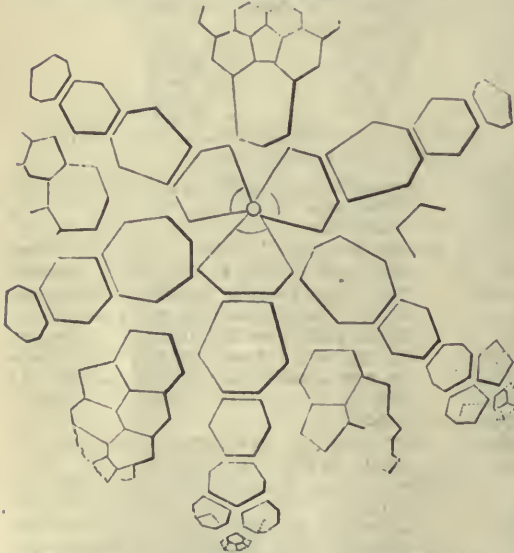


FIG. 437.—Strotocrinus regalis. Diagram, 1/2 diam.

bloomfieldensis, S. A. Miller, 1882, Jour. Cin. Soc. Nat. Hist., vol. 2, p. 258, and vol. 4, p. 76, Up. Burlington or Keokuk Gr. *dilatatus*, see *Physetocrinus dilatatus*.

2 or more; arms simple and composed of plates in single series. Type *S. concius*. *brevis*, Meek & Worthen, 1869, Proc. Acad. Nat. Sci. Phil., p. 68, and Geo. Sur. Ill., vol. 5, p. 439, Burlington Gr.

dentatus, Owen & Shumard, 1852, Geo. Sur. Wis., Iowa, and Minn., p. 597, Burlington Gr. *granulatus*, Troost. Not defined.

granuliferus Wetherby, 1880, Jour. Cin. Soc. Nat. Hist., vol. 2, p. 250, Waverly Gr. *matutinus*, Hall, 1858, Geo. Sur. Iowa, p. 483, Ham. Gr.



FIG. 438.—Synbathocrinus granuliferus. Anterior and posterior views.

oweni, Hall, 1860, 13th Rep. N. Y. Mus. Nat. Hist., p. 111, Waverly Gr.
 papillatus, Hall, 1861, Desc. New Crin., p. 18, Burlington Gr.
 robustus, Shumard, 1866, Trans. St. Louis Acad. Sci., vol. 2, p. 397, and Geo. Sur. Ill., vol. 6, p. 514, Keokuk Gr.
 swallowi, Hall, 1858, Geo. Sur. Iowa, p. 672, St. Louis Gr.
 tennesseæ, Troost. Not defined.
 tennesseensis, Roemer, 1860, Sil. Fauna West Tenn., p. 55, Niagara Gr.
 wachsmuthi, see *Catillocrinus wachsmuthi*.
 wortheni, Hall, 1858, Geo. Sur. Iowa, p. 560, Burlington Gr.

SYRINGOCRINUS, Billings, 1859, Can. Org. Rem., Decade 4, p. 65. [Ety. *syrinx*, pipe; *krinon*, lily.] Founded, possibly, on the fragment of a ventral sac; at all events, not a well-characterized genus. Type *S. paradoxicus*.
 paradoxicus, Billings, 1859, Can. Org. Rem., Decade 4, p. 65, Trenton Gr.

TÆNIASTER, Billings, 1858, Can. Org. Rem., Decade 3, p. 80. [Ety. *tainia*, ribbon; *aster*, star.] No disk or marginal plates; rays long, flexible, spinous; adambulacral plates elongated; two rows of ambulacral pores; ossicles contracted in the middle. Type *T. spinosus*.

cylindricus, Billings, 1857, (Palæocomma cylindrica,) Geo. Sur. Can., p. 292, Trenton Gr.

elegans, S. A. Miller, 1882, Jour. Cin. Soc. Nat. Hist., vol. 5, p. 41, Hud. Riv. Gr.

spinosus, Billings, 1857, (Palæocomma spinosa,) Geo. Sur. Can., p. 292, and Can. Org. Rem., Decade 3, p. 80, Trenton Gr.

TALAROCRINUS, Wachsmuth & Springer, 1881, Proc. Acad. Nat. Sci. Phil., p. 259. [Ety. *talaros*, basket; *krinon*, lily.] Calyx sub-conical; suture lines impressed; distinguished from *Dichocrinus* by its higher vault and having the opening through it and not at the end of a tube, and in having the secondary radials form part of the calyx. Type *T. cornigerus*.

cornigerus, Shumard, 1857, (*Dichocrinus cornigerus*.) Trans. St. Louis Acad. Sci., vol. 1, p. 72, Kaskaskia Gr.

elegans, Lyon & Casseday, 1860, (*Dichocrinus elegans*.) Proc. Am. Acad. Arts and Sci., vol. 5, p. 22, St. Louis Gr.

ovatus, Worthen, 1882, Bull. No. 1, Ill. St. Mus. Nat. Hist., p. 36, and Geo. Sur. Ill., vol. 7, p. 314, Kaskaskia Gr.



FIG. 439.—*Tentaster spinosus*.

cylindricus, Billings, 1857, (Palæocomma cylindrica,) Geo. Sur. Can., p. 292, Trenton Gr.

elegans, S. A. Miller, 1882, Jour. Cin. Soc. Nat. Hist., vol. 5, p. 41, Hud. Riv. Gr.

spinosus, Billings, 1857, (Palæocomma spinosa,) Geo. Sur. Can., p. 292, and Can. Org. Rem., Decade 3, p. 80, Trenton Gr.

sexlobatus, Shumard, 1857, (*Dichocrinus sexlobatus*.) Trans. St. Louis Acad. Sci., vol. 1, p. 73, Kaskaskia Gr.
symmetricus, Lyon & Casseday, 1860, (*Dichocrinus symmetricus*.) Proc. Am. Acad. Arts and Sci., vol. 5, p. 22, Kaskaskia Gr.

TAXOCRINUS, Phillips, 1843, Morris Cat. Brit. Foss., p. 90. [Ety. *taxus*, yew-tree; *krinon*, lily.] Calyx short, cup-shaped; basals 3, small, unequal; subradials 5, one larger than the others; primary radials 3 or 4 by 5; secondary radials 3 to six by 10; tertiary radials supporting arms; interradials 0 to 9; azygous interradials 2 to 5; arms dividing once or twice. Type *T. egertoni*.

communis, Hall, 1863, (*Forbesocrinus communis*.) 17th Rep. N. Y. St. Mus. Nat. Hist., p. 55, and Ohio Pal., vol. 2, p. 169, Waverly Gr.

curtus, Williams, 1882, Proc. Acad. Nat. Sci. Phil., p. 30, Chemung Gr.

elegans, Billings, 1857, (*Lecanocrinus elegans*.) Geo. Sur. Can., p. 278, and Can. Org. Rem., Decade 4, p. 47, Trenton Gr.

fletcheri, Worthen, 1882, Bull. No. 1, Ill. St. Mus. Nat. Hist., p. 31, and Geo. Sur. Ill., vol. 7, p. 308, Keokuk Gr.

giddingei, Hall, 1858, (*Forbesocrinus giddingei*.) Geo. Sur. Iowa, p. 633, Keokuk Gr.



FIG. 440.—*Taxocrinus* (?) *elegans*.



FIG. 441.—*Taxocrinus gracilis*. Diagram.

gracilis, Meek & Worthen, 1865, Proc. Acad. Nat. Sci. Phil., p. 142, and Geo. Sur. Ill., vol. 3, p. 421, Ham. Gr.

intermedius, Wachsmuth & Springer, (in press,) Geo. Sur. Ill., vol. 8, p. 199, Kinderhook Gr.

interseapularis, Hall, 1858, Geo. Sur. Iowa, p. 482, Ham. Gr.

ithacensis, Williams, 1882, Proc. Acad. Nat. Sci. Phil., p. 28, Chemung Gr.

juvenis, Hall, 1861, (*Forbesocrinus juvenis*.) Bost. Jour. Nat. Hist., vol. 7, p. 319, Burlington Gr.

kelloggi, Hall, 1863, (*Forbesocrinus kelloggi*.) 17th Rep. N. Y. St. Mus. Nat. Hist., p. 56, and Ohio Pal., vol. 2, p. 171, Waverly Gr.

kelloggi, Hall, 1863, (*Forbesocrinus kelloggi*.) 17th Rep. N. Y. St. Mus. Nat. Hist., p. 56, and Ohio Pal., vol. 2, p. 171, Waverly Gr.

kelloggi, Hall, 1863, (*Forbesocrinus kelloggi*.) 17th Rep. N. Y. St. Mus. Nat. Hist., p. 56, and Ohio Pal., vol. 2, p. 171, Waverly Gr.

laevis, Billings, 1857, Geo. Sur. Can., p. 278, and Can. Org. Rem., Decade 4, p. 47, Trenton Gr.

lobatus, Hall, 1862, (Forbesocrinus lobatus,) 15th Rep. N. Y. St. Mus. Nat. Hist., p. 124, Ham Gr.

lobatus var. tardus, Hall, 1863, (Forbesocrinus lobatus var. tardus,) 17th Rep. N. Y. St. Mus. Nat. Hist., p. 56 and Ohio Pal., vol. 2, p. 171, Waverly Gr.

meeki, Hall, 1858, (Forbesocrinus meeki,) Geo. Sur. Iowa, p. 631, Keokuk Gr.

multibrachiatus, Lyon & Casseday, 1858, (Forbesocrinus multibrachiatus,) Am. Jour. Sci. and Arts, vol. 28, p. 235, Keokuk Gr.

multibrachiatus var. colletti, White, 1881, 2d Ann. Rep. Bureau of Statistics of Indiana, p. 506, Keokuk Gr.



FIG. 442.—*Taxocrinus robustus*.

nuntius, Hall, 1862, (Forbesocrinus nuntius,) 15th Rep. N. Y. St. Mus. Nat. Hist., p. 124, Ham Gr.

ramulosus, Hall, 1860, (Forbesocrinus ramulosus,) Supp. Geo. Sur. Iowa, p. 67, Burlington Gr.

robustus, Wachsmuth, (in press,) Geo. Sur. Ill., vol 8, Kinderhook Gr.

semiovatus, Meek & Worthen, 1860, (Forbesocrinus semiovatus,) Proc. Acad. Nat. Sci. Phil., p. 389, and Geo. Sur. Ill., vol. 2, p. 272, St. Louis Gr.

shumardanus, Hall, 1858, (Forbesocrinus shumardanus,) Geo. Sur. Iowa, p. 671, St. Louis Gr.

thiemii, Hall, 1861, (Forbesocrinus thiemii,) Desc. New Crin., p. 8, and Geo. Sur. Ill., vol. 5, p. 389, Burlington Gr.

whitfieldi, Hall, 1858, (Forbesocrinus whitfieldi,) Geo. Sur. Iowa, p. 632, Kaskaskia Gr.

TECHNOCRINUS, Hall, 1859, Pal. N. Y., vol. 3, p. 139. [Ety. *technē*, art; *krinon*, lily.] Basals 4, one larger than the others; primary radials 3 x 5; secondary radials 1 x 10; tertiary radials 2 x 20; interradials 3 x 5; arms simple, bearing pinnules; column round. Type T. andrewsi.

andrewsi, Hall, 1859, Pal. N. Y., vol. 3, p. 141, Oriskany sandstone.

sculptus, Hall, 1859, Pal. N. Y., vol. 3, p. 143, Oriskany sandstone.

spinulosus, Hall, 1859, Pal. N. Y., vol 3, p. 140, Oriskany sandstone.

striatus, Hall, 1859, Pal. N. Y., vol. 3, p. 142, Oriskany sandstone.

TELEIOCRINUS, Wachsmuth & Springer, 1881, Proc. Acad. Nat. Sci. Phil., p. 320. [Ety. *teleios*, perfect; *krinon*, lily.] Distinguished from *Strotocrinus*, with which it has generally been classed, by having a long ventral tube, instead of a simple opening through the vault. Type T. umbrosus.

ægilops, Hall, 1860, (Actinoocrinus ægilops,) Supp. to Geo. Sur. Iowa, p. 5, Up. Burlington Gr.

althea, Hall, 1861, (Actinoocrinus althea,) Desc. New Crin., p. 13, Up. Burlington Gr.

clivovus, Hall, 1861, (Actinoocrinus clivovus,) Bost. Jour. Nat. Hist., vol. 7, p. 274, Up. Burlington Gr.

erodus, Hall, 1861, (Actinoocrinus erodus,) Desc. New Crin., p. 12, Up. Burlington Gr.

insculptus, Hall, 1861, (Actinoocrinus insculptus,) Desc. New Crin., p. 12, Up. Burlington Gr.

liratus, Hall, 1860, (Actinoocrinus liratus,) Supp. to Geo. Sur. Iowa, p. 1, and Geo. Sur. Ill., vol. 5, p. 355, Burlington Gr.

rudis, Hall, 1860, (Actinoocrinus rudis,) Supp. to Geo. Sur. Iowa, p. 33, Burlington Gr.

tenuiradiatus, Hall, 1861, (Actinoocrinus tenuiradiatus,) Desc. New Crin., p. 12, Burlington Gr.

umbrosus, Hall, 1858, (Actinoocrinus umbrosus,) Geo. Sur. Iowa, p. 590, Up. Burlington Gr.

THYSANOCRINUS, Hall, 1852, Pal. N. Y., vol. 2, p. 188. [Ety. *thysanos*, fringed; *krinon*, lily.] Calyx small, subglobose; basals 5; subradials 5; primary radials 3 x 5; secondary radials 2 or more x 10; regular interradials 3; azygous area wide, lower plates large, smaller above; arms composed of a double series of plates, with pinnules; column round. Type T. liliiformis.

aculeatus, Hall, 1852, Pal. N. Y., vol. 2, p. 190, Niagara Gr.

canaliculatus, Hall, 1852, Pal. N. Y., vol. 2, p. 189, Niagara Gr.

immaturus, Hall, 1852, Pal. N. Y., vol. 2, p. 191, Niagara Gr.

liliiformis, Hall, 1852, Pal. N. Y., vol. 2, p. 188, Niagara Gr.

microbasalis, see *Archæocrinus microbasalis*.

pyriformis, see *Archæocrinus pyriformis*.

TREMATASTER, Worthen & Miller, 1883, Geo. Sur. Ill., vol. 7, p. 330. [Ety. *trema*, opening; *aster*, star.] Central part discoid; rays long, flexuous, a double series of ambulacral plates, with tapering ends directed toward the apices of the rays, upon each side of which there is a series of curved adambulacral plates, which form the margin of the rays; pores large between the con-

tracting sides of the ambulacral plates, and the concave sides of the curving adambulacrals; four plates border on each pore; orals 10. Type *T. difficilis*.

difficilis, Worthen & Miller, 1883, *Geo. Sur. Ill.*, vol. 7, p. 330, *Kaskaskia Gr.*

Trematocrinus, syn for *Goniasteroidocrinus*.

fiscellus, see *Goniasteroidocrinus fiscellus*.

papillatus, see *G. papillatus*.

reticulatus, see *G. reticulatus*.

robustus, see *G. robustus*.

spinigerus, see *G. spinigerus*.

tuberculatus, see *G. tuberculatus*.

typus, see *G. typus*.

Triacrinus, Ringuenberg, 1887, *Proc. Acad. Nat. Sci. Phil.*, p. 144. The name was preoccupied; beside it is probably a syn. for *Pisocrinus*.

globosus, see *Pisocrinus globosus*.

pyriformis, see *Pisocrinus pyriformis*.

TRICELOCRINUS, Meek & Worthen, 1868, *Proc. Acad. Nat. Sci. Phil.*, p. 356, and *Geo. Sur. Ill.*, vol. 5, p. 507. [Ety. *treis*, three; *koilos*, hollow; *krinon*, lily.] Calyx subpyramidal, or subfusiform; base short, trihedral, and excavated along the interbasal sutures; summit contracted; radials long and narrow; deltoids small; ambulacra narrow, deeply situated in the sinuses; hydrospires small, three (?) on a side; spiracles and mouth small; anus large; column circular. Type *T. woodmani*.

meekanus, Etheridge & Carpenter, 1886, *Catal. of Blastoidea*, p. 208, *Warsaw Gr.*

obliquatus, Roemer, 1851, (*Pentatremites obliquatus*.) *Archiv f. Naturgesch.*, Jahrg. xvii, p. 367, *St. Louis Gr.*

varsouviensis, Worthen, 1875, *Geo. Sur. Ill.*, vol. 6, p. 521, *St. Louis Gr.*

woodmani, Meek & Worthen, 1868, (*Pentremites*, *Troostocrinus*) *Tricelocrinus woodmani*.) *Proc. Acad. Nat. Sci. Phil.*, p. 356, and *Geo. Sur. Ill.*, vol. 5, p. 506, *Warsaw Gr.*

TROOSTOCRINUS, Shumard, 1865, *Trans. St. Louis Acad. Sci.*, vol. 2, p. 384. [Ety. proper name; *krinon*, lily.] Distinguished from *Pentremites* by the slender, subfusiform shape, linear ambulacra, lancet plates concealed, triangular base, and simple summit structure; spiracles at the sides of the proximal side plates; hydrospirals open into linear spiracular apertures. Type *T. reinwardti*.

bipyramidalis, Hall, 1858, (*Pentremites bipyramidalis*.) *Geo. Sur. Iowa*, p. 607, *Keokuk Gr.*

grosvenori, Shumard, 1858, (*Pentremites grosvenori*.) *Trans. St. Louis Acad. Sci.*, vol. 1, p. 240, *Warsaw Gr.*

lineatus, Shumard, 1858, (*Pentremites lineatus*.) *Trans. St. Louis Acad. Sci.*, vol. 1, p. 241, *Burlington Gr.* This is made the type of the genus *Metablastus* by Etheridge & Carpenter, to which they also refer *T. wortheni* and *Tricelocrinus varsouviensis*.

reinwardti, Troost, 1835, (*Pentremites reinwardti*.) *Trans. Geo. Soc. Pa.*, vol. 1, p. 224, *Niagara Gr.*

subcylindricus, Hall & Whitfield, 1875, (*Pentremites subcylindricus*.) *Ohio Pal.*, vol. 2, p. 129, *Niagara Gr.*

subtruncatus, Hall, 1858, (*Pentremites subtruncatus*.) *Geo. Sur. Iowa*, p. 485, *Ham. Gr.*

wortheni, Hall, 1858, (*Pentremites wortheni*.) *Geo. Sur. Iowa*, p. 606, *Keokuk Gr.*

VASOCRINUS, Lyon, 1857, *Geo. Sur. Ky.*, vol. 3, p. 485. [Ety. *vas*, vessel; *krinon*, lily.]

Calyx low, vase-shaped; basals 5; subradials, 5; primary radials, 1 x 5; secondary radials 2 x 5; arms, 10 or more; azgyous interradials 2 or more, first one large; ventral sac. Type *V. valens lyoni*, Hall, 1861, (*Cyathocrinus lyoni*.) *Desc. New Crin.*, p. 3, and *Bost. Jour. Nat. Hist.*, vol. 7, p. 298, *Keokuk Gr.*

macropleurus, Hall, 1861, (*Cyathocrinus macropleurus*.) *Desc. New Crin.*, p. 5, and *Bost. Jour. Nat. Hist.*, vol. 7, p. 295, *Burlington Gr.*

sculptus, Lyon, 1857, *Geo. Sur. Ky.*, vol. 3, p. 486, *Ham. Gr.*

valens, Lyon, 1857, *Geo. Sur. Ky.*, vol. 3, p. 485, *Ham. Gr.*

XENOCRINUS, S. A. Miller, 1881, *Jour. Cin. Soc. Nat. Hist.*, vol. 4, p. 71 and 176. [Ety. *xenos*, strange; *krinon*, lily.] Ba-



FIG. 443.
Troostocrinus wortheni.

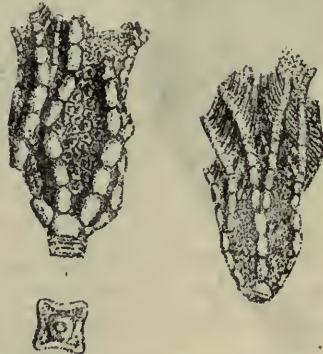


FIG. 444.—*Xenocrinus pentecillus*. Azygons and opposite side views and end of column.

sals 4; primary radials 3 x 5; secondary radials 4 to 6 x 10; interradial areas excavated and filled with numerous

plates; azygous area having a central vertical series of plates which continue up the ventral sac; column square. Type X. penicillus.

baeri, Meek, 1872, (Glyptocrinus *baeri*.) Am. Jour. Sci. and Arts, 3d ser., vol. 3, p. 260, and Ohio Pal., vol. 1, p. 37, Hud. Riv. Gr.

penicillus, S. A. Miller, 1881, Jour. Cin. Soc. Nat. Hist., vol. 4, p. 72, Hud. Riv. Gr.

ZEACRINUS, Troost, Catal. Foss. 1850, and described by Hall, 1858, Geo. Sur. Iowa, p. 541. [Ety. *zea*, Indian corn; *krinon*, lily.] Calyx low, basin-shaped; basals 5, hidden by the column; subradials 5; radials 2 x 5, with from 1 to 6 additional in the azygous ray; azygous interradials 4 to 7; arms 10 to 40, with pinnules; ventral sac subpyramidal, covered with small plates; column round. Type Z. *magnoliiformis*.

acanthophorus, see *Hydreionocrinus acanthophorus*.

arbores, Worthen, 1873, Geo. Sur. Ill., vol. 5, p. 534, St. Louis Gr.

armiger, see *Hydreionocrinus armiger*.

asper, Meek & Worthen, 1869, Proc. Acad. Nat. Sci. Phil., p. 150, and Geo. Sur. Ill., vol. 5, p. 430, Burlington Gr.

bifurcatus, McChesney, 1860, New Pal. Foss., p. 10, and Trans. Chi. Acad. Sci., vol. 1, p. 71, Kaskaskia Gr.

cariniferus, see *Cœliocrinus cariniferus*.

compactilis, Worthen, 1873, Geo. Sur. Ill., vol. 5, p. 536, Kaskaskia Gr.

coxanus, Worthen, 1882, Bull. No. 1, Ill. St. Mus. Nat. Hist., p. 27, and Geo. Sur. Ill., vol. 7, p. 302, Keokuk Gr.

crassus, see *Eupachycrinus crassus*.

crateriformis, Troost. Not defined.

depressus, see *Hydreionocrinus depressus*.

discus, see *Hydreionocrinus discus*.

elegans, Hall,

1858, Geo. Sur. Iowa, p. 547,

Burlington Gr.

florealis, Yandell

& Shumard,

1847, (Cyatho-

crinus *florea-*

lis.) Cont. to

Geo. Ky., p.

24, Kaskaskia

Gr.

formosus, see *Eu-*

pachycrinus

formosus.

intermedius,

Hall, 1858,

Geo. Sur. Iowa,

p. 681, Kas-

kaskia Gr.

keokuk, Wor-

then, 1882, Bull. No. 1, Ill. St. Mus. Nat.

Hist., p. 28, and Geo. Sur. Ill., vol. 7, p.

30, Keokuk Gr.

lyra, see *Cœliocrinus lyra*.

magnoliiformis, Owen & Norwood, 1846, (Cyathocrinus *magnoliiformis*.) Research Pot. Carb. Rocks Ky., and Geo. Sur. Iowa, p. 684, Kaskaskia Gr.

maniformis, Yandell & Shumard, 1847, (Poterioocrinus *maniformis*.) Cont. to Geo. Ky., p. 24, Kaskaskia Gr.

merope, Hall, 1863, 17th Rep. N. Y. St. Mus. Nat. Hist., p. 60, and Ohio Pal., vol. 2, p. 178, Waverly Gr.

moorii, Whitfield, 1882, Ann. N. Y. Acad. Sci., vol. 2, p. 227, Coal Meas.

microspinus, see *Hydreionocrinus microspinus*.

nodosus, Wachsmuth & Springer, 1886, Revis. Palæocrinoidea, pt. 3, p. 243, Keokuk Gr.

ovalis, Lyon & Casseday, 1858, Am. Jour. Sci., 2d ser., vol. 29, p. 71, Kaskaskia Gr.

paternus, Hall, 1863, 17th Rep. N. Y. St. Mus. Nat. Hist., p. 59, Waverly Gr.

perangulatus, White, 1862, Proc. Bost. Soc. Nat. Hist., vol. 9, p. 11, Burlington Gr.

pikensis, Worthen, 1882, Bull. No. 1, Ill. St. Mus. Nat. Hist., p. 29, and Geo. Sur. Ill., vol. 7, p. 304, Burlington Gr.

planobrachiatus, Meek & Worthen, 1860, Proc. Acad. Nat. Sci. Phil., p. 391, and Geo. Sur. Ill., vol. 2, p. 240, Keokuk Gr.

ramosus, Hall, 1858, Geo. Sur. Iowa, p. 548, Burlington Gr.

sacculus, White, 1862, Proc. Bost. Soc. Nat. Hist., vol. 9, p. 12, Burlington Gr.



FIG. 446.—*Zeacrinus spinuliferus*.

sacculus var. *concinus*, White, 1862, Proc. Bost. Soc. Nat. Hist., vol. 9, p. 12, Burlington Gr.

scobina, Meek &

Worthen, 1869,

Proc. Acad. Nat.

Sci. Phil., p. 149,

and Geo. Sur.

Ill., vol. 5, p.

426, Burlington

Gr.

scoparius, Hall,

1861, Desc. New

Crin., p. 6, and

Jour. Bost. Soc.

Nat. Hist., vol. 7,

p. 305, Burling-

ton Gr.

serratus, Meek &

Worthen, 1861,

Proc. Acad. Nat. Sci. Phil., p. 151, and

Geo. Sur. Ill., vol. 5, p. 428, Burling-

ton Gr.



FIG. 447.—*Zeacrinus troostanus*. Diagram.



FIG. 445.—*Zeacrinus elegans*.

spinus, Owen & Shumard, 1852, (Poteroocrinus spinosus,) Jour. Acad. Nat. Sci. Phil., vol. 2, p. 91, Kaskaskia Gr.
 spinuliferus, Worthen, (in press,) (Poteroocrinus spinuliferus,) Geo. Sur. Ill., vol. 8, p. 90, Kaskaskia Gr.
 stimpsoni, Lyon, 1869, Trans. Am. Phil. Soc., vol. 13, p. 465, Subcarb.

subtumidus, see Eupachyrcrinus subtumidus.
 troostanus, Meek & Worthen, 1860, Proc. Acad. Nat. Sci. Phil., p. 390, and Geo. Sur. Ill., vol. 2, p. 186, Burlington Gr.
 wortheni, Hall, 1858, Geo. Sur. Iowa, p. 683, Kaskaskia Gr.

SUBKINGDOM MOLLUSCOIDA.

CLASS BRYOZOA.

THE Bryozoa are small animals that grow in clusters, forming branched or moss-like compound structures. Each animal lives in a separate cell, called a zoecium, into which it can retract itself, though some connection exists between the animals. The Flustra or Sea-mats, abundant on the shores of the ocean, and the moss-like encrustations so common on marine shells, are examples. All known Palæozoic Bryozoa were marine, and lived in calcareous cells, forming a mass that is often difficult to distinguish from the true corals.

This calcareous mass or skeleton is called the bryozoum or zoarium. It is found encrusting other objects, or standing on a foot-stalk, with basal attachment, and, in other cases, apparently free. There are rarely any such calcareous partitions in the cell-tubes as abound in the true corals, and the method of reproduction was exclusively gemmiparous, while the true corals were increased by both gemmiparous and fissiparous reproduction.

The animal consists of a bent tube or alimentary canal, having an œsophagus, stomach, and intestine. The two orifices of the canal are situated close together, but the anal opening is beyond the ring of ciliated tentacles that surround the mouth. Thus constituted, the alimentary canal is inclosed in a sac having two openings corresponding to the two extremities of the canal. Generally the upper side of this sac is flexible, and admits of being invaginated, so that when the animal retracts itself into its cell the inverted portion forms a sheath around the tentacles. Ova may be developed in a receptacle attached to the zoecium, called the oecium, or in an inflation of the surface of the zoarium, called a gonocyst. The gonœcium is a modified zoecium. The term oœcia is also applied to these structures. Many Bryozoa have appendicular organs called avicularia and vibracula. The avicularia may be pedunculate, and sway to and fro, or fixed and firmly attached to the zoecium. The vibracula are flexible, bristle-like structures, set in the excavated summit of a knob-like elevation or blunt spine.

Some naturalists refer the Monticuliporidæ and Stelliporidæ to the Bryozoa, and probably the latter should be so classed on as good grounds as the Fistuliporidæ are referred to the Bryozoa. The Palæozoic Bryozoa are referred to an order called the Gymnolæmata, which are supposed to have had a complete ring of

tentacles around the mouth. This order has been divided into five suborders, viz.: Chilostomata, Cryptostomata, Trepostomata, Cyclostomata, and Ctenostomata. The families which we recognize are as follows:

- FAMILY ACANTHOCLADIDÆ.—Acanthocladia, Diplopora, Glauconome, Ichthyorachis, Ptilopora, Ramipora, Septopora, Synocladia.
- FAMILY AMPLEXOPORIDÆ.—Amplexopora, Atactopora, Discotrypa, Leptotrypa, Petalotrypa.
- FAMILY ARTHROSTYLIDÆ.—Arthroclema, Arthrostylus, Helopora, Nematopora, Nematoporella, Sceptropora.
- FAMILY ASCODICTYONIDÆ.—Ascodictyon, Rhopalonaria.
- FAMILY BATOSTOMELLIDÆ.—Anisotrypa, Batostoma (?), Batostomella, Leioclema, Peronopora.
- FAMILY BOTRYLLOPORIDÆ.—Botryllopora.
- FAMILY BYTHOPORIDÆ.—Bythopora.
- FAMILY CERAMOPORIDÆ.—Aspidopora, Ceramella, Ceramopora, Ceramoporella, Chiloporella, Crepipora, Eridopora, Glossotrypa, Idiotrypa, Lichenalia, Lichenotrypa, Odontotrypa, Petigopora, Phractopora, Pileotrypa, Sagenella, Selenopora, Spatiopora.
- FAMILY CRISINELLIDÆ.—Crisinella.
- FAMILY ENALLOPORIDÆ.—Diploclema, Enallopora, Protocrisina.
- FAMILY FENESTELLIDÆ.—Archimedes, Clathropora, Coscinella, Coscinium, Coscintrypa, Evactinopora, Fenestella, Fenestralia, Fenestrapora, Helicopora, Hemitrypa, Isotrypa, Loculipora, Lyropora, Phyllopora, Polypora, Ptilopora, Ptiloporella, Ptiloporina, Reptaria, Reteporina, Semicoscinium, Semiopora, Tectulipora, Unitrypa.
- FAMILY FISTULIPORIDÆ.—Actinotrypa, Buscopora, Callopora, Calloporella, Callotrypa, Chilotrypa, Cœlocaulis, Eridopora, Favicella, Fistulipora, Lichenotrypa, Pinacotrypa, Selenopora, Strotopora.
- FAMILY HELIOTRYPIDÆ.—Heliotrypa.
- FAMILY LABECHIIDÆ.—Labechia.
- FAMILY PALESCHARIDÆ.—Paleschara.
- FAMILY PHACELOPORIDÆ.—Phacelopora.
- FAMILY PTILODICTYONIDÆ.—Coscinella, Cyclopora, Cycloporella, Escharopora, Graptodictya, Heterodictya, Phænopora, Proutella, Ptilodictya, Ptilotrypa, Streblotrypa, Worthenopora.
- FAMILY RIIABDOMESONTIDÆ.—Acanthoclema, Anisotrypa, Bactropora, Cœloconus, Nemataxis, Rhombopora, Tropidopora.
- FAMILY RHINOPORIDÆ.—Rhinopora.
- FAMILY SPHRAGIOPORIDÆ.—Sphragiopora.
- FAMILY STICTOPORIDÆ.—Acrogenia, Arthropora, Cystodictya, Dichotrypa, Dieranopora, Eurodictya, Euspilopora, Goniotrypa, Heliotrypa, Intrapora, Pachydictya, Phractopora, Phyllodictya, Prismopora, Rhinidictya, Scalariopora, Stictopora, Stictoporella, Stictoporina, Stictotrypa, Sulcopora, Tænidictya, Tæniopora, Thamnotrypa.
- FAMILY SUBRETIPORIDÆ.—Chainodictyon, Drymotrypa, Subretopora.
- FAMILY THAMNISCIDÆ.—Crisinella, Diplopora, Thamniscus.

FAMILY THEONOIDÆ.—Scenellopora.

FAMILY TREMATOPORIDÆ.—Acanthoclema, Amplexopora, Atactopora, Atactoporella, Bactropora, Chilotrypa, Diamesopora, Homotrypa, Homotrypella, Nemataxis, Nicholsonella, Orthopora, Trematella, Trematopora, Trepidopora.

FAMILY TUBULIPORIDÆ.—Berenicea, Clonopora, Cystopora, Hederella, Hermodia, Stomatopora.

ACANTHOCLADIA, King, 1849, Ann. and Mag. Nat. Hist., 2d ser., vol. 3, p. 389. [Ety. *akantha*, spine; *kladus*, branch.] Stem symmetrically and bilaterally branched, more or less on one plane; rarely bifurcating; branches short, simple, occasionally elongated and becoming bilaterally branched; celluliferous on one side only; cell apertures circular and arranged in three or more longitudinal series, separated by dividing ridges. Type A. anceps.

americana, Swallow, 1858, Trans. St. Louis Acad. Sci., vol. 1, p. 180, Permian Gr.

fruticosa, Ulrich, (in press.) Geo. Sur. Ill., vol. 8, pl. 65, Up. Coal Meas.

ACANTHOCLEMA, Hall, 1887, Pal. N. Y., vol. 6, p. 72. [Ety. *akantha*, spine; *klema*, twig.] Ramose, solid, cells arising from a central axis; cell apertures oval, in longitudinal parallel rows, about ten on a branch, separated by longitudinal ridges; between the apertures, in the longitudinal direction, there are spiniform nodes. Type A. alternatum.

alternatum, Hall, 1881, (Trematopora alternata,) Bryozoans of the Up. Held. Gr., and Pal. N. Y., vol. 6, p. 72, Up. Held. Gr.

bispinulatum, Hall, 1881, (Callopora bispinulata,) (Trans. Alb. Inst., vol. 10, p. 82, and Pal. N. Y., vol. 6, p. 182, Ham. Gr.

confluens, Ulrich, 1888, (Rhombopora confluens,) Bull. Denison Univ., p. 91, Cuyahoga Shales.

divergens, Hall, 1887, Pal. N. Y., vol. 6, p. 73, Up. Held. Gr.

ovatum, Hall, 1887, Pal. N. Y., vol. 6, p. 73, Up. Held. Gr.

scutulatum, Hall, 1881, (Trematopora scutulata,) Trans. Alb. Inst., vol. 10, p. 180, and Pal. N. Y., vol. 6, p. 190, Ham. Gr.

sulcatum, Hall, 1887, Pal. N. Y., vol. 6, p. 192, Ham. Gr.

triseriale, Hall, 1883, (Stictopora triseriale,) Rep. St. Geol. and Pal. N. Y., vol. 6, p. 74, Up. Held. Gr.

ACROGENIA, Hall, 1884, Rep. St. Geol. p. 51. [Ety. *akros*, sharp; *genea*, growth.] Frond ramose; two branches proceeding from the truncate termination of each preceding one; base of each division obconical, terete above and

strongly striated, gradually becoming flattened and celluliferous; margins noncelluliferous; apertures in rows separated by ridges, central range of apertures the smaller. Type A. prolifera.

prolifera, Hall, 1884, Rep. St. Geol., p. 52, and Pal. N. Y., vol. 6, p. 267, Ham. Gr.

ACTINOTRYPA,

Ulrich, Geo. Sur. Ill., vol.

8, p. 386, (in press.) [Ety. *aktin*, a ray; *trupa*, an opening.] Like *Dichotrypa*. Cell apertures showing the projecting ends of from eight to ten vertical septa-like ridges, that extend down on the inner side of the tubular vestibule nearly or quite to the primitive apertures. Type A. peculiaris.

peculiaris, Rominger, 1866, (Fistulipora peculiaris,) Proc. Acad. Nat. Sci. Phil., p. 10, Keokuk Gr.

Alecto, Lamouroux, 1821, Exposit. Method. It was preoccupied by Leach in the class Echinodermata, when Lamouroux used it, and hence *Stomatopora* is used in its place.

auloporoides, see *Stomatopora auloporoides*.

canadensis, see *Hederella canadensis*.

confusa, see *Stomatopora confusa*.

frondosa, see *Stomatopora frondosa*.

inflata, see *Stomatopora inflata*.

nexilis, see *Stomatopora nexilis*.

AMPLEXOPORA, Ulrich, 1882, Jour. Cin. Soc. Nat. Hist., vol. 5, p. 154. [Ety. *amplexus*, an encircling; *poros*, pore.] Ramose; cells of one kind only; walls thin in the axial part of the branches, but thicker in the peripheral region; acanthopores numerous. Type A. cingulata.

affinis, Ulrich, (in press.) Geo. Sur. Ill., vol. 8, pl. 36, Hud. Riv. Gr.

canadensis, Foord, 1883, Cont. to Micro-palæontology, p. 17, Trenton Gr.

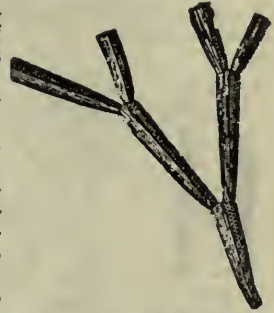


FIG. 448—*Acrogenia prolifera*.

cingulata, Ulrich, 1882, Jour. Cin. Soc. Nat. Hist., vol. 5, p. 254, Hud. Riv. Gr.



FIG. 449.—*Amplexopora cingulata*. Tangential section x 50, showing wall structure, and vertical section x 50.

discoidea, Nicholson, 1875, (*Chetetes discoideus*.) Ohio Pal., vol. 2, p. 206, Hud. Riv. Gr.



FIG. 450.—*Amplexopora robusta* funnel-shaped diaphragm, supposed to be a modified cystiphragm.

pustulosa, Ulrich, (in press,) Geo. Sur. Ill., vol. 8, pl. 36, Hud. Riv. Gr.
robusta, Ulrich, 1883, Jour. Cin. Soc. Nat. Hist., vol. 6, p. 82, Hud. Riv. Gr.
septosa, Ulrich, 1879, (*Atacopora septosa*.) Jour. Cin. Soc. Nat. Hist., vol. 2, p. 125, Hud. Riv. Gr.
superba, Foord, 1883, Cont. to Micropalaeontology, p. 16, Trenton Gr.

winchelli, Ulrich, 1886, 14th Rep. Geo. Sur. Minn., p. 91, Trenton Gr.

ANISOTRYPA, Ulrich, 1883, Jour. Cin. Soc. Nat. Hist., vol. 6, p. 275. [Ety. *anisos*, unequal; *trupa*, perforation.] Ramose, hollow, inner side lined with an epitheca; walls of tubes thin in the interior, and thickened exteriorly; no interstitial cells or spiniform tubuli. Type A. symmetrica.

fistulosa, Ulrich, (in press,) Geo. Sur. Ill., vol. 8, pl. 72, St. Louis Gr.
ramulosa, Ulrich, (in press,) Geo. Sur. Ill., vol. 8, pl. 72, St. Louis Gr.
solida, Ulrich, (in press,) Geo. Sur. Ill., vol. 8, pl. 72, Kaskaskia Gr.
symmetrica, Ulrich, 1883, Jour. Cin. Soc. Nat. Hist., vol. 6, p. 76, Kaskaskia Gr.

ARCHIMEDES, LeSueur, 1842, (*Retepora archimedes*.) Am. Jour. Sci., vol. 43, p. 19. [Ety. from its resemblance to the machine for raising water, consisting of a tube rolled in a spiral form around a cylinder, invented by Archimedes. Distinguished from *Fenestella* by its axis and mode of growth; the flabeliform expansion acquiring a solid central axis, around which it revolves in an ascending spiral form, spreading equally in all directions. Type A. wortheni.

communis, Ulrich, (in press), Geol. Sur. Ill., vol. 8, pl. 63, Kaskaskia Gr.

compactus, Ulrich, (in press), Geol. Sur. Ill., vol. 8, pl. 63, Kaskaskia Gr.

distans, Ulrich, (in press), Geol. Sur. Ill., vol. 8, pl. 63, Kaskaskia Gr.

grandis, Ulrich, (in press), Geol. Sur. Ill., vol. 8, pl. 63, Keokuk Gr.

intermedius, Ulrich, (in press), Geol. Sur. Ill., vol. 8, pl. 63, Kaskaskia Gr.

invaginatus, Ulrich, (in press), Geol. Sur. Ill., vol. 8, pl. 63, Kaskaskia Gr.

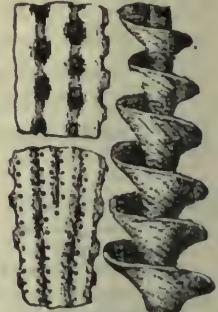


FIG. 451.—*Archimedes reversus*.



FIG. 452—*Archimedes wortheni*.

owenanus, Hall, 1857, Proc. Am. Ass'n Ad. Sci., vol. 10, p. 176, Keokuk Gr.

perminimus, Ulrich, (in press), Geo. Sur. Ill., vol. 8, pl. 63, Kaskaskia Gr.

proutanus, Ulrich, (in press), Geo. Sur. Ill., vol. 8, pl. 63, Kaskaskia Gr.

reversus, Hall, 1858, Geo. Rep. Iowa, p. 652, Warsaw Gr.

sublaxus, Ulrich, (in press), Geo. Sur. Ill., vol. 8, pl. 63, Kaskaskia Gr.

swallovanus, Hall, 1857, Proc. Am. Ass'n Ad. Sci., vol. 10, p. 176, Kaskaskia Gr.

terebriformis, Ulrich, (in press), Geo. Sur. Ill., vol. 8, pl. 63, Kaskaskia Gr.

wortheni, Hall, 1857, Proc. Am. Ass'n Ad. Sci., vol. 10, p. 176, and Geo. Sur. Iowa, p. 651, Warsaw Gr.

Archimediopora, D'Orb., 1850, Prod. de Pal., t. 1, p. 102, syn. for *Archimedes*.

Archimediopora archimedes was too tautological, and by common consent *Archimedes* has become the generic name.

archimedes, see *Archimedes*.

laxus, Hall, 1857, Proc. Am. Ass'n Ad. Sci., vol. 10, p. 176, Kaskaskia Gr.
meekanus, Hall, 1857, Proc. Am. Ass'n Ad. Sci., vol. 10, p. 176, Kaskaskia Gr.
negligens, Ulrich, (in press), Geo. Sur. Ill., vol. 8, pl. 63, Keokuk Gr.

ARTHROCLEMA, Billings, 1862, Pal. Foss., vol. 1, p. 54. [Ety. *arthron*, joint; *klema*, twig.] Cylindrical jointed stem, with long, slender-jointed branches; pores oval. Type *A. pulchellum*.
angulare, Ulrich, (in press), Geo. Sur. Ill., vol. 8, pl. 29, Hud. Riv. Gr.
billingsi, Ulrich, (in press), Geo. Sur. Ill., vol. 8, Trenton Gr.
pulchellum, Billings, 1862, Pal. Foss., vol. 1, p. 54, Trenton Gr. (See p. 329.)
spiniforme, see *Helopora spiniformis*.
Arthronema, Ulrich, 1882, Jour. Cin. Soc. Nat. Hist., vol. 5, p. 160. The name was preoccupied. See *Arthrostylus*.



FIG. 453.—*Arthropora shafferi*.

curtum, see *Arthrostylus curtus*.
tenuis, see *Arthrostylus tenuis*.

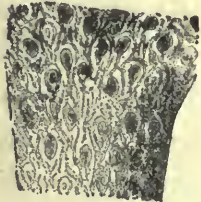


FIG. 454.—*Arthropora shafferi*. Magnified section.

ARTHROPORA, Ulrich, 1882, Jour. Cin. Soc. Nat. Hist., vol. 5, p. 152. [Ety. *arthron*, a joint; *poros*, perforation.] Zoarium like *Stictopora*, but in short, jointed, branching segments; cell apertures subcircular, and surrounded by interstitial pits. Type *A. shafferi*.

shafferi, Meek, 1872, (*Stictopora shafferi*.) Proc. Acad. Nat. Sci., p. 317, and Ohio Pal., vol. 1, p. 69, Hud. Riv. Gr.
simplex, Ulrich, 1886, 14th Rep. Geo. Sur. Minn., p. 65, Trenton Gr.

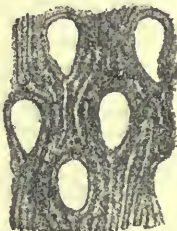


FIG. 455.—*Arthropora shafferi*. Tangential section x 50.

ARTHROSTYLUS, Ulrich, 1888, Am. Geol., vol. 1, p. 230. [Ety. *arthron*, joint; *stylos*, pillar.] Ramose, composed of subcylindrical segments, swollen at each end, celluliferous on one side, striated on the other; cells between elevated lines. Type *A. tenuis*.
curtus, Ulrich, 1882, (*Arthronema curtum*.) Jour. Cin. Soc. Nat. Hist., vol. 5, p. 161, Hud. Riv. Gr.

tenuis, Ulrich, 1882, (*Arthronema tenue*.) Jour. Cin. Soc. Nat. Hist., vol. 5, p. 160, Trenton Gr.
ASCODICTYON, Nicholson, 1877, Ann. and Mag. Nat. Hist., 4th ser., vol. 19, p. 463. [Ety. *askos*, leather bottle; *dictyon*, net.] Organism composite, parasitic, composed of numerous calcareous cells; minutely perforated. Type *A. tusiforme*. It is probably a sponge.
fusiforme, Nicholson, 1877, Ann. and Mag. Nat. Hist., 4th ser., vol. 19, p. 463, Ham. Gr.
stellatum, Nicholson, 1877, Ann. and Mag. Nat. Hist., 4th ser., vol. 19, p. 464, Ham. Gr.
ASPIDOPORA, Ulrich, 1882, Jour. Cin. Soc. Nat. Hist., vol. 5, p. 155. [Ety. *aspis*, shield; *poros*, perforation.] Thin, free expansions; concentrically wrinkled and striated epitheca on the lower side; cells gradually increasing in size toward the center of the convex expansion; interstitial cells numerous; diaphragms cross both kinds of tubes; spiniform tubuli present. Type *A. areolata*.
areolata, Ulrich, 1883, Jour. Cin. Soc. Nat. Hist., vol. 6, p. 164, Utica Slate.
caliculus, James, 1875, (*Chetetes caliculus*.) Int. Catal. Cin. Foss., p. 1, and Nicholson Struct. and Affin. Montic., p. 165, Utica Slate.
parasitica, Ulrich, 1886, 14th Rep. Geo. Sur. Minn., p. 90, Trenton Gr.
ATACTOPORA, Ulrich, 1879, Jour. Cin. Soc. Nat. Hist., vol. 2, p. 119. [Ety. *atactos*, without regularity; *poros*, pore.] Incrusting; surface with monticules or maculae; cell apertures petaloid, surrounded by rows of blunt spines; interstitial cells in clusters; tube walls inflected; diaphragms present. Type *A. hirsuta*.
hirsuta, Ulrich, 1879, Jour. Cin. Soc. Nat. Hist., vol. 2, p. 120, Hud. Riv. Gr.
maculata, Ulrich, 1879, Jour. Cin. Soc. Nat. Hist., vol. 2, p. 121, Hud. Riv. Gr.
multigranosa, see *Atactoporella multigranosa*.
mundula, see *Atactoporella mundula*.
septosa, see *Amplexopora septosa*.
? subramosa, Ulrich, 1879, Jour. Cin. Soc. Nat. Hist., vol. 2, p. 124, Hud. Riv. Gr.
tenella, see *Atactoporella tenella*.
ATACTOPORELLA, Ulrich, 1883, Jour. Cin. Soc. Nat. Hist., vol. 6, p. 247. [Ety. diminutive of *Atactopora*.] Incrusting; surface with monticules or maculae; cell apertures petaloid; interstitial cells numerous; spiniform tubuli and diaphragms. Type *A. typicalis*.
multigranosa, Ulrich, 1879, (*Atactopora multigranosa*.) Jour. Cin. Soc. Nat. Hist., vol. 2, p. 122, Hud. Riv. Gr.
mundula, Ulrich, 1879, (*Atactopora mundula*.) Jour. Cin. Soc. Nat. Hist., vol. 2, p. 123, Hud. Riv. Gr.

newportensis, Ulrich, 1883, Jour. Cin. Soc. Nat. Hist., vol. 6, p. 250, Utica Slate.



FIG. 456.—Actatoporella newportensis.

ortoni, Nicholson, 1874, (Chetetes ortoni,) Quar. Jour. Geo. Soc., vol. 30, p. 513, and Ohio Pal., vol. 2, p. 211, Hud. Riv. Gr.

schucherti, Ulrich, 1883, Jour. Cin. Soc. Nat. Hist., vol. 6, p. 251, Hud. Riv. Gr.

tenella, Ulrich, 1879, (Atactopora tenella,) Jour. Cin. Soc. Nat. Hist., vol. 2, p. 123, Hud. Riv. Gr.

typicalis, Ulrich, 1883, Jour. Cin. Soc. Nat. Hist., vol. 6, p. 248, Utica Slate.

BACTROPORA, Hall, 1887, Pal. N. Y., vol. 6, p. 193. [Ety. *baktron*, staff; *poros*, pore.]

Ramose, solid; base tapering, striated; cells tubular, curved oblique from the center; septa thin, apertures oval, distant near the base, closer above; interspaces granulose. Type *B. granistriata*.

curvata, Hall, 1887, Pal. N. Y., vol. 6, p. 194, Ham. Gr.

granistriata, Hall, 1881, (Trematopora *granistriata*,) Trans. Alb. Inst., vol. 10, p. 182, and Pal. N. Y., vol. 6, p. 193, Ham. Gr.

simplex, Ulrich, (in press,) Geo. Sur. Ill., vol. 8, pl. 70, Keokuk Gr.

BATOSTOMA, Ulrich, 1882, Jour. Cin. Soc. Nat. Hist., vol. 5, p. 154. [Ety. *batos*, prickly bush; *stoma*, mouth.]

Ramose, base expanded; cell apertures ovate or circular, surrounded by a ring-wall; interstitial tubes numerous; spiniform tubuli abundant. Type *B. implicatum*.

fertile, Ulrich, 14th Rep. Geo. Sur. Minn., p. 92 Trenton Gr.

imperfectum, Ulrich, (in press,) Geo. Sur. Ill., vol. 8, pl. 35, Hud. Riv. Gr.

implicatum, Nicholson, 1881, (Monticlipora *implicata*,) Struct. and Affin. of Montic., p. 147, Hud. Riv. Gr.

irrasum, Ulrich, 1886, 14th Rep. Geo. Sur. Minn., p. 94, Trenton Gr.

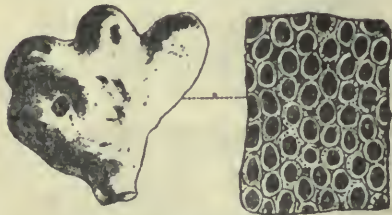


FIG. 457.—Batostoma jamesi. Natural size and magnified.

jamesi, Nicholson, 1874, (Chetetes *jamesi*,) Quar. Jour. Geo. Soc., vol. 30, p. 506, and Ohio Pal., vol. 2, p. 200 Hud. Riv. Gr.

manitobense, Ulrich, (in press,) Micropalæontology, p. 7, Hud. Riv. Gr. (?)

ottawense, Foord, 1883, Cont. to Micropalæontology, p. 18, Trenton Gr.

rugosum, Whitfield, 1882, (Fistulipora *rugosa*,) Geo. Wis., vol. 4, p. 255, Hud. Riv. Gr.

variabile, Ulrich, (in press,) Geo. Sur. Ill., vol. 8, pl. 35, Hud. Riv. Gr.

BATOSTOMELLA, Ulrich, 1882, Jour. Cin. Soc. Nat. Hist., vol. 5, p. 154. [Ety. diminutive of *Batostoma*.]

Ramose, smooth, cell apertures small; interstitial cells and spiniform tubuli; walls of tubes in the peripheral region thick. Type *B. gracilis*.

abrupta, Ulrich, (in press,) Geo. Sur. Ill., vol. 8, pl. 75, Kaskaskia Gr.



FIG. 458.—Batostomella gracilis. Natural size and enlarged.

gracilis, Nicholson, 1874, (Chetetes *gracilis*,) Quar. Jour. Geo. Soc., vol. 30, p. 504, and Ohio Pal., vol. 2, p. 198, Hud. Riv. Gr.

interstincta, Ulrich, (in press,) Geo. Sur. Ill., vol. 8, pl. 75, St. Louis Gr.

nitidula, Ulrich, (in press,) Geo. Sur. Ill., vol. 8, pl. 75, Kaskaskia Gr.

obliqua, Ulrich, (in press,) Geo. Sur. Ill., vol. 8, pl. 46, Ham. Gr.

spinulosa, Ulrich, (in press,) Geo. Sur. Ill., vol. 8, pl. 75, Kaskaskia Gr.

simulatrix, Ulrich, (in press,) Geo. Sur. Ill., vol. 8, pl. 35, Hud. Riv. Gr.

BERENICEA, Lamoureux, 1821, Exp. Meth. des. genres. d. pol., 80. [Ety. mythological name.]

Incrusting, composed of a very thin, calcareous, foliaceous base, bearing numerous ovate, distinctly separated cells, not piled; aperture round near the broad anterior end; cells disposed in an obscurely radiated arrangement. Type *B. diluviana*.

insueta, Dawson, 1883, Rep. on Redpath, Mus. No. 2, p. 12, Subcarboniferous.

minnesotensis, Ulrich, 1886, 14th Rep. Geo. Sur. of Minn., p. 58, Trenton Gr.

primitiva, Ulrich, 1882, Jour. Cin. Soc. Nat. Hist., vol. 5, p. 157, Hud. Riv. Gr.

vesiculosa, Ulrich, 1882, Jour. Cin. Soc. Nat. Hist., vol. 5, p. 158, Utica Slate or lower part Hud. Riv. Gr.

BOTRYLLOPORA, Nicholson, 1874, Geo. Mag. Lond. n. s., vol. 1, p. 160. [Ety. *botryllos*, cluster; *poros*, pore.]

Incrusting, forming systems of small circular disks, the upper surfaces of which are marked with radiating, cell-bearing ridges; non-

poriferous space in the center of each disk, round which the radiating ridges occupy a slightly elevated zone. Type *B. socialis*.



FIG. 459.—*Botryllipora socialis*. a, Group on coral natural size; b, enlarged specimen; c, enlarged ray to show pores.

socialis, Nicholson, 1874, *Geo. Mag. Lond.* n. s., vol. 1, p. 160, Ham. Gr.

BUSCOPORA, Ulrich, 1886, *Cont. to Am. Pal.*, p. 22. [Ety. *Busk*, proper name; *poros*, perforation.] Zoarium thin, lamellate; incrusting or free; under surface, with a concentrically wrinkled epitheca; zoecia tubular, short, with subcircular apertures and a faintly elevated border or peristome; posterior margin, with a tooth-like process divided at its termination; accessory cells present; interstitial spaces vesiculose; zoecial tubes, with diaphragms. Type *B. lunata*.

dentata, Ulrich, syn. for *B. lunata*.

lunata, Rominger, 1866, (*Fistulipora lunata*), *Proc. Acad. Nat. Sci. Phil.*, p. 7, and *Pal. N. Y.*, vol. 6, p. 77, Up. Held. Gr.

lunata var. *tubulata*, Hall, 1887, (*Lichenaia lunata* var. *tubulata*.) *Rep. St. Geol.* for 1885, pl.

31, and *Pal. N. Y.*, vol. 6, p. 78, Up. Held. Gr.

BYTHOPORA, Miller & Dyer, 1878, *Cont. to Pal. No. 2*, p. 6. [Ety. *buthos*, depths of sea; *poros*, pore.] Dendroid, branches small, sometimes anastomosing, smooth;

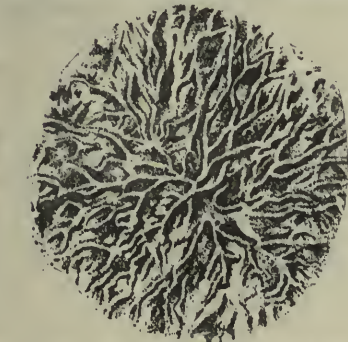


FIG. 461.—*Bythopora fruticosa*.

cell apertures longer than wide, separated by impressed lines. Type *B. fruticosa*.

arctipora, Nicholson, 1875, (*Ptilodictya arctipora*.) *Ann. and Mag.*, ser. 4, vol. 15, p. 180, *Utica* Slate.

delicatula, (?) instead of *Monticulipora delicatula*.

fruticosa, Miller & Dyer, 1878, *Cont. to Pal. No. 2*, p. 6, *Hud. Riv. Gr.*

herricki, Ulrich, 1886, 14th *Rep. Geo. Sur. Minn.*, p. 99, *Trenton Gr.*

nashvillensis, S. A. Miller, 1880, *Jour. Cin. Soc. Nat. Hist.*, vol. 3, p. 143, *Trenton Gr.*

striata, Ulrich, (*in press*), *Micropalaentology*, p. 10, *Hud. Riv. Gr.*



CALLOPORA, Hall, 1852, *Pal. N. Y.*, vol. 2, p. 144. FIG. 462.—*Bythopora nashvillensis*. Magnified.

Ramoso, smooth, or tuberculated; cell tubes cylindrical; interstitial cells numerous; diaphragms numerous, no spiniform tubuli; intercellular space occupied by septate tubuli. Type *C. elegantula*.

aculeolata, see *Cœlocaulis aculeolata*.

? *aspera*, Hall, 1852, *Pal. N. Y.*, vol. 2, p. 147, *Niagara Gr.*

bipunctata, Hall, 1884, *Rep. St. Geol.*, p. 15, syn. for *Streblotrypa hamiltonensis*.

bispinulata, see *Orthopora bispinulata*.

cellulosa, Hall, 1883, *Rep. St. Geol.*, pl. 12, fig. 7-9, *Low. Held. Gr.*

cervicornis, Hall, 1879, *Desc. New Spec. Foss.*, p. 3, and 11th *Rep. Ind. Geo. Sur.*, p. 238, *Niagara Gr.*

cincinnatiensis, Ulrich, syn. for *Leioclema occidens*.

diversa, Hall, 1879, *Desc. New. Spec. Foss.*, p. 4, and 11th *Rep. Ind. Geo. Sur.*, p. 239, *Niagara Gr.*

elegantula, Hall, 1852, *Pal. N. Y.*, vol. 2, p. 144, *Niagara Gr.*

? *exsul*, Hall, 1876, (*Alveolites exsul*.) 28th *Rep. N. Y. St. Mus. Nat. Hist.*, p. 115, *Niagara Gr.*

fistulosa, Hall, 1883, *Rep. St. Geol.*, pl. 12, fig. 1-6, *Low. Held. Gr.*

florida, Hall, 1852, *Pal. N. Y.*, vol. 2, p. 146, *Niagara Gr.*

geniculata, Hall, 1887, *Pal. N. Y.*, vol. 6, p. 75, *Up. Held. Gr.*

hemispherica, see *Fistulipora hemispherica*.

heteropora, see *Callotrypa heteropora*.

hyale, see *Cœlocaulis hyale*.

incrassata, see *Fistulipora incrassata*.

incontroversa, Ulrich, 1886, 14th *Rep. Geo. Sur. Minn.*, p. 96, *Trenton Gr.*

internodata, see *Callotrypa internodata*.

irregularis, see *Cœlocaulis irregularis*.

laminata, Hall, 1852, *Pal. N. Y.*, vol. 2, p. 146, *Niagara Gr.*

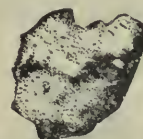


FIG. 463.—*Callopora exsul*.

macropora, see *Callotrypa macropora*.
macropora var. *signata*, see *Callotrypa macropora* var. *signata*.
magnopora, Foerste, 1887, Bull. Denison University, p. 173, Niagara Gr.
minutissima, see *Leiclema minutissimum*.
missouriensis, Rominger, syn. for *Leiclema punctatum*.
multiseriata, see *Callotrypa multiseriata*.
nodulosa, Nicholson, 1874, (Chetetes nodulosus,) Quar. Jour. Geo. Soc., vol. 30, p. 506, and Ohio Pal., vol. 2, p. 200, Hud. Riv. Gr.
nummiformis, Hall, 1852, Pal. N. Y., vol. 2, p. 148, Niagara Gr.
oculifera, see *Callotrypa oculifera*.
ohioensis, Foerste, 1887, Bull. Denison Univ., p. 174, Niagara Gr.
onealli, James, 1875, (Chetetes onealli,) Int. Catal. Cin. Foss., p. 2, Hud. Riv. Gr.
opleta, Hall, 1887, Pal. N. Y., vol. 6, p. 21, Low. Held. Gr.



FIG. 464.—*Callopora sigillarioides*. Natural size and magnified.

1875, (Chetetes sigillarioides,) Ohio Pal., vol. 2, p. 203, Hud. Riv. Gr.
singularis, Hall, 1876, 28th Rep. N. Y. St. Mus. Nat. Hist., p. 115, Niagara Gr.
subnodosa, Ulrich, (in press), Geo. Sur. Ill., vol. 8, pl. 33, Hud. Riv. Gr.
subplana, Ulrich, 1882, Jour. Cin. Soc. Nat. Hist., vol. 5, p. 253, Hud. Riv. Gr.
undulata, Ulrich, 1886, 14th Rep. Geo. Sur. Minn., p. 95, Trenton Gr.
unispina, see *Callotrypa unispina*.
venusta, see *Ceolocaulis venusta*.



FIG. 465.—*Callopora subnodosa*. Tangential section $\times 50$, showing amalgamation of walls.

CALLOPORILLA, Ulrich, 1882, Jour. Cin. Soc. Nat. Hist., vol. 5, p. 154. [Ety. diminutive of *Callopora*.] Thin expansions, epitheca below; tubes with thick walls containing interstitial cells or angular

mesopores; diaphragms and spiniform tubuli. Type *C. harrisi*.
harrisi, Ulrich, 1883, Jour. Cin. Soc. Nat. Hist., vol. 6, p. 91, Hud. Riv. Gr.
nodulosa, Ulrich, (in press), Geo. Sur. Ill., vol. 8, pl. 33, Hud. Riv. Gr.
CALLOTRYPA, Hall, 1887, Pal. N. Y., vol. 6, p. 24. [Ety. *kallos*, beautiful; *trypa*, foramen.] Distinguished from *Callopora* by having a solid intercellular space, or one occupied with minute tubuli without septa. Type *C. macropora*.
heteropora, Hall, 1874, (Callopora heteropora,) 26th Rep. N. Y. St. Mus. Nat. Hist., p. 102, Low. Held. Gr.
internodata, Hall, 1881, (Callopora internodata,) Trans. Alb. Inst., vol. 10, p. 182, and Pal. N. Y., vol. 6, p. 189, Ham. Gr.
macropora, Hall, 1874, (Callopora macropora,) 26th Rep. N. Y. St. Mus. Nat. Hist., p. 101, Low. Held. Gr.
macropora var. *signata*, Hall, 1874, (Trematopora signata,) 26th Rep. N. Y. St. Mus. Nat. Hist., p. 104, Low. Held. Gr.
multiseriata, Hall, 1881, (Callopora multiseriata,) Bryozoans of the Up. Held. Gr., p. 7, and Pal. N. Y., vol. 6, p. 75, Up. Held. Gr.
oculifera, Hall, 1879, (Callopora oculifera,) 32d Rep. N. Y. St. Mus. Nat. Hist., p. 155, Low. Held. Gr.
paucipora, Hall, 1887, Pal. N. Y., vol. 6, pl. 23, fig. 21, Low. Held. Gr.
striata, Hall, 1887, Pal. N. Y., vol. 6, p. 26, Low. Held. Gr.
unispina, Hall, 1874, (Callopora unispina,) 26th Rep. N. Y. St. Mus. Nat. Hist., p. 102, Low. Held. Gr.
Carinopora, Nicholson, 1874, Ann. and Mag. Nat. Hist., 4th ser., vol. 13, and Pal. Prov. Ont., p. 109, synonym for *Fenestella*.
hindi, Nicholson, 1874, Ann. and Mag. Nat. Hist., 4th ser., vol. 13, and Pal. Prov. Ont., p. 111. Not a good species.
CERAMELLA, Hall, 1887, Pal. N. Y., vol. 6, p. 19. [Ety. *keramis*, imbricated.] Thin, growing from a spreading base, celluliferous on both sides, tubes oblique; peristomes elevated; maculae sterile, depressed. Type *C. scidacea*.
scidacea, Hall, 1887, Pal. N. Y., vol. 6, p. 240, Ham. Gr.
CERAMOPORA, Hall, 1852, Pal. N. Y., vol. 2, p. 168. [Ety. *keramis*, imbricated like roof tile; *poros*, pore.] Discoidal, free or attached by the center of the base to foreign bodies; under surface with one or more layers of small, irregular, intercommunicating cells, which do not form tubes; cells large, oblique, imbricating, arranged in a radial manner around the depressed center, communicating with each other and the mesopores by means of remote perforations in their walls; mesopores irregular, short, numerous at the center of the colony, decreasing in number toward the margin. Type *C. imbricata*.

agellus, Hall, 1867, 28th Rep. N. Y. Mus. Nat. Hist., p. 120, Niagara Gr.
 beani, James, 1885, Jour. Cin. Soc. Nat. Hist., vol. 7, p. 23, Hud. Riv. Gr.
 confluens, Hall, 1876, 28th Rep. N. Y. Mus. Nat. Hist., p. 119, Niagara Gr.
 explanata, Hall, 1879, Desc. New Spec. Foss., p. 5, and 11th Rep. Ind. Geo. and Nat. Hist., p. 245, Niagara Gr.
 foliacea, Hall, 1852, Pal. N. Y., vol. 2, p. 170, Niagara Gr.
 huronensis, Nicholson, 1875, Geo. Mag. n. s., vol. 2, p. 37, Ham. Gr.
 imbricata, Hall, 1852, Pal. N. Y., vol. 2, p. 169, Niagara Gr.
 incrustans, Hall, 1852, Pal. N. Y., vol. 2, p. 169, Niagara Gr.
 labacula, Hall, 1876, 28th Rep. N. Y. Mus. Nat. Hist., p. 119, Niagara Gr.
 labeculoidea, Hall, 1883, Rep. St. Geol., pl. 16, fig. 1-2, and Pal. N. Y., vol. 6, p. 33, Low. Held. Gr.
 maculata, Hall, 1874, 26th Rep. N. Y. Mus. Nat. Hist., p. 108, Low. Held. Gr.
 maxima, Hall, 1874, 26th Rep. N. Y. Mus. Nat. Hist., p. 109, Low. Held. Gr.
 nicholsoni, James, 1875, Int. to Catai. Cin. Foss., p. 3, Hud. Riv. Gr.
 nothus, Hall, 1879, Desc. New Spec. Foss., p. 6, and 11th Rep. Ind. Geo. and Nat. Hist., p. 244, Niagara Gr.

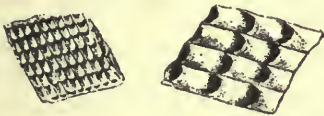


FIG. 466.—*Ceramopora ohioensis*. Fragment natural size and magnified.

ohioensis, Nicholson, 1875, Ohio Pal., vol. 2, p. 265, Hud. Riv. Gr.
orbiculata, Ringuette, 1886, Bull. Buf. Soc. Nat. Hist., vol. 5, p. 19. Not properly defined.
parvicella, Hall, 1879, 32d Rep. N. Y. St. Mus. Nat. Hist., p. 158, Low. Held. Gr.
raripora, Hall, 1879, Desc. New Spec. Foss., p. 6, and 11th Rep. Ind. Geo. and Nat. Hist., p. 244, Niagara Gr.
CERAMOPORELLA, Ulrich, 1882, Jour. Cin. Soc. Nat. Hist., vol. 5, p. 156, and Geo. Sur. Ill., vol. 8, (in press.) [Ety. from *Ceramopora*.] Incrusting, consisting of one or more thin layers; zoecial tubes short, apertures rounded, direct or oblique, and more or less nearly isolated by mesopores. Type *C. distincta*.
distincta, Ulrich, (in press.) Geo. Sur. Ill., vol. 8, pl. 39, Hud. Riv. Gr.
granulosa, Ulrich, (in press.) Geo. Sur. Ill., vol. 8, pl. 41, Hud. Riv. Gr.
stellata, Ulrich, (in press.) Geo. Sur. Ill., vol. 8, pl. 41, Hud. Riv. Gr.
Ceriopora, Goldfuss, 1826, Germ. Petref. [Ety. *kerion*, honey-comb; *poros*, pore.] Not a Palæozoic genus.
hamiltonensis, see *Streblotrypa hamiltonensis*.

CHAINODICTYON, Foerste, 1887, Bull. Denison Univ., p. 81. Zoaria flabellate, consisting of narrow inosculating branches, poriferous on one side only, the other with concentric or lunate plications. Fenestrules elliptical; zoecia subtubular in two to four alternating series, their apertures rounded and placed at the bottom of sloping areas. Type *C. laxum*.
laxum, Foerste, 1887, Bull. Denison Univ., vol. 2, p. 81, Low. Coal Meas.
laxum var. *minor*, Ulrich, (in press.) Geo. Sur. Ill., vol. 8, pl. 62, Low. Coal Meas.
CHILOPORELLA, Ulrich, 1882, Jour. Cin. Soc. Nat. Hist., vol. 5, p. 157. [Ety. *cheilos*, edge or lip; *poros*, pore; *ella*, dim.] Flabellate fronds or compressed branches, from a greatly expanded heavy crust; zoecial tubes long, very thin-walled, large, and of irregular shape in the axial region; walls much thickened near the surface; apertures ovate, the lunarium conspicuously elevated; mesopores numerous; diaphragms few, generally absent. Type *C. flabellata*.
flabellata, Ulrich, 1879, (Fistulipora flabellata,) Jour. Cin. Soc. Nat. Hist., vol. 2, p. 28. Hud. Riv. Gr.
CHILOTRYPA, Ulrich, 1884, Jour. Cin. Soc. Nat. Hist., vol. 7, p. 49. [Ety. *cheilos*, edge; *trypa*, opening.] Ramose, small central tube to which the zoecia are attached; interstitial spaces vesiculose; diaphragms wanting, or few. Type *C. hispida*.
hispida, Ulrich, 1884, Jour. Cin. Soc. Nat. Hist., vol. 7, p. 50, Kaskaskia Gr.
ostiolata, Hall, 1852, (*Tematopora ostiolata*), Pal. N. Y., vol. 2, p. 152, Niagara Gr.
CLATHROPORA, Hall, 1852, Pal. N. Y., vol. 2, p. 159. [Ety. *clathrum*, lattice; *poros*, pore.] Reticulate, uniformly poriferous on both sides of the bifoliate fronds; apertures more or less quadrangular, regularly arranged in parallel series or obliquely in quincunx order. Type *C. alcornis*.
alcornis, Hall, 1852, Pal. N. Y., vol. 2, p. 159, Niagara Gr.

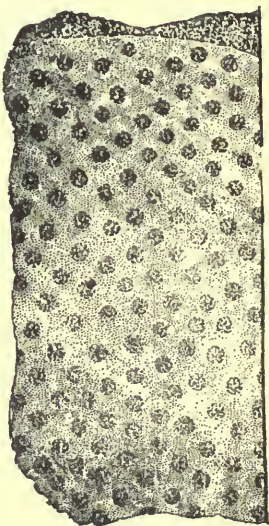


FIG. 467.—*Clathropora frondosa*.

- carinata*, Hall, syn. for *Coscinotrypa cribriformis*.
- clintonensis*, Hall & Whitfield, 1875, Ohio Pal., vol. 2, p. 113, Niagara Gr.
- flabellata*, Hall, 1851, Foster & Whitney's Rep., vol. 2, p. 207, Trenton Gr.
- frondosa*, Hall, 1852, Pal. N. Y., vol. 2, p. 160, Niagara Gr.
- gracilis*, Spencer, 1884, Bull. No. 1, Mus. Univ. St. Mo., p. 54, Niagara Gr.
- intermedia*, Nicholson & Hinde, 1874, Can. Jour., p. 156, Niagara Gr.
- intertexta*, Nicholson, 1874, Geo. Mag. Lond. n. s., vol. 1, p. 125, Corniferous Gr.
- striatura*, see *Coscinium striatum*.
- CLONOPORA**, Hall, 1881, Bryozoans of the Up. Held. Gr., p. 20. [Ety. *klonos*, confusion; *poros*, pore.] Consisting of an aggregation of elongate, cylindrical, tubular cells, which at intervals become free and turn abruptly outward in an umbelliform expansion, or in alternation; cell apertures expanded or narrowly trumpet-shaped. Type *C. semireducta*.
- fasciculata*, Hall, 1887, Pal. N. Y. vol. 6, p. 289, Up. Held. Gr.
- incurva*, Hall, 1881, Bryozoans of Up. Held. Gr., p. 20, Up. Held. Gr.
- semireducta*, Hall, 1881, Bryozoans of Up. Held. Gr., p. 20, Up. Held. Gr.
- CÆLOCAULIS**, Hall, 1887, Pal. N. Y., vol. 6, p. 23. [Ety. *koilos*, hollow; *kantos*, stem.] Ramose, structure like *Callopora*, but growing as hollow stems, the thin expansion lined with a striated epitheca. Type *C. venusta*.
- aculeolata*, Hall, 1881, (*Callopora aculeolata*.) Bryozoans of Up. Held. Gr., p. 7, and Pal. N. Y., vol. 6, p. 76, Up. Held. Gr.
- hyale*, Hall, 1874, (*Callopora hyale*.) 26th Rep. N. Y. St. Mus. Nat. Hist., p. 100, and Pal. N. Y., vol. 6, p. 76, Up. Held. Gr.
- irregularis*, Hall, 1881, (*Callopora irregularis*.) Bryozoans of the Up. Held. Gr., p. 7, and Pal. N. Y., vol. 6, p. 76, Up. Held. Gr.
- mediopora*, Hall, 1887, Pal. N. Y., vol. 6, p. 23, Low. Held. Gr.
- venusta*, Hall, 1874, (*Callopora venusta*.) 26th Rep. N. Y. St. Mus. Nat. Hist., p. 101, and Pal. N. Y., vol. 6, p. 23, Low. Held. Gr.
- CÆLOCONUS**, Ulrich, Geo. Sur. Ill., vol. 8, p. 402. [Ety. *koilos*, hollow; *konos*, cone.] Zoaria simple, hollow, expanding gradually from the striated and sub-acute basal extremity, substance thin; external characters of zoecia as in *Rhombopora*; primitive portion short; hemisepta well developed. Type *C. rhombicus*.
- granosus*, Ulrich, (in press.) Geo. Sur. Ill., vol. 8, pl. 72, Kaskaskia Gr.
- rhombicus*, Ulrich, (in press.) Geo. Sur. Ill., vol. 8, pl. 72, St. Louis Gr.
- COSCINELLA**, Hall, 1887, Pal. N. Y., vol. 6, p. 19. [Ety. diminutive of *Coscinium*.] Distinguished from *Coscinium* by the presence of minute, angular pits between the cell apertures and around the margins of the fenestrules. Type *C. elegantula*.
- cosciniformis*, Nicholson, 1875, (*Ptilodictya cosciniformis*.) Geo. Mag., vol. 2, p. 35, and Pal. Prov. Ont., p. 80, Ham. Gr.
- elegantula*, Hall, 1887, Pal. N. Y., vol. 7, p. 239, Ham. Gr.
- COSCINIUM**, Keyserling, 1846, Geognost. beobacht., p. 192. [Ety. *koskinion*, a little sieve.] Lobed, leaf-like expansions, cells on each side, quincuncially arranged; perforated as in *Adcona cribriformis*; intercellular spaces wide, and permeated with capillary tubuli, which fill up with age; the dividing plate has a cancellous structure on either side, from the outer cellules of which the large oblique cells, terminating on the free surface, take their rise. Type *C. cyclops*.
- asterium*, Prout, 1860, Trans. St. Louis Acad. Sci., vol. 1, p. 574, Keokuk Gr.
- cribriforme*, see *Coscinotrypa cribriformis*.
- cyclops*, Keyserling, 1846, Geognost. beobacht., p. 192, Up. Held. Gr.
- elegans*, Prout, 1860, Trans. St. Louis Acad. Sci., vol. 1, p. 572, St. Louis Gr.
- escharoides*, Prout, 1860, Trans. St. Louis Acad. Sci., vol. 1, p. 574, (erroneously written *escharense*.) Keokuk Gr.
- keyserlingi*, Prout, 1858, Trans. St. Louis Acad. Sci., vol. 1, p. 269, Warsaw Gr.
- latum*, Ulrich, (in press.) Geo. Sur. Ill., vol. 8, pl. 76, Burlington Gr.
- michelini*, Prout, 1860, Trans. St. Louis Acad. Sci., vol. 1, p. 573, St. Louis Gr.
- plumosum*, Prout, 1860, Trans. St. Louis Acad. Sci., vol. 1, p. 572, St. Louis Gr.
- saganella*, Prout, 1860, Trans. St. Louis Acad. Sci., vol. 1, p. 573, St. Louis Gr.
- striatum*, Hall, 1887, Pal. N. Y., vol. 6, p. 238, Ham. Gr.
- striatum*, Hall, 1887, Pal. N. Y., vol. 6, p. 88, Up. Held. Gr.
- tuberculatum*, Prout, 1860, Trans. St. Louis Acad., vol. 1, p. 573, Keokuk Gr.
- wortheni*, Prout, 1860, Trans. St. Louis Acad. Sci., vol. 1, p. 571, Keokuk Gr.
- COSCINOTRYPA**, Hall, 1887, Pal. N. Y., vol. 6, p. 19. [Ety. *koskinion*, a little sieve; *trupa*, door.] Explanate, celluliferous on both sides, with fenestrules at varying distances; surface plicated; cells tubular, arising from a mesotheca; apertures trilobate, denticulated; intercellular tissue vesiculose. Type *C. cribriformis*.
- carinata*, Hall, syn. for *C. cribriformis*.
- cribriformis*, Prout, 1858, (*Coscinium cribriforme*.) Trans. St. Louis Acad. Sci., vol. 1, p. 267, Up. Held. Gr.
- Crateripora*, Ulrich, 1879, Jour. Cin. Soc. Nat. Hist., vol. 2, p. 29, *C. erecta*, *C. lineata*, and *C. lineata* var. *expansa*, rep-

resent the basal articulating sockets of Ptilodictya and Arthropora, and are not entitled to rank as species.

CREPIPORA, Ulrich, (in press,) Geo. Sur. Ill., vol. 8. [Ety. *krepis*, horseshoe; *poros*, pore.] Incrusting, lamellate or massive, with a wrinkled epitheca on the lower side, in one case forming regular hollow branches; surface exhibiting, at subregular intervals, maculae of mesopores, appearing as minutely porous or subsolid elevations or depressions; zoëcia very little oblique, the apertures varying from rhomboidal to subpyriform; lunarium well marked in perfect examples; best shown in tangential sections; mesopores usually restricted to the maculae; diaphragms present. Type *C. simulans*.

epidermata, Ulrich, (in press,) Geo. Sur. Ill., vol. 8, pl. 40, Hud. Riv. Group.

hemispherica, Ulrich, (in press,) Geo. Sur. Ill., vol. 8, pl. 40, Hud. Riv. Gr.

imprensa, Ulrich, (in press,) Geo. Sur. Ill., vol. 8, pl. 40, Hud. Riv. Gr.

simulans, Ulrich, (in press,) Geo. Sur. Ill., vol. 8, pl. 39 and 40, Hud. Riv. Gr.

solida, Ulrich, (in press,) Geo. Sur. Ill., vol. 8, pl. 40, Hud. Riv. Gr.

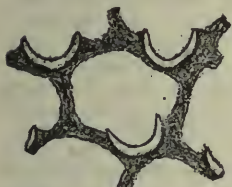


FIG. 468.—*Crepipora simulans*. Tangential section, showing lunarium.

Crisina scrobiculata, see *Crisinella scrobiculata*.

CRISINELLA, Hall, 1883, Rep. St. Geol. Def., pl. 26. [Ety. from *Crisina*.] Ramose, solid, celluliferous on one side; cells in oblique, ascending rows from the center to the margin of the branch; peristomes prominent; interapertural spaces, with polygonal pits or mesopores. Type *C. scrobiculata*.

scrobiculata, Hall, 1881, (*Crisina scrobiculata*), Bryozoans of the Up. Held. Gr., p. 20, and Pal. N. Y., vol. 6, p. 103, Up. Held. Gr.

Cryptopora, Nicholson, 1874, Ann. and Mag. Nat. Hist., 4th ser., vol. 13, and Pal. Prov. Ont., p. 102. Founded upon a cast from the under side of a *Fenestella mirabilis*, Nicholson. Not a species.

CYCLOPORA, Prout, 1860, Trans. St. Louis Acad. Sci., vol. 1, p. 574. [Ety. *kuklos*, circle; *poros*, pore.] Discoidal, frondescent or incrusting; plates sometimes superposed with subprismatic cells longer than broad, having their sides formed of a minutely porous interstitial network, developed from an epitheca marked by transverse bands more or less concentric, separating the bases of the cells; cells shallow and expanded; interstitial cells. Type *C. fungia*.

discoidea, see *Proutella discoidea*.

expatiata, Ulrich, (in press,) Geo. Sur. Ill., vol. 8, pl. 68, Keokuk Gr.

fungia, Prout, 1860, Trans. St. Louis Acad. Sci., vol. 1, p. 577, Keokuk Gr.

jamesi, Prout, syn. for *Ptilodictya pavonia*.

polymorpha, Prout, 1860, Trans. St. Louis Acad. Sci., vol. 1, p. 578, Kaskaskia Gr.

CYCLOPORELLA, Ulrich, (in press,) Geo. Sur. Ill., vol. 8, p. 404. [Ety. dim. of *Cyclopora*.] Thin discoidal expansion;

zoëcia subtubular, with a succession of superior hemisepta in the vestibular portion; irregular mesopores abundant; acanthopores of large size, numerous. Type *C. spinifera*.

perversa, Ulrich, (in press,) Geo. Sur. Ill., vol. 8, pl. 69, Keokuk Gr.

spinifera, Ulrich, (in press,) Geo. Sur. Ill., vol. 8, pl. 69, Keokuk Gr.

CYSTODICTYA, Ulrich, 1882, Jour. Cin. Soc. Nat. Hist. vol. 5, p. 152. [Ety. *kustis*, a bladder; *dictyon*, net.] Zoarium like *Stictopora*, but with wide interstitial spaces occupied with vesicular tissue.

Type *C. ocellata*

americana, Ulrich, (in press,) Geo. Sur. Ill. vol. 8, pl. 76, Keokuk Gr.

angusta, Ulrich, 1888, Bull. Denison Univ., p. 81, Waverly Gr.

hamiltonensis, Ulrich, (in press,) Geo. Sur. Ill., vol. 8, pl. 43, Ham Gr.

lineata, Ulrich, 1884, Jour. Cin. Soc. Nat. Hist. vol. 7, p. 37, Keokuk Gr.

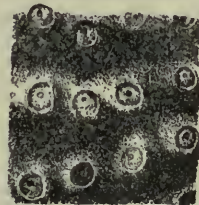


FIG. 469.—*Cystodycta ocellata*. Natural size and 18 diam.

lineata var. *major*, Ulrich, (in press,) Geo. Sur. Ill., vol. 8, pl. 76, St. Louis Gr.

lineata, var. *stludovici*, Ulrich, (in press,) Geo. Sur. Ill., vol. 8, pl. 76, St. Louis Gr.

nitida, Ulrich, (in press,) Geo. Sur. Ill., vol. 8, pl. 76, Keokuk Gr.

ocellata, Ulrich, 1882, Jour. Cin. Soc. Nat. Hist., vol. 5, p. 170, Keokuk Gr.

pustulosa, Ulrich, (in press,) Geo. Sur. Ill., vol. 8, pl. 76, Keokuk Gr.

simulans, Ulrich, 1888, Bull. Denison Univ., p. 81, Waverly Gr.

zigzag, Ulrich, 1888, Bull. Denison Univ., p. 81, Cuyahoga Shales.



FIG. 470.—*Cystodycta ocellata*. Tangential section showing lunarium.

CYSTOPORA, Hall, 1881, Bryozoans of Up. Held. Gr., p. 19. [Ety. *kustis*, bladder; *poros*, pore.] Simple or branching subcylindrical stipes; cells arising from the axis; circular and subcylindrical below, enlarged above the middle and becoming ampullate, turning abruptly outward below the apertures, which are extremely contracted; cell-tubes exposed more than half their length. Type C. geniculata.

geniculata, Hall, 1881, Bryozoans of the Up. Held. Gr., p. 20, and Pal. N. Y., vol. 6, p. 103, Up. Held. Gr.

DIAMESOPORA, Hall, 1852, Pal. N. Y., vol. 2, p. 158, and vol. 6, p. 19. [Ety. *diamesos*, the part between; *poros*, opening.] Ramose, hollow, epitheca on inner surface; intercellular space solid; surface like Trematopora. Type D. dichotoma. camerata, Hall, 1883, (Trematopora camerata,) Rep. St. Geol. and Pal. N. Y., vol. 6, p. 72, Up. Held. Gr.

communis, Ulrich, (in press,) Geo. Sur. Ill., vol. 8, pl. 39 and 41, Utica Slate.

constricta, Hall, 1874, (Trematopora constricta,) 26th Rep. N. Y. St. Mus. Nat. Hist., p. 104, Low. Held. Gr.

dichotoma, Hall, 1852, Pal. N. Y., vol. 2, p. 158, Low. Held. Gr.

dispersa, Hall, 1879, (Trematopora dispersa,) 32d Rep. N. Y. St. Mus. Nat. Hist., p. 150, Low. Held. Gr.

vaupeli, Ulrich, (in press,) Geo. Sur. Ill., vol. 8, pl. 39 and 41, Utica Slate.

DICHOTRYPA, Ulrich, (in press,) Geo. Sur. Ill., vol. 8, p. 386. [Ety. *dicha*, double; *trupa*, opening.] Consisting of large bifoliate expansions; the surface with solid maculae; zoecial and minute structure as in Cystodictya. Type D. foliata. elegans, Ulrich, (in press,) Geo. Sur. Ill., vol. 8, pl. 76, St. Louis Gr.

expatiata, Ulrich, (in press,) Geo. Sur. Ill., vol. 8, St. Louis Gr.

flabellum, Rominger, 1866, (Fistulipora flabellum,) Proc. Acad. Nat. Sci., Phil., p. 9, St. Louis Gr.

foliata, Ulrich, (in press,) Geo. Sur. Ill., vol. 8, pl. 42, Ham. Gr.

grandis, Ulrich, (in press,) Geo. Sur. Ill., vol. 8, pl. 42, Niagara Gr.

intermedia, Ulrich, (in press,) Geo. Sur. Ill., vol. 8, pl. 76, St. Louis Gr.

lyroides, Ulrich, (in press,) Geo. Sur. Ill., vol. 8, pl. 77, St. Louis Gr.

DICRANOPORA, Ulrich, 1882, Jour. Cin. Soc. Nat. Hist., vol. 5, p. 166. [Ety. *dikranos*, two-pointed; *poros*, pore.] Zoarium like Stictopora, but distinguished by being composed of ligulate joints, the edges being subparallel to near the upper end, when they diverge and bear two segments; cell-mouths between raised longitudinal lines; no interstitial cells. Type D. internodia.

emacerata, Nicholson, 1875, (Ptilodictya emacerata,) Pal. Ohio, vol. 2, p. 261, Hud. Riv. Gr.

fragilis, Billings, 1866, (Ptilodictya fragilis,) Catal. Sil. Foss. Antic., p. 9, Hud. Riv. Gr.



FIG. 471.—*Dicranopora internodia*. Natural size and magnified.

internodia, Miller & Dyer, 1878, (Ptilodictya internodia,) Cont. to Pal., No. 2, p. 7, Hud. Riv. Gr.

lata, Ulrich, 1882, Jour. Cin. Soc. Nat. Hist., vol. 5, p. 166, Hud. Riv. Gr.

nitidula, Billings, 1866, (Ptilodictya nitidula,) Catal. Sil. Foss. Antic., p. 9, Hud. Riv. Gr.

trentonensis, Ulrich, 1882, Jour. Cin. Soc. Nat. Hist., vol. 5, p. 167, Trenton Gr.

DIPLOCLEMA, Ulrich, (in press,) Geo. Sur. Ill., vol. 8, p. 368. [Ety. *diploos*, double; *klema*, twig.] Ramose, ovate in cross section; zoecia tubular, long, apparently moniliform proximally; separated internally by an axial lamina, from which they gradually diverge to open on the two sides of the compressed branches; apertures prominent, isolated, somewhat constricted and circular; external wall thin. Type D. trentonense.

trentonense, Ulrich, (in press,) Geo. Sur. Ill., vol. 8, pl. 53, Trenton Gr.

DIPLOPORA, Young & Young, 1875, Proc. Nat. Hist. Soc. Glasgow. [Ety. *diploos*, double; *poros*, pore.] Very slender straight stems, throwing off a few lateral branches of equal dimensions; obverse or zoiferous side, with two ranges of zoecia apertures, and moderately developed medium keel; reverse striated. Type D. marginalis.

bifurcata, Ulrich, (in press,) Geo. Sur. Ill., vol. 8, pl. 62, Kaskaskia Gr.

biserialis, Ulrich, (in press,) Geo. Sur. Ill., vol. 8, pl. 62, Low. Coal Meas.

DISCOTRYPA, Ulrich, 1882, Jour. Cin. Soc. Nat. Hist., vol. 5, p. 155. [Ety. *diskos*, quoit; *trupa*, opening.] Free, thin, circular expansions; cells rhomboidal or hexagonal; low monticules, with clusters of large cells present; no interstitial cells or spiniform tubuli. Type D. elegans.

? devonica, Ulrich, 1886, Cont. to Am. Pal., p. 25, Up. Held. Gr.

elegans, Ulrich, 1879, (Chetetes elegans,) Jour. Cin. Soc. Nat. Hist., vol. 2, p. 130, Hud. Riv. Gr.

ENALLOPORA, D'Orbigny, 1850, Prodr. d. Paléont., t. 1, p. 22. [Ety. *enalloos*, changed; *poros*, pore.] Small bifurcating branches, without connecting bars; cell-mouths

prominent on each side, opening laterally and alternately. Type *E. perantiqua*.

cinctosa, Ulrich, 1882, (*Mitoclema cinctosa*.) Jour. Cin. Soc. Nat. Hist., vol. 5, p. 159, Trenton Gr.

perantiqua, Hall, 1847, (*Gorgonia perantiqua*.) Pal. N. Y., vol. 1, p. 76, Trenton Gr.

ERIDOPORA, Ulrich, 1882, Jour. Cin. Soc. Nat. Hist., vol. 5, p. 137. [Ety. *eridos*, in dispute; *poros*, pore.] Zoarium thin, incrusting; cell-mouths oblique, ovate, or subtriangular, one side more prominent than the other, surrounded by angular interstitial cells, which do not form tubes, and may be either open or closed; intertubular spaces vesicular. Type *E. macrostoma*. Should this genus prove to be founded upon reliable characters, then many of the parasitic species now placed with *Fistulipora* will be referred to it.

macrostoma, Ulrich, 1882, Jour. Cin. Soc. Nat. Hist., vol. 5, p. 137, Kaskaskia Gr.

minima, Ulrich, 1886, Cont. to Am. Pal., p. 21, Up. Held. Gr.

punctifera, Ulrich, 1882, Jour. Cin. Nat. Hist., vol. 5, p. 138, Kaskaskia Gr.

Eschara, Lamarck, 1801, Syst. An. sans Vert. [Ety. *eschara*, scar.] Not American Palaeozoic.

? *concentrica*, Prout, Trans. St. Louis Acad. Sci., vol. 1, p. 234, Coal Meas. Not recognized.

ovatifera, Troost, 1840, 5th Geo. Rep. Tenn. Low. Sil. Not recognized.

reticulata, Troost, 1840, 5th Geo. Rep. Tenn. Low. Sil. Not recognized.

? *tuberculata*, Prout, 1853, Trans. St. Louis Acad. Sci., vol. 1, p. 234. Coal Meas. Not recognized.

ESCHAROPORA, Hall, 1847, Pal. N. Y., vol. 1, p. 72. [Ety. *eschara*, scar; *poros*, pore.] Cylindrical, solid, tapering above, expanded and root-like below; cells oval, inclosed in a rhomboid, by elevated oblique lines; tubes radiating from an imaginary axis. Type *E. recta*.

angusta, Hall, 1879, Desc. New Spec. Foss., p. 6, and 11th Rep. Ind. Geo. and Nat. Hist., p. 245, Niagara Gr.

lirata, see *Ptilodictya lirata*.

nebulosa, see *Ptilodictya nebulosa*.

recta, Hall, 1847, Pal. N. Y., vol. 1, p. 73, Trenton Gr.

recta var. *nodosa*, Hall, 1847, Pal. N. Y., vol. 1, p. 73, Trenton Gr.

tenuis, see *Phænopora tenuis*.

EURYDICTYA, Ulrich, (in press,) Geo. Sur. Ill., vol. 8, p. 389. [Ety. *eury*s, broad; *dictyon*, a net.] Broad, simple, or irregularly divided, bifoliate expansions, without nonporiferous parallel margins; surface with more or less conspicuous, small, solid maculae or monticules; zoecial structure very much as in *Sulcopora*, the differences being of small importance, and due to zoarial habit.

Type *E. montifera*. Syn. (?) for *Phænopora*.

calhouensis, Ulrich, (in press,) Geo. Sur. Ill., vol. 8, pl. 30, Trenton Gr.

montifera, Ulrich, (in press,) Geo. Sur. Ill., vol. 8, pl. 30, Hud. Riv. Gr.

sterlingensis, Ulrich, (in press,) Geo. Sur. Ill., vol. 8, pl. 30, Hud. Riv. Gr.

EUSPILOPORA, Ulrich, (in press,) Geo. Sur. Ill., vol. 8, p. 389. [Ety. *euspilos*, full of dots; *poros*, pore.] Small, bifoliate, lobate or irregularly dividing branches; cell apertures subcircular, arranged between longitudinal spinous ridges at the center of the stipe; at intervals several short oblique rows of cells extend outward from the central rows to near the margins of the frond; these alternate with concave nonporiferous but finely granular spaces, which do not extend out as far as the celluliferous lobes, and which cause the edges of the frond to be serrate; internally a vertical row of shallow vesicles behind the vestibular portion of the zoecia; all the remaining interspaces traversed by numerous minute tubuli. Type *E. serrata*. Syn. (?) for *Stictopora*.

barrisi, Ulrich, (in press,) Geol. Sur. Ill., vol. 8, pl. 43, Ham. Gr.

serrata, Ulrich, (in press,) Geo. Sur. Ill., vol. 8, pl. 43, Ham. Gr.

EVACTINOPORA, Meek & Worthen, 1865, Proc. Acad. Nat. Sci. Phil., p. 165. [Ety. *evactinos*, with beautiful rays; *poros*, pore.] Free, consisting of four or more vertical leaves which radiate from an imaginary axis; rays thin, celluliferous on both sides; interstitial spaces occupied by vesicular cells, filled with sclerenchyma, which is traversed by canals. Type *E. radiata*.

grandis, Meek & Worthen, 1868, Geo. Sur. Ill., vol. 3, p. 503, Burlington Gr.

quinqueradiata, Ulrich, (in press,) Geo. Sur. Ill., vol. 8, pl. 73, Burlington Gr.

radiata, Meek & Worthen, 1865, Proc. Acad. Nat. Sci. Phil., p. 65, and Geo. Sur. Ill., vol. 3, p. 502, Burlington Gr.

sexradiata, Meek & Worthen, 1868, Geo. Sur. Ill., vol. 3, p. 502, Burlington Gr.

FAVICELLA, Hall, 1837, Pal. N. Y., vol. 6, p. 19. [Ety. *favus*, honey-comb; *ellus*, diminutive.] Free or incrusting, thin expansion; apertures inclosed in polygonal vestibular areas, similar to *Selenopora*; intercellular surface occupied by minute mesopores; structure vesiculose. Type *F. inclusa*.

inclusa, Hall, 1861, (*Thallostigma inclusa*.) Trans. Alb. Inst., vol. 10, p. 188, and Pal. N. Y., vol. 6, p. 234, Ham. Gr.

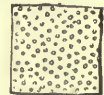


FIG. 472.—*Evactinopora grandis*. Pores 2 diam.

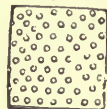


FIG. 473.—*Evactinopora radiata*. Pores 2 diam.

- FENESTELLA, Lonsdale, 1839, Murch, Sil. Syst. [Ety. *fenestella*, little window.] Zoarium, flattened or infundibuliform, composed of rays radiating from a base and uniting laterally by dissepiments, so as to form a net-work, the meshes of which are usually oblong; inner surface of rays rounded and striated, and without cells; cells on the outer side of the rays in two rows, one on each side of a median ridge; dissepiments without cells. Type *F. antiqua*.
- acaulis*, see *Unitrypa acaulis*.
- acmea*, Hall, 1876, 28th Rep. N. Y. Mus. Nat. Hist., p. 124, Niagara Gr.
- aculeata*, see *Polypora aculeata*.
- acuticosta*, Roemer, 1860, Sil. Fauna West. Tenn., p. 30, Niagara Gr.
- adnata*, see *Polypora adnata*.
- adornata*, Hall, 1887, Pal. N. Y., vol. vi, p. 66, Low. Held. Gr.
- adraste*, Hall, 1883, Rep. St. Geol., pl. 20, fig. 20-22, Low. Held. Gr.
- aequalis*, Hall, 1881, Bryozoans of the Up. Held. Gr., p. 31, and Pal. N. Y., vol. 6, p. 112, Up. Held. Gr.
- aeyle*, Hall, 1883, Rep. St. Geol., pl. 19, fig. 11-13, and Pal. N. Y., vol. 6, p. 46, Low. Held. Gr.
- albida*, Hall, 1887, 6th Ann. Rep. Geo. N. Y., p. 48, Waverly Gr.
- albida* var. *richfieldensis*, Ulrich, 1888, Bull. Denison Univ., p. 66, Waverly Gr.
- althaea*, Hall, 1883, Rep. St. Geol., pl. 19, fig. 17-19, and Pal. N. Y., vol. 6, p. 48, Low. Held. Gr.
- ambigua*, see *Loculipora ambigua*.
- angulata*, Hall, 1881, Bryozoans of the Up. Held. Gr., p. 28, Up. Held. Gr.
- angustata*, Hall, 1884, 36th Rep. N. Y. St. Mus. Nat. Hist., p. 60, Ham. Gr.
- anonyma*, Hall, 1881, Bryozoans of the Up. Held. Gr., p. 34, Up. Held. Gr.
- aperta*, Hall, 1887, 6th Ann. Rep. St. Geol. N. Y., p. 58, Waverly Gr.
- arctica*, Salter, 1855, Belcher's Last Arctic Voyage, vol. 2, p. 385, Carboniferous.
- arta*, see *Polypora arta*.
- aspectans*, Hall, 1884, 36th Rep. N. Y. St. Mus. Nat. Hist., p. 59, Ham. Gr.
- assita*, Hall, 1884, 36th Rep. N. Y. St. Mus. Nat. Hist., p. 64, Ham. Gr.
- banyana*, Prout, 1859, Trans. St. Louis Acad. Sci., vol. 1, p. 450, Warsaw Gr.
- bellistriata*, Hall, 1879, Desc. New Spec. Foss., p. 7, and 11th Rep. Ind. Geo. and Nat. Hist., p. 252, Niagara Gr.
- bicornis*, Spencer, 1884, Bull. No. 1, Mus. Univ. St. Mo., p. 55, Clinton Gr.
- bifurca*, Ulrich, 1886, Cont. to Am. Pal., p. 6, Up. Held. Gr.
- bifurcata*, Prout, 1866, Trans. St. Louis Acad. Sci., vol. 2, p. 411, Ham. Gr.
- bigeneris*, Ulrich, 1886, Cont. to Am. Pal., p. 11, Up. Held. Gr.
- biimbricata*, Hall, 1881, Bryozoans of the Up. Held. Gr., p. 31, and Pal. N. Y., vol. 6, p. 122, Up. Held. Gr.
- biserialis*, see *Hemitrypa biserialis*.
- biseriata*, Hall, 1881, Bryozoans of the Up. Held. Gr., p. 25, and Pal. N. Y., vol. 6, p. 113, Up. Held. Gr.
- biserrulata*, Hall, 1881, Bryozoans of the Up. Held. Gr., p. 30, and Pal. N. Y., vol. 6, p. 128, Up. Held. Gr.
- brevilinea*, Hall, 1884, 36th Rep. N. Y. St. Mus. Nat. Hist., p. 70, Ham. Gr.
- brevisulcata*, see *Polypora brevisulcata*.
- burlingtonensis*, Ulrich, (in press,) Geo. Sur. Ill., vol. 8, pl. 49, Burlington Gr.
- cavernosa*, Ulrich, 1888, Bull. Denison Univ., p. 69, Waverly Gr.
- celsipora*, see *Polypora celsipora*.
- celsipora* var. *minima*, see *Polypora celsipora* var. *minima*.
- celsipora* var. *minor*, see *Polypora celsipora* var. *minor*.
- cestriensis*, Ulrich, (in press,) Geo. Sur. Ill., vol. 8, pl. 51, Kaskaskia Gr.
- cinctuta*, Hall, 1884, 36th Rep. N. Y. St. Mus. Nat. Hist., p. 62, Ham. Gr.
- cingulata*, Ulrich, (in press,) Geo. Sur. Ill., vol. 8, pl. 52, Keokuk Gr.
- clathrata*, Hall, 1887, Pal. N. Y., vol. 6, p. 117, Up. Held. Gr.
- cleia*, Hall, 1883, Rep. St. Geol., pl. 20, fig. 14-15, Low. Held. Gr.
- compacta*, see *Polypora compacta*.
- compressa*, Ulrich, (in press,) Geo. Sur. Ill., vol. 8, pl. 50, Keokuk Gr.
- compressa*, var. *nodorsalis*, Ulrich, (in press,) Geo. Sur. Ill., vol. 8, pl. 50, Keokuk Gr.
- compressa*, see *Polypora compressa*.
- conferta*, Hall, 1879, Desc. New Spec. Foss., p. 7, and 11th Rep. Ind. Geo., and Nat. Hist., p. 252, Niagara Gr.
- confertipora*, Hall, 1887, Pal. N. Y., vol. 6, p. 108, Up. Held. Gr.
- conjunctiva*, see *Isotrypa conjunctiva*.
- coronis*, Hall, 1883, Rep. St. Geol., pl. 21, fig. 10-13, Low. Held. Gr.
- corticata*, Prout, 1858, Trans. St. Louis Acad. Sci., vol. 1, p. 231, Coal Meas.
- crebripora*, Hall, 1874, 26th Rep. N. Y. St. Mus. Nat. Hist., p. 25, Low. Held. Gr.
- cribrosa*, Hall, 1852, Pal. N. Y., vol. 2, p. 166, Niagara Gr.
- cribrosa*, see *Hemitrypa cribrosa*.
- cultellata*, see *Polypora cultellata*.
- cultrata*, Hall, 1881, Bryozoans of the Up. Held. Gr., p. 29, and Pal. N. Y., vol. 6, p. 119, Up. Held. Gr.
- curvata*, Hall, 1884, 36th Rep. N. Y. St. Mus. Nat. Hist., p. 69, Ham. Gr.
- curvijunctura*, Hall, 1881, Bryozoans of the Up. Held. Gr., p. 29, and Pal. N. Y., vol. 6, p. 107, Up. Held. Gr.
- cylindracea*, Hall, 1881, Bryozoans of the Up. Held. Gr., p. 24, Up. Held. Gr.
- davidsoni*, Nicholson, 1875, Geo. Mag., vol. 2, n. s., p. 36, Ham. Gr.

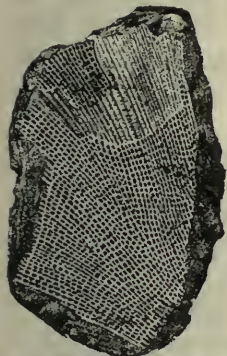


FIG. 474.—Fenestella delicata. Part of a frond.

delicata, Meek, 1871, Proc. Acad. Nat. Sci. Phil., vol. 23, p. 159, and Ohio Pal., vol. 1, p. 273, Waverly Gr.

depressa, Hall, 1881, Bryozoans of the Up. Held. Gr., p. 30, and Pal. N. Y., vol. 6, p. 111, Up. Held. Gr.

dilata, Prout., 1866, Trans. St. Louis Acad. Sci., vol. 2, p. 411, Ham. Gr.

dispanda, Hall, 1887, Pal. N. Y., vol. 6, p. 114, Up. Held. Gr.

distans, see Polypora distans.

elegans, Hall, 1852, Pal. N. Y., vol. 2, p. 164, Niagara Gr.

elegantissima, Eichwald, 1860, Lethæa Rossica, p. 364, Up. Coal Meas.

elegantissima, Hall, 1881. This name was preoccupied, but see Unitrypa elegantissima.

elevatipora, Ulrich, (in press,) Geo. Sur. Ill., vol. 8, pl. 51, Kaskaskia Gr.

elongata, see Polypora elongata.

emaciata, Hall, 1884, 36th Rep. N. Y. St. Mus. Nat. Hist., p. 68, Ham. Gr.

erectipora, Hall, 1881, Bryozoans of the Up. Held. Gr., p. 33, and Pal. N. Y., vol. 6, p. 118, Up. Held. Gr.

eudora, see Polypora eudora.

exigua, Ulrich, (in press,) Geo. Sur. Ill., vol. 8, pl. 51, Warsaw Gr.

eximia, Winchell, 1866, Rep. Low. Penin. Mich., p. 92, Ham. Gr.

exornata, Hall, 1884, 36th Rep. N. Y. St. Mus. Nat. Hist., p. 67, Ham. Gr.

fastigata, see Unitrypa fastigata.

favosa, see Hemitrypa favosa.

filiformis, Nicholson, 1874, Geo. Mag., vol. 1, n. s., p. 199, Up. Held. Gr. The superficial network of some species of Unitrypa.

filistriata, Ulrich, (in press,) Geo. Sur. Ill., vol. 8, pl. 49, Burlington Gr.

flitexta, Winchell, 1866, Rep. Low. Penin. Mich., p. 92, Ham. Gr.

fitulata, see Polypora fistulata.

flabellata, Phillips, 1836, Geo. York, pt. 2, p. 198, Coal Meas., or Permian. Not American. (?)

flabelliformis, see Polypora flabelliformis.

flexuosa, Ulrich, (in press,) Geo. Sur. Ill., vol. 8, pl. 51, Kaskaskia Gr.

foliata, Ulrich, 1888, Bull. Denison Univ., p. 67, Waverly Gr.

funicula, Ulrich, (in press,) Geo. Sur. Ill., vol. 8, pl. 51, Keokuk Gr.

gracilis, see Subretepora gracilis.

granifera, Hall, 1881, Bryozoans of the Up. Held. Gr., p. 33, and Pal. N. Y., vol. 6, p. 125, Up. Held. Gr.

granilinea, see Polypora granilinea.

granulosa, Whitfield, 1878, Ann. Rep. Geo. Sur. Wis., p. 68, and Geo. Sur. Wis., vol. 4, p. 252, Hud. Riv. Gr.

hemitrypa, Prout, 1859, Trans. St. Louis Acad. Sci., vol. 1, p. 444, Warsaw Gr.

herrickana, Ulrich, 1888, Bull. Denison Univ., p. 63, Waverly Gr.

hestia, Hall, 1883, Rep. St. Geol., pl. 20, fig. 12-13, Low. Held. Gr.

hexagonalis, see Polypora hexagonalis.

hexagonalis var. foraminulosa, see Polypora hexagonalis var. foraminulosa.

idalia, Hall, 1874, 26th Rep. N. Y. St. Mus. Nat. Hist., p. 95, Low. Held. Gr.

idothea, see Polypora idothea.

inæqualis, Ulrich, (in press,) Geo. Sur. Ill., vol. 8, pl. 52, Coal Meas.

inflexa, Hall, 1884, 36th Rep. N. Y. St. Mus. Nat. Hist., p. 64, Ham. Gr.

intermedia, Prout, 1858, Trans. St. Louis Acad. Sci., vol. 1, p. 231, Coal Meas.

interrupta, Hall, 1881, Bryozoans of the Up. Held. Gr., p. 32, and Pal. N. Y., vol. 6, p. 123, Up. Held. Gr.

junceus, Hall, 1883, Rep. St. Geol., pl. 20, fig. 16-18, Low. Held. Gr.

lævistriata, see Polypora lævistriata.

largissima, see Polypora largissima.

lata, see Unitrypa lata.

latijunctura, Hall, 1881, Bryozoans of the Up. Held. Gr., p. 31, and Pal. N. Y., vol. 6, p. 128, Up. Held. Gr.

latitruncata, Hall, 1884, 36th Rep. N. Y. St. Mus. Nat. Hist., p. 58, Ham. Gr.

lævinodata, see Polypora lævinodata.

limbata, Foerste, 1887, Bull. Denison Univ., vol. 2, p. 83, Low. Coal Meas.

lineanoda, Hall, 1881, Bryozoans of the Up. Held. Gr., p. 22, Up. Held. Gr.

lunulata, Hall, 1881, Bryozoans of the Up. Held. Gr., p. 31, and Pal. N. Y., vol. 6, p. 121, Up. Held. Gr.

lyelli, Dawson, 1868, Acad. Geol., p. 288, Subcarboniferous.

magnifica, Nicholson, 1874, Geo. Mag., vol. 1, n. s., p. 197, Up. Held. Gr.

marcida, Hall, 1884, 36th Rep. N. Y. St. Mus. Nat. Hist., p. 57, Ham. Gr.

marginalis, Nicholson, 1874, Geo. Mag., vol. 1, n. s., p. 197, Up. Held. Gr.

marginata, McCoy, 1862, Carb. Foss. of Ireland, p. 206, Up. Coal Meas. Not American. (?)

meekana, Ulrich, 1888, Bull. Denison Univ., p. 64, Waverly Gr.

microtrema, D'Orbigny, 1850, Prodr. d. Paléont. Not properly defined.

mimica, Ulrich, (in press,) Geo. Sur. Ill., vol. 8, pl. 52, Low. Coal Meas.

modesta, Ulrich, (in press,) Geo. Sur. Ill., vol. 8, pl. 52, Low. Coal Meas.

multiplex, Hall, 1884, 36th Rep. N. Y. St. Mus. Nat. Hist., p. 57, Ham. Gr.

multiporata var. lodiensis, Meek, 1875, Ohio Pal., vol. 2, p. 274, Waverly Gr.

multispinosa, Ulrich, (in press,) Geo. Sur. Ill., vol. 8, pl. 50, Keokuk Gr.

mutabilis, see Polypora mutabilis.

nervata, see Ptiloporella nervata.

- nervia*, see *Unitrypa nervia*.
nervia var. *constricta*, see *Unitrypa nervia* var. *constricta*.
nexa, see *Polypora nexa*.
nodosa, Prout, 1866, Trans. St. Louis Acad. Sci., vol. 2, p. 410, Ham. Gr.
norwoodana, Prout, 1858, Trans. St. Louis Acad. Sci., vol. 1, p. 233, Coal Meas.
oxfordensis, Ulrich, syn. for *F. granulosa*.
papillata, Hall, syn. for *Polypora paxillata*.
parallela, Hall, 1881, Bryozoans of the Up. Held. Gr., p. 26, and Pal. N. Y., vol. 6, p. 107, Up. Held. Gr.
peculiaris, Hall, 1883, Rep. St. Geol., pl. 33, fig. 19-21, Up. Held. Gr.
parvulipora, Hall, 1876, 28th Rep. N. Y. St. Mus. Nat. Hist., p. 123, Niagara Gr.
patellifera, Ulrich, 1886, Cont. to Pal., p. 8, Up. Held. Gr.
paxillata, see *Polypora paxillata*.
perangulata, see *Polypora perangulata*.
perelegans, Meek, 1872, Pal. E. Nebraska, p. 153, Coal Meas.
perforata, see *Loculipora perforata*.
permarginata, Hall, 1881, Bryozoans of the Up. Held. Gr., p. 30, and Pal. N. Y., vol. 6, p. 127, Up. Held. Gr.
perminuta, Ulrich, (in press.) Geo. Sur. Ill., vol. 8, pl. 52, Low. Coal Meas.
pernodosa, see *Unitrypa pernodosa*.
perplexa, Hall, 1881, Bryozoans of the Up. Held. Gr., p. 33, and Pal. N. Y., vol. 6, p. 130, Up. Held. Gr.
pertenusis, Hall, 1879, Desc. New Spec. Foss., p. 6, and 11th Rep. Geo. Ind. and Nat. Hist., p. 251, Niagara Gr.
pertenusis, Hall, 1881. The name was preoccupied, see *F. proutana*.
perundata, see *Polypora perundata*.
perundulata, see *Reteporina perundulata*.
philia, Hall, 1883, Rep. St. Geol., pl. 20, fig. 9-11, Low. Held. Gr.
planiramosa, Hall, 1883, Rep. St. Geol., pl. 18, fig. 14-18, syn. for *Polypora compressa*.
planiramosa, Hall, 1884, 36th Rep. N. Y. St. Mus. Nat. Hist., p. 65, Ham. Gr.
plebeia, McCoy, 1862, syn. Carb. Foss. Ireland, p. 203, Up. Coal Meas.
plumosa, see *Hemitrypa plumosa*.
popeana, Prout, 1858, Trans. St. Louis Acad. Sci., vol. 1, p. 229, Permian Gr.
porosa, see *Polypora porosa*.
præcursor, see *Unitrypa præcursor*.
prisca, Lonsdale, 1839, Murch. Sil. Syst., p. 178, Clinton Gr.
proceritas, Hall, 1887, Pal. N. Y., vol. 6, p. 115, Up. Held. Gr.
prolixa, Hall, 1879, Desc. New Spec. Foss., p. 8, and 11th Rep. Ind. Geo. and Nat. Hist., p. 253, Niagara Gr.
propria, see *Polypora propria*.
proutana, S. A. Miller, 1882, 2d Ed. Am. Pal. Foss., p. 291, Up. Held. Gr. Proposed instead of *F. pertenusis*, Hall, 1881, Bryozoans of the Up. Held. Gr., p. 29, which was preoccupied.
pulchella, Ulrich, 1886, Cont. to Am. Pal., p. 9, Up. Held. Gr.
puncto-striata, Hall, 1876, 28th Rep. N. Y. St. Mus. Nat. Hist., p. 68, Niagara Gr.
quadrangula, Hall, 1884, 36th Rep. N. Y. St. Mus. Nat. Hist., p. 68, Ham. Gr.
quadrangularis, see *Polypora quadrangularis*.
quadrula, Hall, 1883, Rep. St. Geol., pl. 21, fig. 19-22, Low. Held. Gr.
regalis, Ulrich, 1888, Bull. Denison Univ., p. 70, and Geo. Sur. Ill., vol. 8, pl. 50, Keokuk and Waverly Grs.
remota, Foerste, 1887, Bull. Denison Univ., vol. 2, p. 84 and 87, Low. Coal Meas.
rhombifera, see *Reteporina rhombifera*.
rigida, see *Polypora rigida*.
robusta, see *Polypora robusta*.
rudis, Ulrich, (in press.) Geo. Sur. Ill., vol. 8, pl. 49, Keokuk Gr.
scalaris, see *Unitrypa scalaris*.
sculptilis, Ulrich, 1886, Cont. to Am. Pal., p. 10, Up. Held. Gr.
semirotonda, Hall, 1881, Bryozoans of the Up. Held. Gr., p. 32, and Pal. N. Y., vol. 6, p. 125, Up. Held. Gr.
separata, see *Polypora separata*.
serrata, Hall, 1881, Bryozoans of the Up. Held. Gr., p. 23, and Pal. N. Y., vol. 6, p. 110, Up. Held. Gr.
serratula, Ulrich, (in press.) Geo. Sur. Ill., vol. 8, pl. 50, Warsaw, St. Louis, and Kaskaskia Gr.
sevillensis, Ulrich, (in press.) Geo. Sur. Ill., vol. 8, pl. 52, Low. Coal Meas.
shumardi, Prout, 1858, Trans. St. Louis Acad. Sci., vol. 1, p. 232, Up. Coal Meas.
singularitas, Hall, 1881, Bryozoans of the Up. Held. Gr., p. 29, and Pal. N. Y., vol. 6, p. 114, Up. Held. Gr.
sinuosa, Hall, 1887, Pal. N. Y., vol. 6, p. 116, Up. Held. Gr.
spio, Hall, 1887, Pal. N. Y., vol. 6, p. 47, Low. Held. Gr.
stellata, Hall, 1881, Bryozoans of the Up. Held. Gr., p. 29, and Pal. N. Y., vol. 6, p. 109, Up. Held. Gr.
stipata, see *Unitrypa stipata*.
striata, see *Reteporina striata*.
striatopora, see *Polypora striatopora*.
subflexuosa, Ulrich, 1888, Bull. Denison Univ., p. 68, Waverly Gr.
submutans, see *Polypora submutans*.
subretiformis, Prout, 1858, Trans. St. Louis Acad. Sci., vol. 1, p. 233, Coal Meas.
substriata, Hall, 1881, Bryozoans of the Up. Held. Gr., p. 35, Up. Held. Gr.
subortilis, Hall, 1884, 36th Rep. N. Y. St. Mus. Nat. Hist., p. 71, Ham. Gr.
sylvia, Hall, 1874, 26th Rep. N. Y. St. Mus. Nat. Hist., p. 96, Low. Held. Gr.
tantulus, Hall, 1879, Desc. New Spec. Foss., p. 8, and 11th Rep. Ind. Geo. and Nat. Hist., p. 253, Niagara Gr.
tegulata, see *Unitrypa tegulata*.
tenax, Ulrich, (in press.) Geo. Sur. Ill., vol. 8, pl. 51, Keokuk, St. Louis and Kaskaskia Grs.

tenella, Hall, 1887, Pal. N. Y., vol. 6, p. 105, Up. Held. Gr.

tenuiceps, Hall, 1852, Pal. N. Y., vol. 2, p. 165, Niagara Gr.

tenuis, Hall, 1852, Pal. N. Y., vol. 2, p. 51, Clinton Gr.

thyene, Hall, 1883, Rep. St. Geol., pl. 21, fig. 1-5, Low. Held. Gr.

torta, Hall, 1881, Bryozoans of the Up. Held. Gr., p. 30, Up. Held. Gr.

trituberculata, Prout, 1858, Trans. St. Louis Acad. Sci., vol. 1, p. 228, Coal Meas.

tuberculata, Hall, 1887, Pal. N. Y., vol. 6, p. 116, Up. Held. Gr.

variabilis, Prout, 1858, Trans. St. Louis Acad. Sci., vol. 1, p. 231, Coal Meas.

variopora, Hall, 1881, Bryozoans of the Up. Held. Gr., p. 28, Up. Held. Gr.

vera, Ulrich, (in press,) Geo. Sur. Ill., vol. 8, pl. 44, Ham. Gr.

verrucosa, Hall, 1883, Rep. St. Geol., pl. 33, fig. 11, and Pal. N. Y., vol. 6, p. 110, Up. Held. Gr.

virgosa, Eichwald, 1860, Lethaea Rossica, p. 358, Up. Coal Meas. Probably not American.

wortheni, Ulrich, (in press,) Geo. Sur. Ill., vol. 8, pl. 52, Low. Coal Meas.

FENESTRALIA, Prout, 1858, Trans. St. Louis Acad. Sci., vol. 1, p. 235. [Ety. from genus *Fenestella*.] Zoarium like *Fenestella*, from which it is distinguished by having two rows of cells on each side of the median ridge. Type *F. stuldovici*.

stuldovici, Prout, 1858, Trans. St. Louis Acad. Sci., vol. 1, p. 235, St. Louis Gr.

stuldovici var. *compacta*, Ulrich, (in press,) Geo. Sur. Ill., vol. 8, pl. 59, St. Louis Gr.

FENESTRATORIA, Hall, 1885, Rep. St. Geol., p. 36. [Ety. *fenestra*, opening; *poros*, pore.] Forms of *Fenestellidae* having the branches connected by dissepiments,

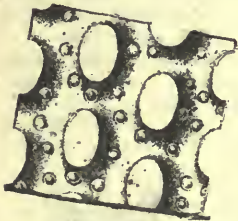


FIG. 475.—*Fenestrapora biperforata*. Magnified nonporiferous side.

infraporosa, Ulrich, 1886, Cont. to Amer. Pal., p. 14, Up. Held. Gr.

occidentalis, Ulrich, (in press,) Geo. Sur. Ill., vol. 8, pl. 44 and 54, Ham. Gr.

FISTULIPORA, McCoy, 1849, Ann. and Mag. Nat. Hist., 2d ser., vol. 3, p. 130. [Ety. *fistula*, pipe; *poros*, pore.] Incrusting or massive; corallites long, cylindrical, thick-walled, not in contact; tabulae

numerous; cells circular, smooth-edged; intervals between corallites filled with vesicular plates, tabulated. Type *F. minor*.

acervulosa, Rominger, 1866, Proc. Acad. Nat. Sci., p. 7, Ham. Gr.

astricta, Ulrich, (in press,) Geo. Sur. Ill., vol. 8, pl. 47 and 48, Ham. Gr.

canadensis, see *Favosites canadensis*.

carbonaria, Ulrich, 1884, Jour. Cin. Soc. Nat. Hist., vol. 7, p. 45, Up. Coal Meas.

clausa, see *Meekopora clausa*.

collina, Ulrich, (in press,) Geo. Sur. Ill., vol. 8, pl. 47 and 48, Ham. Gr.

communis, Ulrich, (in press,) Geo. Sur. Ill., vol. 8, pl. 47 and 48, Ham. Gr.

compressa, Rominger, 1866, Proc. Acad. Nat. Sci., p. 10, Keokuk Gr.

confertipora, Hall, 1881, (*Thallostigma confertipora*), Trans. Alb. Inst., vol. 10, p. 184, and Pal. N. Y., vol. 6, p. 211, Ham. Gr.

constricta, Hall, 1881, (*Lichenalia constricta*), Trans. Alb. Inst., vol. 10, p. 183, and Pal. N. Y., vol. 6, p. 227, Ham. Gr.

corrugata, Ulrich, (in press,) Geo. Sur. Ill., vol. 8, pl. 47 and 48, Ham. Gr.

crassa, Rominger, 1866, Proc. Acad. Nat. Sci., p. 8, Ham. Gr.

decepiens, Hall, 1881, (*Thallostigma decepiens*), Trans. Alb. Inst., vol. 10, p. 187, and Pal. N. Y., vol. 6, p. 232, Ham. Gr.

densa, Hall, 1881, (*Thallostigma densa*), Trans. Alb. Inst., vol. 10, p. 186, and Pal. N. Y., vol. 6, p. 231, Ham. Gr.

digitata, Hall, 1881, (*Thallostigma digitata*), Trans. Alb. Inst., vol. 10, p. 185, and Pal. N. Y., vol. 6, p. 229, Ham. Gr.

elegans, see *Pinacotrypa elegans*.

erianis, Rominger 1866, Proc. Acad. Nat. Sci., p. 8, Ham. Gr.

excellens, Ulrich, 1884, Jour. Cin. Soc. Nat. Hist., vol. 7, p. 46, Kaskaskia Gr.

flabellata, see *Chiloporella flabellata*.

flabellum, see *Dichotrypa flabellum*.

foordi, Ulrich, (in press,) Geo. Sur. Ill., vol. 8, pl. 47 and 48, Ham. Gr.

halli, Rominger, 1866, Proc. Acad. Nat. Sci., p. 6, Niagara Gr.

helios, Rominger, 1866, Proc. Acad. Nat. Sci., p. 7, Corniferous Gr.

hemispherica, Hall, 1881, (*Callopora hemispherica*), Trans. Alb. Inst., vol. 10, p. 183, and Pal. N. Y., vol. 6, p. 226, Ham. Gr.

hemi-pherica, Hall, 1881, (*Callopora hemispherica*), Trans. Alb. Inst., vol. 10, p. 183, and Pal. N. Y., vol. 6, p. 226, Ham. Gr.

hemi-pherica, Hall, 1881, (*Callopora hemispherica*), Trans. Alb. Inst., vol. 10, p. 183, and Pal. N. Y., vol. 6, p. 226, Ham. Gr.

hemi-pherica, Hall, 1881, (*Callopora hemispherica*), Trans. Alb. Inst., vol. 10, p. 183, and Pal. N. Y., vol. 6, p. 226, Ham. Gr.

hemi-pherica, Hall, 1881, (*Callopora hemispherica*), Trans. Alb. Inst., vol. 10, p. 183, and Pal. N. Y., vol. 6, p. 226, Ham. Gr.

hemi-pherica, Hall, 1881, (*Callopora hemispherica*), Trans. Alb. Inst., vol. 10, p. 183, and Pal. N. Y., vol. 6, p. 226, Ham. Gr.

hemi-pherica, Hall, 1881, (*Callopora hemispherica*), Trans. Alb. Inst., vol. 10, p. 183, and Pal. N. Y., vol. 6, p. 226, Ham. Gr.



FIG. 476.—*Flistulipora astricta*. Tangential section, showing lunarium.

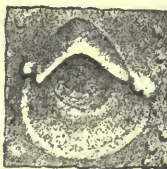


FIG. 477.—*Flistulipora foordi*. Opercular cover $\times 50$.

incrassata, Nicholson, 1874, (*Callopora incrassata*,) *Geo. Mag. Lond. n. s.*, vol. 1, p. 13, and *Rep. Pal. Ont.*, p. 61, *Ham. Gr. intercellata*, Hall, 1881, (*Thallostigma intercellata*,) *Trans. Alb. Inst.*, vol. 10, p. 13, and *Pal. N. Y.*, vol. 6, p. 87, *Up. Held. Gr.*
involvens, Hall, 1887, *Pal. N. Y.*, vol. 6, p. 221, *Ham. Gr.*
labiosa, Winchell, 1866, *Rep. Low. Penin. Mich.*, p. 88, *Ham. Gr.*
lamellata, Hall, 1881, (*Thallostigma lamellata*,) *Trans. Alb. Inst.*, vol. 10, p. 13, and *Pal. N. Y.*, vol. 6, p. 87, *Up. Held. Gr.*
lens, Whitfield, 1878, *Ann. Rep. Geo. Sur. Wis.*, p. 69, and *Geo. Wis.*, vol. 4, p. 256, *Hud. Riv. Gr.*
longimacula, Hall, 1881, (*Thallostigma longimacula*,) *Trans. Alb. Inst.*, vol. 10, p. 185, and *Pal. N. Y.*, vol. 6, p. 209, *Ham. Gr.*
lunata, see *Buscopora lunata*.
multipora, Hall, 1884, (*Thallostigma micropora*,) *Rep. St. Geol.*, p. 26, *Ham. Gr.*
minuta, Rominger, 1866, *Proc. Acad. Nat. Sci.*, p. 7, *Ham. Gr.*
monticulata, Ulrich, *Geo. Sur. Ill.*, vol. 8, pl. 47 and 48, *Ham. Gr.*
multiculeata, Hall, 1884, (*Thallostigma multiculeata*,) *Rep. St. Geol.*, p. 23, *Ham. Gr.*
neglecta, Rominger, 1866, *Proc. Acad. Nat. Sci.*, p. 6, *syn. for Lichenalia concentrica*.

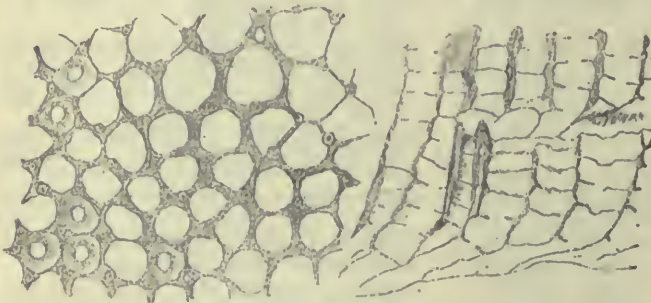


FIG. 478.—Flustra (?) tuberculata. Sections x 50.

nodulifera, Meek, 1872, *Pal. E. Neb.*, p. 143, *Up. Coal Meas.*
normalis, Ulrich, 1886, *Cont. to Am. Pal.*, p. 20, *Up. Held. Gr.*
occidens, Hall & Whitfield, 1873, 23d *Rep. N. Y. St. Mus. Nat. Hist.*, p. 229, *Chemung Gr.*
oweni, James, 1885, *Jour. Cin. Soc. Nat. Hist.*, vol. 7, p. 21, *Hud. Riv. Gr.* Poorly defined.
parasitica, Hall, 1879, (*Callopora parasitica*,) 32d *Rep. N. Y. St. Mus. Nat. Hist.*, p. 157, *Low. Held. Gr.*
peculiaris, see *Actinotrypa peculiaris*.
prolifera, Ulrich, 1884, *Jour. Cin. Soc. Nat. Hist.*, vol. 7, p. 45, *St. Louis Gr.*
proporoidea, Nicholson, 1879, *Pal. Tab. Corals*, p. 310, *Ham. Gr.*

ponderosa, Hall, 1874, (*Callopora ponderosa*,) 26th *Rep. N. Y. St. Mus. Nat. Hist.*, p. 103, *Low. Held. Gr.*
rugosa, see *Batostoma rugosa*.
saffordi, Winchell, 1866, *Rep. Low. Penin. Mich.*, p. 88, *Ham. Gr.*
scrobiculata, Hall, 1884, (*Thallostigma scrobiculata*,) *Rep. St. Geol.*, p. 20, *Ham. Gr.*
segregata, Hall, 1884, (*Thallostigma segregata*,) *Rep. St. Geol.*, p. 27, *Ham. Gr.*
serrulata, Hall, 1884, (*Thallostigma serrulata*,) *Rep. St. Geol.*, p. 22, *Ham. Gr.*
solidissima, Whitfield, 1878, *Ann. Rep. Geo. Sur. Wis.*, p. 69, and *Geo. Wis.*, vol. 4, p. 255, *Hud. Riv. Gr.*
spergenensis, Rominger, 1866, *Proc. Acad. Nat. Sci.*, p. 9, *Warsaw Gr.*
spheroidea, Hall, 1884, (*Thallostigma spheroidea*,) *Rep. St. Geol.*, p. 31, *Ham. Gr.*
spinulifera, Rominger, 1866, *Proc. Acad. Nat. Sci.*, p. 8, *Ham. Gr.*
stellifera, Rominger, 1866, *Proc. Acad. Nat. Sci.*, p. 7, *Ham. Gr.*
subtilis, Hall, 1884, (*Thallostigma subtilis*,) *Rep. St. Geol.*, p. 30, *Ham. Gr.*
sulcata, Rominger, 1866, *Proc. Acad. Nat. Sci.*, p. 7, *Ham. Gr.*
triangularis, Hall, 1884, (*Thallostigma triangularis*,) *Rep. St. Geol.*, p. 32, *Ham. Gr.*
trifaria, Hall, 1887, *Pal. N. Y.*, vol. 6, p. 222, *Ham. Gr.*

trifolia, Rominger, 1866, *Proc. Acad. Nat. Sci.*, p. 9, *Keokuk Gr.*
triloba, Hall, 1887, *Pal. N. Y.*, vol. 6, p. 29, *Low. Held. Gr.*
umbilicata, Hall, 1884, (*Thallostigma umbilicata*,) *Rep. St. Geol.*, p. 23, *Ham. Gr.*
unilinea, Hall, 1887, *Pal. N. Y.*, vol. 6, p. 217, *Ham. Gr.*
utriculus, Rominger, 1866, *Proc. Acad.*

Nat. Sci., p. 8, *Ham. Gr.*
variopora, Hall, 1884, (*Thallostigma variopora*,) *Rep. St. Geol.*, p. 18, *Ham. Gr.*

Flustra, Linnaeus, 1745, *Aménitates académicae. Not Palaeozoic.*
carbaseoides, Eaton, 1832, *Geo. Text Book*, p. 44. Not recognized.

spatulata, see *Worthenopora spatulata*.
tuberculata, Prout, 1859, *Trans. St. Louis Acad. Sci.*, vol. 1, p. 447, *Warsaw Gr.* Not a flustra.

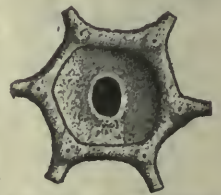


FIG. 479.—Flustra (?) tuberculata. Aperture x 50.

GLAUCONOME, Goldfuss, 1826, Germ. Petref., vol. 1, p. 100, as emended by Lonsdale in Murch. Sil. Syst., p. 677. [Ety. mythological name.] Narrow central stem, with lateral branches; two rows of cells separated by a keel on the face of each branch, and opposite side striated. Type *G. disticha*.



FIG. 480.—*Glaucanome nereidis*.

bellula, Ulrich, (Pinnatopora *bellula*), Geo. Sur. Ill., vol. 8, pl. 66, Low. Coal Meas.

carinata, Hall, 1884, Rep. St. Geol., p. 60, Ham. Gr.

curvata, Ulrich, 1888, (Pinnatopora *curvata*), Bull. Denison Univ., p. 76, Cuyahoga Shales.

flexuosa, Ulrich, (in press), Geo. Sur. Ill., vol. 8, pl. 66, Keokuk Gr.

intermedia, Ulrich, 1888, (Pinnatopora *intermedia*), Bull. Denison Univ., p. 74, Cuyahoga Shales.

minor, Ulrich, 1888, (Pinnatopora *minor*), Bull. Denison Univ., p. 77, Cuyahoga Shales.

nereidis, White, 1874, Rep. Invert. Foss., p. 18, and Geo. Sur. W. 100th Mer., vol. 4, p. 105, Carboniferous.

nodata, Hall, 1881, Bryozoans of the Up. Held. Gr., p. 18, and Pal. N. Y., vol. 6, p. 102, Up. Held Gr.

simulatrix, Ulrich, 1888, (Pinnatopora *simulatrix*), Bull. Denison Univ., p. 75, Cuyahoga Shales.

sinuosa, Hall, 1881, Bryozoans of the Up. Held. Gr., p. 18, and Pal. N. Y., vol. 6, p. 101, Up. Held. Gr.

subangulata, Ulrich, 1888, (Pinnatopora *subangulata*), Bull. Denison Univ., p. 76, Cuyahoga Shales.

tenuiramosa, Ulrich, 1888, (Pinnatopora *tenuiramosa*), Bull. Denison Univ., p. 79, Cuyahoga Shales.

tenuistriata, Hall, 1881, Bryozoans of the Up. Held. Gr., p. 19, and Pal. N. Y., vol. 6, p. 102, Up. Held. Gr.

trilineata, Meek, 1872, Pal. E. Neb., p. 157, Coal Meas.

vinii, Ulrich, 1888, (Pinnatopora *vinii*), Bull. Univ., p. 77, Cuyahoga Shales.

whitii, Foerste, 1887, (Pinnatopora *whitii*), Bull. Univ., p. 78, Low. Coal Meas.

youngi, Ulrich, 1888, (Pinnatopora *youngi*), Bull. Univ., p. 78, Cuyahoga Shales.

GLOSSOTRYPA, Hall, 1887, Pal. N. Y., vol. 6, p. xvii. [Ety. *glosse*, the tongue; *trupa*, opening.] Zoarium tubular; cells arising from the epitheca lining the cylin-

dric frond, intersected by narrow projections from the cell walls, extending partially across the cell tube; apertures paliform; intercellular structure vesiculose. Type *G. paliformis*.

paliformis, Hall, 1881, (Lichenalia *paliformis*), Trans. Alb. Inst., vol. 10, p. 11, and Pal. N. Y., vol. 6, p. 85, Up. Held. Gr.

Glyptotrypa, Ulrich, syn. (?) for *Coscinium*.

GONIOTRYPA,

Ulrich, (in press), Micropalæontology, p. 14. [Ety. *gonia*, angle; *trupa*, opening.] Bifoliate, jointed, segments



FIG. 481.—*Goniotrypa bilateralis*. 1, Transverse section; 2, transverse section lower down; 3, tangential section of the upper part.

small, cells in longitudinal rows; apertures oval, directed obliquely outward. Type *G. bilateralis*. Syn. (?) for *Dicranopora*.

bilateralis, Ulrich, (in press), Micropalæontology, p. 15, Hud. Riv. Gr. (?)

Gorgonia, Linnæus, 1745, Amænitates Acad. [Ety. mythological name.] Not American Palæozoic.

anticorum, Castelnau, 1843, Syst. Sil., p. 50. Not recognized.

(?) *aspera*, see *Subretepora aspera*.

dubia, Goldfuss, 1826, Petref. Germ. Permian. Not recognized.

ehrenbergi, see *Phyllopora ehrenbergi*.

infundibuliformis, Eaton, 1832, Geo. Text Book, p. 43. Not recognized.

perantiqua, see *Enallopora perantiqua*.

retiformis, see *Dictyonema retiforme*.

siluriana, Castelnau, 1843, Syst. Sil., p. 50. Not recognized.

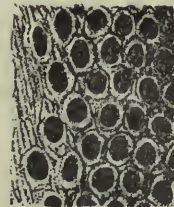


FIG. 482.—*Graptodictya nitida*. Natural size and magnified.

GRAPTODICTYA, Ulrich, 1882, Jour. Cin. Soc. Nat. Hist., vol. 5, p. 165. [Ety. *grapho*, I write; *dictyon*, net.] Zoarium pointed below, branching above, cell apertures circular, and separated by interstitial pits or sulci; distinguished from *Ptilodictya* by the circular cells and surrounding pits. Type *G. perelegans*.

nitida, Ulrich, 1882, Jour. Cin. Soc. Nat. Hist., vol. 5, p. 166, Hud. Riv. Gr.
 perelegans, Ulrich, 1878, (Ptilodictya perelagans,) Jour. Cin. Soc. Nat. Hist., vol. 1, p. 94, Hud. Riv. Gr.

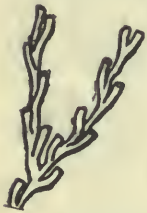


FIG. 483.—*Hederella canadensis*. Magnified.

HEDERELLA, Hall, 1884, Rep. St. Geol., p. 53. [Ety. *hedera*, ivy.] Bryozoum parasitic, procumbent, attached the entire length; main axis tubular, from which proceed lateral tubular cells, giving it the general appearance of Stomatopora. Type *H. canadensis*.

canadensis, Nicholson, 1873, (Alecto (?) *canadensis*.) Can. Nat. and Geol., vol. 7, p. 144, and Pal. Prov. Ont., p. 124, Up. Held. and Ham. Gr.

cirrhosa, Hall, 1884, Rep. St. Geol., p. 53, Ham. Gr.
conferta, Hall, 1884, (Ptilionella *conferta*.) Rep. St. Geol., p. 56, Ham. Gr.
filiformis, Billings, 1858, (Aulopora *filiformis*.) Can. Jour., vol. 4, p. 119, Ham. Gr.
magna, Hall, 1884, Rep. St. Geol., p. 55, Ham. Gr.

HELICOPORA, Claypole, 1883, Quar. Jour. Geo. Soc., p. 30. [Ety. *helix*, spiral; *poros*, pore.] Bryozoum expanded, fenestrate, and spiral; formed of slender, bifurcating rays, poriferous on one face, connected by nonporiferous bars, forming an open net-work; cells arranged in two rows along the rays, one row on each side of a median keel; axis none, or consisting only of the thickened inner border of the bryozoum, not straight, but forming a spiral, rounded, nonporiferous, or slightly poriferous, inner margin. Type *H. latispiralis*. Regarded by some as a synonym for *Fenestella*, and distinguished only by the spiral form.

archimedisformis, Claypole, syn. for *Archimedes laxus*.
latispiralis, Claypole, 1883, Quar. Jour. Geo. Sci., p. 32, Niagara Gr.
ulrichi, Claypole, 1883, Quar. Jour. Soc. Nat. Hist., p. 33, Up. Held. Gr.

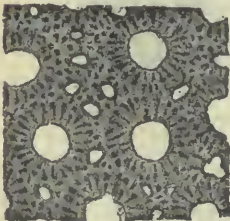


FIG. 484.—*Heliotrypa bifolia*. Tangential section x 50.

HELIOTRYPA, Ulrich, 1883, Jour. Cin. Soc. Nat. Hist., vol. 6, p. 277. [Ety. *helios*, sun; *trupa*, opening.] Bifoliate, interstitial cells developed from the prostrate por-

tion of the zoecia; intercommunication by means of radially arranged tubuli. Type *H. bifolia*.

bifolia, Ulrich, 1883, Jour. Cin. Soc. Nat. Hist., vol. 6, p. 278, Kaskaskia Gr.
 HELOPORA, Hall, 1852, Pal. N. Y., vol. 2, p. 44. [Ety. *helos*, nail; *poros*, pore.] Zoarium jointed; segments small, simple, cylindrical, often swollen at the extremities; cells oval or subangular, and arranged between longitudinal elevated lines or in quincunx. Type *H. fragilis*.
armata, Billings, 1866, Catal. Sil. Foss. Antic., p. 38, Anticosti Gr.
bellula, Billings, 1866, Catal. Sil. Foss. Antic., p. 38, Anticosti Gr.
circe, Billings, 1866, Catal. Sil. Foss. Antic., p. 39, Anticosti Gr.



FIG. 485.—a-l, *Helopora fragilis*; f-h, *Helopora Lindstromi*, sections x 50.

concava, Billings, 1866, Catal. Sil. Foss. Antic., p. 37, Anticosti Gr.
divaricata, Ulrich, 1886, 14th Rep. Geo. Sur. Minn., p. 59, Trenton Gr.
formosa, Billings, 1865, Catal. Sil. Foss. Antic., p. 37, Anticosti Gr.
fragilis, Hall, 1852, Pal. N. Y., vol. 2, p. 44, Clinton Gr.
fragilis var. *acadiensis*, Hall, 1860, Can. Nat. and Geo., vol. 5, Anticosti Gr.
irregularis, Billings, 1866, Catal. Sil. Foss. Antic., p. 39, Anticosti Gr.
imbricata, Ulrich, (in press,) Geo. Sur. Ill., vol. 8, pl. 29, Hud. Riv. Gr.



FIG. 486.—*Helopora fragilis*. Natural size and magnified.

lineata, Billings, 1866, Catal. Sil. Foss. Antic., p. 36, Anticosti Gr.
 lineopora, Billings, 1866, Catal. Sil. Foss. Antic., p. 38, Anticosti Gr.
 nodosa, Billings, 1866, Catal. Sil. Foss. Antic., p. 38, Anticosti Gr.
 spiniformis, Ulrich, 1882, (Arthroclema spiniforme,) Jour. Cin. Soc. Nat. Hist., vol. 5, p. 161, Trenton Gr.
 striatopora, Billings, 1866, Catal. Sil. Foss. Antic., p. 39, Anticosti Gr.
 strigosa, Billings, 1866, Catal. Sil. Foss. Antic., p. 37, Anticosti Gr.
 tenuis, see Arthrostylus tenuis.
 varipora, Billings, 1866, Catal. Sil. Foss. Antic., p. 40, Anticosti Gr.

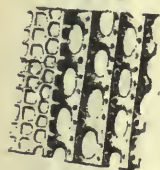


FIG. 487.—Hemitrypa biordo.

HEMITRYPA, Phillips, 1841, Pal. Foss. Cornwall, Devon, and W. Somerset, p. 27. [Ety. *emisos*, half; *trupa*, perforation.] Fenestelloid; branches connected by dissepiments; cell apertures in two ranges, separated by carinae, which

are elevated, widened at the summit, and connected by scale, which meet midway and coalesce, forming pseudocarinae. Type *H. oculata*.

aspera, Ulrich, (in press), Geo. Sur. Ill., vol. 8, pl. 57, Keokuk Gr.
 biordo, Hall, 1887, Pal. N. Y., vol. 6, p. 149, Up. Held. Gr.
 biserialis, Hall, 1879, 32d Rep. N. Y. St. Mus. Nat. Hist., p. 174, Low. Held. Gr.
 biserialis var. exilis, Hall, 1887, Pal. N. Y., vol. 6, p. 57, Low. Held. Gr.
 columellata, Hall, 1887, Pal. N. Y., vol. 6, p. 146, Up. Held. Gr.
 cribrosa, Hall, 1881, (Fenestella cribrosa,) Trans. Alb. Inst., vol. 10, p. 35, Up. Held. Gr.
 dubia, syn. for *Loculipora ambigua*.
 favosa, Hall, 1881, Trans. Alb. Inst., vol. 10, p. 35, and Pal. N. Y., vol. 6, p. 148, Up. Held. Gr.
 nodosa, Ulrich, (in press,) Geo. Sur. Ill., vol. 8, pl. 57, Keokuk Gr.
 prima, Hall, syn. for *Unitrypa nervia*.
 pateriformis, Ulrich, (in press,) Geo. Sur. Ill., vol. 8, pl. 57, Keokuk Gr.
 perstriata, Ulrich, (in press,) Geo. Sur. Ill., vol. 8, pl. 57, Keokuk Gr.
 plumosa, Prout, 1858, (Fenestella plumosa,) Trans. St. Louis Acad. Sci., vol. 1, p. 236, Keokuk and Warsaw Gr.
 proutana, Ulrich, (in press,) Geo. Sur. Ill., vol. 8, pl. 57, proposed instead of *Fenestella hemitrypa* of Prout, Keokuk and Warsaw Grs.
 proutana var. nodulosa, Ulrich, (in press,) Geo. Sur. Ill., vol. 8, pl. 57, Keokuk Gr.
 proutana var. vermifera, Ulrich, (in press,) Geo. Sur. Ill., vol. 8, pl. 57, Warsaw Gr.
 tenera, Ulrich, (in press,) Geo. Sur. Ill., vol. 8, pl. 44, Hamilton Gr.

ulrichi, Foerste, 1887, Bull. Denison Univ., vol. 2, p. 152, Clinton Gr.

HERNODIA, Hall, 1884, Rep. St. Geol., p. 58.

[Ety. *hernodes*, like a young sprout.] Bryozoum parasitic, procumbent, increasing by gemmation like *Aulopora*; budding lateral, and for some distance in contact and frequently coalescing with the parent cells. Type *H. humifusa*.

humifusa, Hall, 1884, Rep. St. Geol., p. 58, Ham. Gr.

HETERODICTYA, Nicholson, 1875, Geo. Mag., vol. 2, n. s., p. 33, and Pal. Prov. Ont., p. 79. [Ety. *heteros*, irregular; *dictyon*, net.] The correct orthography is *Heterodictyon*.

Flattened, two-edged frond, with subparallel sides, consisting of two series of cells upon opposite sides of a central membrane; cells are in longitudinal rows; tabulae present. Type *H. gigantea*.

gigantea, Nicholson, 1875, Geo. Mag., vol. 2, p. 34, and Pal. Prov. Ont., p. 79, Subcarboniferous.



FIG. 488.—Heterodictya gigantea. Magnified.

Hippochoa, Lamouroux, 1821,

Expos. method. Not Palaeozoic.

inflata, see *Stomatopora inflata*.

HOMOTRYPA, Ulrich, 1882, Jour. Cin. Soc. Nat. Hist., vol. 5, p. 240. [Ety. *homos*, similar; *trupa*, perforation.]

Ramosc or subfrondescent; surface smooth or bearing monticules; cells, circular, ovate or polygonal, thin-walled; groups of larger-sized cells; mesopores absent or restricted to the maculae; spiniform tubuli, diaphragms and cystiphragms present. Type *H. curvata*.

arbuscula, Ulrich, (in press), Geo. Sur. Ill., vol. 8, pl. 38, Birdseye Gr.

curvata, Ulrich, 1882, Jour. Cin. Soc. Nat. Hist., vol. 5, p. 241, Hud. Riv. Gr.

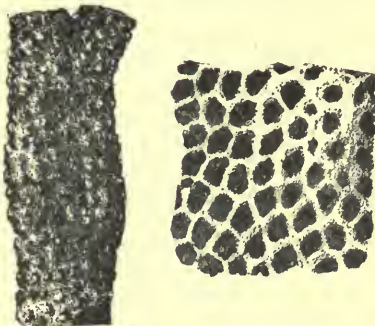


FIG. 489.—Homotrypa obliqua. Natural size and magnified.

exilis, Ulrich, 1886, 14th Rep. Geo. Sur. Minn., p. 80, Trenton Gr.

flabellaris, Ulrich, (in press), Geo. Sur. Ill., vol. 8, pl. 32, Hud. Riv. Gr.

gelasinosa, Ulrich, (in press), Geo. Sur. Ill., vol. 8, pl. 32, Hud. Riv. Gr.
 insignis, Ulrich, 1886, 14th Rep. Geo. Sur. Minn., p. 82, Trenton Gr.
 minnesotensis, Ulrich, 1886, 14th Rep. Geo. Sur. Minn., p. 79, Trenton Gr.
 obliqua, Ulrich, 1882, Jour. Cin. Soc. Nat. Hist., vol. 5, p. 243, Hud. Riv. Gr.
 subramosa, Ulrich, 1886, 14th Rep. Geo. Sur. Minn., p. 81, Trenton Gr.

HOMOTRYPELLA, Ulrich, 1886, 14th Rep. Geo. Sur. Minn., p. 83. [Ety. *homotrypa*, a genus; *ellus*, diminutive.] Zoarium ramose; monticules wanting; interstitial cells present; zoecia small, moderately thick walls, and cystoid diaphragms straight; spiniform tubuli numerous. Type H. instabilis.

contexta, Ulrich, (in press), Geo. Sur. Ill., vol. 8, pl. 32, Hud. Riv. Gr.

granulifera, Ulrich, 1879, (Chetetes granuliferus,) Jour. Cin. Soc. Nat. Hist., vol. 2, p. 128, Trenton Gr.

instabilis, Ulrich, 1886, 14th Rep. Geo. Sur. Minn., p. 83, Trenton Gr.

Hornera, Lamouroux, 1821, Expos. Method. des genres de L'Ordre des Pol. [Ety. proper name.] Not American Palæozoic.

dichotoma, see Subretepora dichotoma.

ICHTHYORACHIS, McCoy, 1844, Carb. Foss. Ireland, p. 205. [Ety. *ichthys*, fish; *rachis*, backbone.] Bryozoum plumose, consisting of a rachis, with short lateral branches or pinnules; celluliferous on one side; cell apertures in two ranges on the branches, and in three or more on the main stem. Type I. newenhami.

nereis, Hall, 1874, 26th Rep. N. Y. St. Mus. Nat. Hist., p. 98, Low. Held. Gr.

IDOTRYPA, Ulrich, 1883, Jour. Cin. Soc. Nat. Hist., vol. 6, p. 272. [Ety. *idios*, peculiar; *trupa*, opening.] Parasitic, interstitial cells angular, both cells with diaphragms; spiniform tubuli present. Type I. parasitica.

parasitica, Ulrich, 1883, Jour. Cin. Soc. Nat. Hist., vol. 6, p. 273, Niagara Gr.

INTRAPORA, Hall, 1881, Bryozoans of the Up. Held. Gr., p. 16. [Ety. *intra*, within; *poros*, pore.] Resembling Stictopora, branches broad; intercellular spaces regularly punctured or pitted, as if by minute cell apertures; cells with rounded mouths and short prostrate portion; intercellular space vesiculose. Type I. puteolata.

puteolata, Hall, 1881, Bryozoans of the Up. Held. Gr., p. 16, and Pal. N. Y., vol. 6, p. 97, Up. Held. Gr.

Intricaria, DeFrance, 1823, Dictionnaire des Sciences Naturelles. Not a Palæozoic genus.

clathrata, see Subretepora clathrata.

reticulata, see Subretepora reticulata.

ISOTRYPA, Hall, 1885, Rep. St. Geol., p. 37. [Ety. *isos*, equal; *trupa*, perforation.] Fenestelloid, having the branches con-

nected by dissepiments, and with two ranges of cell apertures, separated by carinae, elevated and much thickened above, connected by distinct lateral processes; the reverse face has on or near the dissepiments conspicuous pores larger than the cell apertures. Type I. conjunctiva.

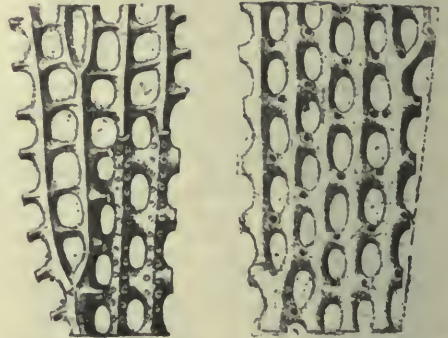


FIG. 490.—*Isotrypa conjunctiva*. Celluliferous side and noncelluliferous side, with pores on the dissepiments.

bifaria, syn. for I. conjunctiva.

conjunctiva, Hall, 1881, (Fenestella conjunctiva,) Trans. Alb. Inst., vol. 10, p. 143, and Pal. N. Y., vol. 6, p. 143, Up. Held. Gr.

consimilis, Hall, 1885, Rep. St. Geol., pl. 2, fig. 14, Up. Held. Gr.

LABECHIA, Edwards & Haime, 1851, Pol. Foss. des Terr. Pal., p. 297. [Ety. proper name.] Bryozoum laminar, incrusting, or attached by part of the base, and having the remainder covered by an epitheca; surface covered with rounded or elongated, solid, tubercles, separated by an imperforate calcareous membrane; internally it consists of vertical columns extending from the epitheca below, and terminating above in the surface tubercles, the interspaces between the columns consisting of lenticular vesicles, the uppermost layer of which gives rise to the seemingly imperforate membrane between the tubercles. Type L. conferta. Probably this genus belongs to the Protozoa, and is related to the sponges.

montifera, Ulrich, 1886, Cont. to Am. Pal., p. 33, Hud. Riv. Gr.

LEIOCLEMA, Ulrich, 1882, Jour. Cin. Soc. Nat. Hist., vol. 5, p. 141. [Ety. *leios*, smooth; *klema*, twig.] Ramose, lamellate, or parasitic; surface even; cell-mouths small, rounded, surrounded by interstitial cells; tubes thin-walled; diaphragms remote; acanthopores abundant. Type L. punctatum.

araneum, Ulrich, (in press,) Geo. Sur. Ill., vol. 8, pl. 75, Kaskaskia Gr.

foliatum, Ulrich, (in press,) Geo. Sur. Ill., vol. 8, p. 301, Warsaw Gr.

gracillimum, Ulrich, (in press,) Geo. Sur. Ill., vol. 8, pl. 75, Keokuk Gr.
 minutissimum, Nicholson, 1875, (Callopora minutissima.) Pal. Prov. of Ontario, p. 77, Hamilton Gr.

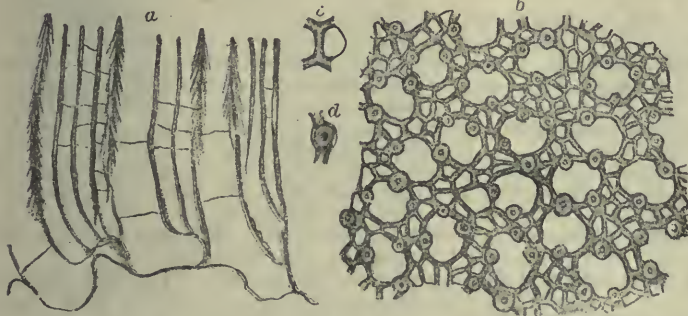


FIG. 491.—*Leloclema foliatum*. *a*, Vertical section x 28, showing entire thickness of zoarium, tabulation of zoecia and mesopores, and structure of the acanthopores; *b*, taugential section x 28, showing distribution of acanthopores, mesopores, and zoecia; *c*, small portion of wall x 50; *d*, acanthopore x 50, showing its structure.

punctatum, Hall, 1858, Callopora punctata, Geo. Sur. Iowa, p. 653, Keokuk and Warsaw Grs.
 subglobosum, Ulrich, (in press,) Geo. Sur. Ill., vol. 8, pl. 75, Kinderhook Gr.
 wachsmuthi, Ulrich, (in press,) Geo. Sur. Ill., vol. 8, pl. 75, Kinderhook Gr.
 wilmingtense, Ulrich, (in press,) Geo. Sur. Ill., vol. 8, pl. 34, Hud. Riv. Gr.

LEPTOTRYPA, Ulrich, 1883, Jour. Cin. Soc. Nat. Hist., vol. 6, p. 158. [Ety. *leptos*, thin; *trupa*, perforation.] Thin, incrusting; cells polygonal, thin-walled; surface, with monticules; spiniform tubuli; no diaphragms or rudimentary. Type *L. minima*.

clavacoidea, James, 1875, (Chetetes clavacoidea.) Int. Catal. Cin. Foss., p. 2, and Nicholson on Struct. and Affin. Montic, p. 182, Hud. Riv. Gr.
 clavis, Ulrich, 1883, Jour. Cin. Soc. Nat. Hist., vol. 6, p. 161, Utica Slate.
 cortex, Ulrich, 1883, Jour. Cin. Soc. Nat. Hist., vol. 6, p. 162, Utica Slate.
 hexagonalis, Ulrich, (in press,) Geo. Sur. Ill., vol. 8, pl. 36, Trenton Gr.
 minima, Ulrich, 1883, Jour. Cin. Soc. Nat. Hist., vol. 6, p. 159, Hud. Riv. Gr.
 ornata, Ulrich, 1883, Jour. Cin. Soc. Nat. Hist., vol. 6, p. 160, Hud. Riv. Gr.
 semipilaris, Ulrich, (in press,) Geo. Sur. Ill., vol. 8, pl. 36, Hud. Riv. Gr.
 stidhami, Ulrich, (in press,) Geo. Sur. Ill., vol. 8, pl. 36, Hud. Riv. Gr.

LICHENALIA, Hall, 1852, Pal. N. Y., vol. 2, p. 171. [Sig. from resemblance to a lichen.] Membranous expansions, growing in circular or flabellate forms, celluliferous on one side, the other covered with an epitheca; cells septate, arising from the epitheca; apertures circular or trilobate, often denticulate; interaper-

tural space smooth; intercellular space vesiculose. Type *L. concentrica*.
 alternata, Hall, 1881, Bryozoans of the Up. Held. Gr., p. 8, and Pal. N. Y., vol. 6, p. 80, Up. Held. Gr.

alveata, see *Odontotrypa alveata*.
bistriata, Hall, 1881, Bryozoans of the Up. Held. Gr., p. 8, and Pal. N. Y., vol. 6, p. 79, Up. Held. Gr.
bullata, Hall, 1887, Pal. N. Y., vol. 6, p. 205, Ham. Gr.
carinata, Hall, 1881, Bryozoans of the Up. Held. Gr., p. 9, Up. Held. Gr.
circincta, see *Selenopora circincta*.
clivulata, see *Pileotrypa clivulata*.
clypeiformis, Hall, 1884, Rep. St. Geol., p. 37, Ham. Gr.

colliculata, Hall, 1884, Rep. St. Geol., p. 36, Ham. Gr.
complexata, see *Selenopora complexata*.
concentrica, Hall, 1852, Pal. N. Y., vol. 2, p. 171, Niagara Gr.

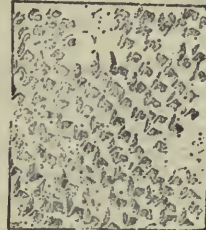


FIG. 492.—*Lichenalia concentrica*. Under surface and upper surface magnified.

concentrica var. *maculata*, Hall, 1879, 28th Rep. N. Y. St. Mus. Nat. Hist., p. 117, Niagara Gr.
concentrica var. *parvula*, Hall, 1876, 28th Rep. N. Y. St. Mus. Nat. Hist., p. 117, Niagara Gr.
confusa, Hall, 1887, Pal. N. Y., vol. 6, p. 204, Ham. Gr.
constricta, see *Fistulipora constricta*.
conulata, Hall, 1881, Bryozoans of the Up. Held. Gr., p. 9, and Pal. N. Y., vol. 6, p. 81, Up. Held. Gr.
cornuta, Hall, 1887, Pal. N. Y., vol. 6, p. 203, Ham. Gr.
crassa, Hall, 1879, (Trematopora crassa,) 32d Rep. N. Y. St. Mus. Nat. Hist., p. 152, Low Held. Gr.
crustacea, Hall, 1881, Bryozoans of the Up. Held. Gr., p. 8, Up. Held. Gr.
cultellata, Hall, 1884, Rep. St. Geol., p. 35, Ham. Gr.
denticulata, see *Pileotrypa denticulata*.

- dissimilis, Hall, 1883, Rep. St. Geol., pl. 15, fig. 10-13, Low. Held. Gr.
- distans, Hall, 1883, Rep. St. Geol., pl. 15, fig. 8-9, Low. Held. Gr.
- foliacea, Hall, 1884, Rep. St. Geol., p. 35, Ham. Gr.
- geometrica, Hall, 1887, Pal. N. Y., vol. 6, p. 79, Up. Held. Gr.
- granifera, see *Pileotrypa granifera*.
- imbricella, Hall, 1884, Rep. St. Geol., p. 35, Ham. Gr.
- longispina, see *Lichenotrypa longispina*.
- lunata, see *Buscopora lunata*.
- maculosa, Hall, 1884, (*Trematopora maculosa*), 26th Rep. N. Y. St. Mus. Nat. Hist., p. 106, Low. Held. Gr.
- operculata, Hall, 1887, Pal. N. Y., vol. 6, p. 205, Ham. Gr.
- ovata, Hall, 1887, Pal. N. Y., vol. 6, p. 80, Up. Held. Gr.
- paliformis, see *Glossotrypa paliformis*.
- permarginata, Hall, 1881, Bryozoans of the Up. Held. Gr., p. 10, and Rep. St. Geol., 1883, pl. 24, fig. 20, Up. Held. Gr.
- pustulosa, Hall, 1887, Pal. N. Y., vol. 6, p. 206, Ham. Gr.
- pyriformis, see *Pileotrypa pyriformis*.
- radiata, Hall, 1881, Bryozoans of the Up. Held. Gr., p. 10, Up. Held. Gr.
- ramosa, Hall, 1887, Pal. N. Y., vol. 6, p. 199, Ham. Gr.
- serialis, Hall, 1887, Pal. N. Y., vol. 6, p. 32, Low. Held. Gr.
- stellata, Hall, 1884, Rep. St. Geol., p. 33, Ham. Gr.
- subcava, Hall, 1881, Bryozoans of the Up. Held. Gr., p. 8, and Rep. St. Geol., 1883, pl. 24, fig. 23-25, Up. Held. Gr.
- substellata, Hall, 1881, Bryozoans of the Up. Held. Gr., p. 7, and Rep. St. Geol., 1883, pl. 24, fig. 26, Up. Held. Gr.
- subtrigona, Hall, 1887, Pal. N. Y., vol. 6, p. 196, Ham. Gr.
- tessellata, Hall, 1887, Pal. N. Y., vol. 6, p. 207, Ham. Gr.
- torta, Hall, 1883, Rep. St. Geol., pl. 15, fig. 1-7, Low. Held. Gr.
- tortuosa, Hall, 1883, Rep. St. Geol., pl. 13, fig. 17-18, Low. Held. Gr.
- vesiculata, Hall, 1887, Pal. N. Y., vol. 6, p. 197, Ham. Gr.
- LICHENOTRYPA**, Ulrich, 1886, Cont. to Am. Pal., p. 23. [Ety. *lichen*, a tree-moss; *trupa*, perforation.] Zoarium thin, incrusting, in early growth like *Fistulipora*, with short, tubular zoecia, wide, concave interspaces, subcircular apertures, posterior margin elevated; in later growth peristomes of adjacent cells unite by thin, irregular walls, which traverse the interstitial spaces, and form an irregular net-work, with spine-like elevations; interstitial cells present. Type *L. cavernosa*. Syn. (?) for *Lichenalia*.
- cavernosa*, Ulrich, 1886, Cont. to Am. Pal., p. 24, Up. Held. Gr.
- longispina*, Hall, 1881, (*Lichenalia longispina*), Trans. Alb. Inst., vol. 10, p. 11, and Pal. N. Y., vol. 6, p. 287, Up. Held. Gr.
- LOCULIPORA**, Hall, 1887, Pal. N. Y., vol. 6, p. xxiii. [Ety. *loculus*, cell; *poros*, pore.] Fenestelloid; branches connected by dissepiments; cell apertures in two ranges, surrounding the fenestrules; branches and dissepiments carinated; carinae elevated and much thickened above, having the appearance of the branches and dissepiments of the noncelluliferous face of the frond. Type *L. perforata*.
- ambigua*, Hall, 1876, (*Fenestella ambigua*), 28th Rep. N. Y. St. Mus. Nat. Hist., p. 123, Niagara Gr.
- circumstata*, Hall, 1887, Pal. N. Y., vol. 6, p. 144, Up. Held. Gr.
- perforata*, Hall, 1884, (*Fenestella perforata*), 36th Rep. N. Y. St. Mus. Nat. Hist., p. 65, Ham. Gr.
- LYROPORA**, Hall, 1857, Proc. Am. Ass. Ad. Sci., vol. 10, p. 179. [Ety. *lyra*, lute; *poros*, pore.] Zoarium consisting of a reticulated expansion, margined by two strong diverging supports which curve outward and upward; the rays of the expansion carry from two to five rows of cells; but there are none in the dissepiments; fenestrules small, ovate. Type *L. lyra*.
- cinctura*, Hall, 1885, Rep. St. Geol., pl. 1, Ham. Gr.
- divergens*, Ulrich, (in press.) Geo. Sur. Ill. vol. 8, pl. 58, Kaskaskia Gr.
- lyra*, Hall, 1857, Proc. Am. Ass. Ad. Sci., vol. 10, p. 179, Kaskaskia Gr.
- ovalis*, Ulrich, (in press.) Geo. Sur. Ill., vol. 8, pl. 58, Kaskaskia Gr.
- quincuncialis*, Hall, 1857, Proc. Am. Ass. Ad. Sci., vol. 10, p. 179, Kaskaskia Gr.
- ranosculum*, Ulrich, (in press.) Geo. Sur. Ill., vol. 8, pl. 58, Kaskaskia Gr.
- retrorsa*, Meek & Worthen, 1868, Geo. Sur. Ill., vol. 3, p. 504, Burlington Gr.
- subquadrans*, Hall, 1857, Proc. Am. Ass. Ad. Sci., vol. 10, p. 179, Kaskaskia Gr.
- MEEKOPORA**, Ulrich, (in press.) Geo. Sur. Ill., vol. 8, p. 383. [Ety. proper name.] Bifoliate, sometimes branching; the median laminae thin, flexuous; cells arranged with their oblique apertures directed toward the distal margin of the expansion; lunarium moderate or obsolete; zoecial tubes oblique, the anterior walls thinnest and flexuous; diaphragms numerous, often recurved; oecium a large oval cell, showing as a convex space with a small apical perforation. Type *M. eximia*.
- (?) *aperta*, Ulrich, (in press.) Geo. Sur. Ill., vol. 8, pl. 76, Keokuk Gr.

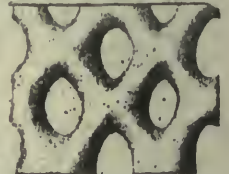


FIG. 403.—*Lyropora cinctura*. Noncelluliferous side.

approximata, Ulrich, (in press,) Geo. Sur. Ill., vol. 8, pl. 77, Kaskaskia Gr.

clausa, Ulrich, 1884, (Fistulipora? clausa,) Jour. Cin. Soc. Nat. Hist., vol. 7, p. 47, Kaskaskia Gr.

eximia, Ulrich, (in press,) Geo. Sur. Ill., vol. 8, pl. 77, Kaskaskia Gr.

Mitoclema, Ulrich, 1882, Jour. Cin. Soc. Nat. Hist., vol. 5, p. 150. Syn. for Enallopora.

cinctosa, see Enallopora cinctosa.

NEMATAXIS, Hall, 1887, Pal. N. Y., vol. 6, p. 74. [Ety. *nema*, thread; *axon*, axis.] Ramose, solid, bifurcating, cells arising from a filiform axis, apertures oval, in parallel rows, separated by ridges; surface marked with monticules, destitute of cell apertures, and extending across the branch, give it an annulated appearance. Type N. fibrosus.

fibrosus, Hall, 1887, Pal. N. Y., vol. 6, p. 74, Up. Held. Gr.

simplex, Hall, 1887, Pal. N. Y., vol. 6, p. 193, Ham. Gr.

NEMATOPORA, Ulrich, (in press,) Geo. Sur. Ill., vol. 8, p. 401. [Ety. *nema*, thread; *poros*, pore.] Slender, ramose, continuous above the pointed basal extremity; zoecia subtubular, short, arranged in a radial manner around one or two minute axial tubes; apertures ovate or subcircular, with peristome, generally arranged between longitudinal ridges; one or two diaphragms occasionally present. Type N. quadrata.

alternata, Ulrich, (in press,) Geo. Sur. Ill., vol. 8, pl. 29, Galena Gr.

delicatula, Ulrich, (in press,) Geo. Sur. Ill., vol. 8, pl. 29, Galena Gr.

quadrata, Ulrich, (in press,) Geo. Sur. Ill., vol. 8, pl. 29, Trenton Gr.

retrorsa, Ulrich, (in press,) Geo. Sur. Ill., vol. 8, pl. 29, Galena Gr.

NICHOLSONELLA, Ulrich, (in press,) Geo. Sur. Ill., vol. 8, p. 374. [Ety. proper name.] Irregularly intertwining, flattened branches, sometimes laminated; zoecia tubular, with diaphragms in the "mature" region; apertures circular, with a granose peristome; interspaces wide, occupied by numerous angular mesopores, that more or less isolate the zoecia; walls of both the zoecia and mesopores thin, and in the mature region traversed longitudinally by tubuli; the interzoecial spaces are filled with a calcareous deposit, into which the tubuli continue, but in which the mesopore walls become unrecognizable; mesopores with thick and numerous diaphragms. Type N. ponderosa.

cumulata, Ulrich, (in press,) Geo. Sur. Ill., vol. 8, pl. 33, Hud. Riv. Gr.

ponderosa, Ulrich, (in press,) Geo. Sur. Ill., vol. 8, pl. 34, Trenton Gr.

ODONTOTRYPA, Hall, 1887, Pal. N. Y., vol. 6, p. xvii. [Ety. *odous*, tooth; *trupa*, opening.] Distinguished from Lichenalia, by the oblique trilobate, closely arranged cell apertures, with strongly elevated, denticulated margins, forming a crescentic projection over the aperture. Type O. alveata.

alveata, Hall, 1881, (Lichenalia alveata,) Trans. Alb. Inst., vol. 10, p. 10, and Pal. N. Y., vol. 6, p. 85, Up. Held. Gr.

ORTHOPORA, Hall, 1887, Pal. N. Y., vol. 6, p. xiv. [Ety. *orthos*, straight; *poros*, pore.] Zoarium ramose, solid; cell apertures arranged in parallel, longitudinal rows; intercellular space solid, or occupied near the surface by minute tubuli; no septa. Type O. regularis.

bispinulata, Hall, 1884, (Callopora bispinulata,) Rep. St. Geol., p. 14, Ham. Gr.

ornata, Hall, 1887, Pal. N. Y., vol. 6, p. 184, Ham. Gr.

regularis, Hall, 1874, (Trematopora regularis,) 26th Rep. N. Y. St. Mus. Nat. Hist., p. 105, Up. Held. Gr.

reticulata, Hall, 1887, Pal. N. Y., vol. 6, p. 179, Ham. Gr.

rhombifera, Hall, 1874, (Trematopora rhombifera,) 26th Rep. N. Y. St. Mus. Nat. Hist., p. 106, Up. Held. Gr.

scutulata, Hall, 1881, (Trematopora scutulata,) Trans. Alb. Inst., vol. 10, p. 6, and Pal. N. Y., vol. 6, p. 70, Up. Held. Gr.

PACHYDICTYA, Ulrich, 1882, Jour. Cin. Soc. Nat. Hist., vol. 5, p. 152. [Ety. *pachys*, thick; *dictyon*, net.] Zoarium composed of large, thick, branching fronds; cells ovate, separated by interstitial tubes; diaphragms in both sets of tubes; median epithelial plates perforated by minute foramina. Type P. robusta.

conciatrix, Ulrich, 1886, 14th Rep. Geo. Sur. Minn., p. 76, Trenton Gr.

everetti, Ulrich, (in press,) Geo. Sur. Ill., vol. 8, pl. 33, Trenton Gr.

fimbriata, Ulrich, 1886, 14th Rep. Geo. Sur. Minn., p. 75, Trenton Gr.

firma, Ulrich, (in press,) Geo. Sur. Ill., vol. 8, pl. 31, Hud. Riv. Gr.

foliata, Ulrich, 1886, 14th Rep. Geo. Sur. Minn., p. 73, Trenton Gr.

gigantea, Ulrich, (in press,) Geo. Sur. Ill., vol. 8, pl. 31, Hud. Riv. Gr.

occidentalis, Ulrich, 1886, 14th Rep. Geo. Sur. Minn., p. 75, Trenton Gr.

robusta, Ulrich, 1882, Jour. Cin. Soc. Nat. Hist., vol. 5, p. 173, Trenton Gr.

splendens, Ulrich, (in press,) Geo. Sur. Ill., vol. 8, pl. 31 and 32, Hud. Riv. Gr.

PALESCHARA, Hall, 1874, 26th Rep. N. Y. St. Mus. Nat. Hist., p. 107. [Sig. ancient Eschara.] Incrusting expansions; cells polygonal, oblong, separated by thin solid walls; maculae present; no spiniform tubuli or diaphragms. Type P. incrustans.



FIG. 494.—Meekopora clausa. Aperture with cover x 50.

amplectans, Hall, 1884, Rep. St. Geol., p. 7, Ham. Gr.
aspera, Hall, 1876, syn. for *P. maculata*.
bifoliata, syn. for *Ptilodictya nebulosa*.
bilateralis, Hall, 1883, Rep. St. Geo., pl. 16, fig. 22-25, Low. Held. Gr.
concentrica, Hall, 1887, Pal. N. Y., vol. 6, p. 67, Low. Held. Gr.
foliata, syn. for *Ptilodictya nebulosa*.
incrassata, Hall, 1879, 28th Rep. N. Y. St. Mus. Nat. Hist., p. 121, Niagara Gr.
incrustans, Hall, 1874, 26th Rep. N. Y. St. Mus. Nat. Hist., p. 107, Low. Held. Gr.
intercella, Hall, 1884, Rep. St. Geol., p. 5, Ham. Gr.
maculata, Hall, 1876, 28th Rep. N. Y. St. Mus. Nat. Hist., p. 121, Niagara Gr.
offula, Hall, 1876, 28th Rep. N. Y. St. Mus. Nat. Hist., p. 120, Niagara Gr.
pertenuis, Hall, 1884, Rep. St. Geol., p. 7, Ham. Gr.
radiata, Hall, 1883, Rep. St. Geol., p. 16, fig. 13-14, Low. Held. Gr.



FIG. 495.—*Paleoscharcha offula*.

reticulata, Hall, 1884, Rep. St. Geol., p. 6, Ham. Gr.
sphaerion, Hall, 1876, 28th Rep. N. Y. St. Mus. Nat. Hist., p. 121, Niagara Gr.
tenuis, Hall, 1887, Pal. N. Y., vol. 6, p. 36, Low. Held. Gr.
variocella, Hall, 1884, Rep. St. Geol., p. 6, Ham. Gr.

PETALOTRYPA, Ulrich, (in press,) Geo. Sur. Ill., vol. 8, p. 377. [Ety. *petalos*, spread out; *trupa*, an opening.] Bifoliate, consisting of irregular, compressed branches or simple fronds, celluliferous on both sides; zoœcial tubes prismatic, arising from a strongly flexuous mesial line; apertures subcircular or polygonal; mesopore-like interspaces, that do not differ in their tabulation from the zoœcia, may occur; very small acanthopores (?) occupy many of the angles of junction. Type *P. compressa*.

compressa, Ulrich, (in press,) Geo. Sur. Ill., vol. 8, pl. 46, Ham. Gr.

delicata, Ulrich, (in press,) Geo. Sur. Ill., vol. 8, pl. 46, Ham. Gr.

PETIGOPORA, Ulrich, 1882, Journal Cin. Soc. Nat. Hist., vol. 5, p. 155.

[Ety. *petigo*, scab; *poros*, pore.] Small patches adhering to foreign objects, with a narrow nonporiferous band or germinating membrane along the outer margin; no interstitial cells; spiniform tubuli present. Type *P. gregaria*.
asperula, Ulrich, 1883, Jour. Cin. Soc. Nat. Hist., vol. 6, p. 157, Hud. Riv. Gr.

gregaria, Ulrich, 1883, Jour. Cin. Soc. Nat. Hist., vol. 6, p. 155, Hud. Riv. Gr.
petechialis, Nicholson, 1875, (Chetetes *petechialis*.) Ohio Pal., vol. 2, p. 213, Hud. Riv. Gr.

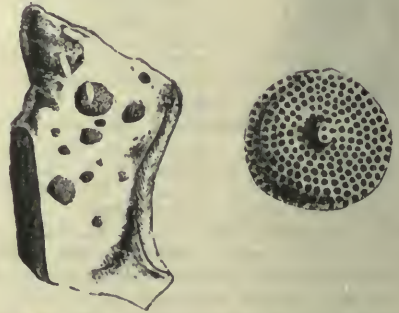


FIG. 496.—*Petigopora petechialis* on a *Monticulopora*; also, specimen greatly enlarged.

PHÆLOPORA, Ulrich, (in press,) Geo. Sur. Ill., vol. 8, p. 368. [Ety. *phakelos*, bundle; *poros*, pore.] Zoarium articulated; segments short, obconical, consisting of two or more equal, conical zoœcia, with slightly contracted circular apertures. Type *P. pertenuis*.

contracta, Ulrich, (in press,) Geo. Sur. Ill., vol. 8, pl. 29, Trenton Gr.

pertenuis, Ulrich, (in press,) Geo. Sur. Ill., vol. 8, pl. 29, Galena Gr.

PHÆNOPORA, Hall, 1852, Pal. N. Y., vol. 2, p. 46. [Ety. *phaino*, to open or make a window; *poros*, pore.] Zoarium forming thin, broad, or ensiform expansions, celluliferous on both sides; cellules oval and arranged between elevated lines; maculae often developed; distinguished from *Ptilodictya* and *Stictopora* by the absence of a nonporiferous, striated edge. Type *P. explanata*.

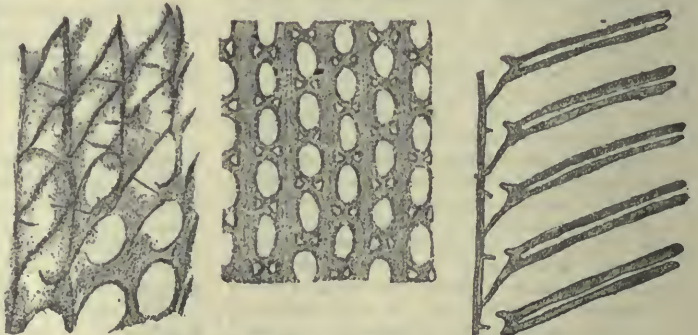


FIG. 497.—*Phænopora constellata*. Sections x 50.

constellata, Hall, 1852, Pal. N. Y., vol. 2, p. 47, Clinton Gr.
ensiformis, Hall, 1852, Pal. N. Y., vol. 2, p. 48, Clinton Gr.
excellens, Billings, 1866, (*Ptilodictya excellens*.) Cat. Sil. Foss. Antic., p. 34, Anticosti Gr.

expansa, Hall & Whitfield, 1875, Ohio Pal., vol. 2, p. 114, Niagara Gr.



FIG. 498.—Phenopora expansa.

explanata, Hall, 1852, Pal. N. Y., vol. 2, p. 46, Clinton Gr.

multi-pora, Hall, 1851, Geo. Lake Supp. Land Dist., vol. 2, p. 206, Trenton Gr.

tenuis, Hall, 1874, (Escharopora tenuis,) 26th Rep. N. Y. St. Mus. Nat. Hist., p. 99, Low. Held. Gr.

PHRACTOPORA, Hall, 1881, Trans. Alb. Inst., vol. 10, p. 12. [Ety. phractos, inclosed; poros, pore.] Zoarium explanate, free or incrusting, frequently contorted, celluliferous

on one or both faces; surface elevated at irregular intervals into prominent crests; cells tubular, without septa; intercellular structure vesiculose near the base, septate above. Type P. cristata.

cristata, Hall, 1881, Trans. Alb. Inst., vol. 10, p. 12, and Pal. N. Y., vol. 6, p. 99, Up. Held. Gr.

cristata var. lineata, Hall, 1887, Pal. N. Y., vol. 6, p. 99, Up. Held. Gr.

PHYLLODICTYA, Ulrich, 1882, Jour. Cin. Soc. Nat. Hist., vol. 5, p. 153. [Ety. phyllon, leaf; dictyon, net.] Zoarium forming simple, leaf-like expansions, sometimes branched; cell apertures small, oblique, with the lower margin

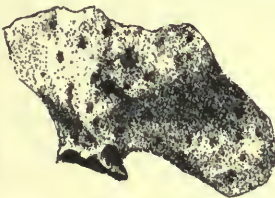


FIG. 499.—Phyllodictya frondosa.

lipped; interstitial spaces minutely granular or punctate. Type P. frondosa.

frondosa, Ulrich, 1882, Jour. Cin. Soc. Nat. Hist., vol. 5, p. 174, Trenton Gr.

PHYLLOPORA, King, 1849, Ann. and Mag. Nat. Hist., 2d ser., vol. 3, p. 389. [Ety. phyllon, leaf; poros, perforation.] Zoarium like Fenestella, but having cellules on the whole of the under surface of the rays in two or more ranges. Type P. ehrenbergi.

aspera, Ulrich, (in press.) Geo. Sur. Ill., vol. 8, pl. 46, Up. Held. Gr.

corticosa, see Subretepora corticosa, ehrenbergi, Geinitz, 1846, (Gorgonia ehrenbergi,) Grundriss, p. 585, Permian Gr. Very doubtfully identified in America.

superba, Ulrich, (in press.) Geo. Sur. Ill., vol. 8, pl. 46 and 55, Ham. Gr.

variolata, see Subretepora variolata.

Phylloporina, Ulrich, syn. for Subretepora.

PILEOTRYPA, Hall, 1887, Pal. N. Y., vol. 6, p. xvi. [Ety. pileos, cap; trupa, opening.] Distinguished from Lichenalia by having the posterior portions of the peristomes strongly elevated and arched, with distinct denticulations in the aperture, which, in the course of growth, form two longitudinal striations along the interior of the cell wall. Type P. denticulata.

clivulata, Hall, 1881, (Lichenalia clivulata,) Trans. Alb. Inst., vol. 10, p. 9, and Pal. N. Y., vol. 6, p. 83, Up. Held. Gr.

denticulata, Hall, 1881, (Lichenalia denticulata,) Trans. Alb. Inst., vol. 10, p. 8, and Pal. N. Y., vol. 6, p. 84, Up. Held. Gr.

granifera, Hall, 1881, (Lichenalia granifera,) Trans. Alb. Inst., vol. 10, p. 11, and Pal. N. Y., vol. 6, p. 84, Up. Held. Gr.

pyriformis, Hall, 1881, (Lichenalia pyriformis,) Trans. Alb. Inst., vol. 10, p. 12, and Pal. N. Y., vol. 6, p. 82, Up. Held. Gr.

PINACOTRYPA, Ulrich, (in press.) Geo. Sur. Ill., vol. 8, p. 384. [Ety. pinax, plank; trupa, opening.] Thin, contorted expansions, with a wrinkled epitheca below; zoecia with subcircular apertures, a well-developed granose peristome, thin walls, and, so far as observed, no lunarium; interspaces wide, occupied by a single series of very large angular mesopores, which never present the appearance of vesicular tissue; diaphragms horizontal, few in the zoecial tubes, numerous in the mesopores. Type P. elegans.

elegans, Rominger, 1866, (Fistulipora elegans,) Proc. Acad. Nat. Sci. Phil., p. 9, Ham. Gr.

Pinnatopora, syn. for Glauconome. curvata, see Glauconome curvata. intermedia, see Glauconome intermedia. minor, see Glauconome minor. simulatrix, see Glauconome simulatrix. subangulata, see Glauconome subangulata. tenuiramosa, see Glauconome tenuiramosa. vinei, see Glauconome vinei. whitii, see Glauconome whitii. youngi, see Glauconome youngi.

POLYPORA, McCoy, 1845, Carb. Foss. Ireland, p. 206. [Ety. polys, many; poros, pore.] Zoarium like that of Fenestella, from which it is distinguished by having no median ridge on the celluliferous side of the rays, and in having from three to ten rows of cell openings. Type P. dendroides.

aculeata, Hall, 1881, (Fenestella aculeata,) Trans. Alb. Inst., vol. 10, p. 21, and Pal. N. Y., vol. 6, p. 157, Up. Held. Gr.

adnata, Hall, 1881, (Fenestella adnata,) Trans. Alb. Inst., vol. 10, p. 25, and Pal. N. Y., vol. 6, p. 152, Up. Held. Gr.

albionensis, Spencer, 1884, Bull. No. 1, Univ. St. Mo., p. 55, Niagara Gr.

approximata, Ulrich, (in press,) Geo. Sur. Ill., vol. 8, pl. 61, Kaskaskia Gr.
 arkonensis, S. A. Miller, 1883, 2d ed. Am. Pal. Foss., p. 292, Ham. Gr. Proposed instead of *P. tuberculata*, Nicholson, in Geo. Mag. for April, 1874, and Rep. Pal. Prov. Ont., p. 100, figs. 37, a, b, c. Found at Arkona, township of Bosanquet, Canada.

arta, Hall, 1879, (*Fenestella arta*.) 32d Rep. N. Y. St. Mus. Nat. Hist., p. 163, Low. Held. Gr.

biarmica, Keyserling, 1846, Geognost. Beobacht, p. 191. Geinitz referred a form from the Coal Meas. and Prout referred one from the Kaskaskia Gr. to it. Probably not an American species.

biseriata, Ulrich, (in press,) Geo. Sur. Ill., vol. 8, pl. 60, Warsaw and St. Louis Gr.

blandida, Ulrich, 1886, Contri. to Amer. Pal., p. 18, Up. Held. Gr.

brevisulcata, Hall, 1881, (*Fenestella brevisulcata*.) Trans. Alb. Inst., vol. 10, p. 26, and Pal.



FIG. 500.—*Polypora biseriata*. Aperture having the central perforation of the cover closed, $\times 50$.

N. Y., vol. 6, p. 168, Up. Held. Gr.

burlingtonensis, Ulrich, (in press,) Geo. Sur. Ill., vol. 8, pl. 59, Burlington Gr.

carinella, Hall, 1887, Pal. N. Y., vol. 6, p. 153, Up. Held. Gr.

celsipora, Hall, 1881, (*Fenestella celsipora*.) Trans. Alb. Inst., vol. 10, p. 24, and Pal. N. Y., vol. 6, p. 150, Up. Held. Gr.

celsipora var. minima, Hall, 1881, (*Fenestella celsipora* var. minima.) Trans. Alb., Inst., vol. 10, p. 24, and Pal. N. Y., vol. 6, p. 151, Up. Held. Gr.

celsipora var. minor, Hall, 1881, (*Fenestella celsipora* var. minor.) Trans. Alb. Inst., vol. 10, p. 24, and Pal. N. Y., vol. 6, p. 151, Up. Held. Gr.

cestriensis, Ulrich, (in press,) Geo. Sur. Ill., vol. 8, pl. 60, Kaskaskia Gr.

compacta, Hall, 1879, (*Fenestella compacta*.) 32d Rep. N. Y. St. Mus. Nat. Hist., p. 163, Low. Held. Gr.

complanata, Ulrich, (in press,) Geo. Sur. Ill., vol. 8, pl. 60, Kaskaskia Gr.

compressa, Hall, 1879, (*Fenestella Compressa*.) 32d Rep. N. Y. St. Mus. Nat. Hist., p. 164, Low. Held. Gr.

corticiosa, Ulrich, (in press,) Geo. Sur. Ill., vol. 8, pl. 61, Kaskaskia Gr.

crebescens, Hall, 1887, Pal. N. Y., vol. 6, p. 170, Up. Held. Gr.

crassa, Ulrich, (in press,) Geo. Sur. Ill., vol. 8, pl. 61, Up. Coal Meas.

cultellata, Hall, 1881, (*Fenestella cultellata*.) Trans. Alb. Inst., vol. 10, p. 21, and Pal. N. Y., vol. 6, p. 160, Up. Held. Gr.

distans, Hall, 1881, (*Fenestella distans*.) Trans. Alb. Inst., vol. 10, p. 24, and Pal.

N. Y., vol. 6, p. 161, Up. Held. Gr.

elegans, Hall, 1874, 26th Rep. N. Y. St. Mus. Nat. Hist., p. 97, Low. Held. Gr.

elongata, Hall, 1882, Rep. St. Geol. and Pal. N. Y., vol. 6, p. 153, Up. Held. Gr.

eudora, Hall, 1887, Pal. N. Y., vol. 6, p. 58, Low. Held. Gr.

fistulata, Hall, 1884, (*Fenestella fistulata*.) 36th Rep. N. Y. St. Mus. Nat. Hist., p. 59, Ham. Gr.

flabelliformis, Hall, 1881, (*Fenestella flabelliformis*.) Trans. Alb. Inst., vol. 10, p. 23, and Pal. N. Y., vol. 6, p. 161, Up. Held. Gr.

gracilis, Prout, 1860, Trans. St. Louis Acad. Sci., p. 580, Warsaw Gr.

grandis, Toulou, 1875, N. Jahrbuch, p. 230, Carboniferous.

granilinea, Hall, 1881, (*Fenestella granilinea*.) Trans. Alb. Inst., vol. 10, p. 27, and Pal. N. Y., vol. 6, p. 154, Up. Held. Gr.

hallana, Prout, 1860, Trans. St. Louis Acad. Sci., vol. 1, p. 580, Warsaw Gr.

hamiltonensis, Prout, 1866, Geo. Sur. Ill., vol. 2, p. 423, Ham. Gr.

hexagonalis, Hall, 1881, (*Fenestella hexagonalis*.) Trans. Alb. Inst., vol. 10, p. 27, and Pal. N. Y., vol. 6, p. 164, Up. Held. Gr.

hexagonalis var. foraminulosa, Hall, 1881, (*Fenestella hexagonalis* var. foraminulosa.) Trans. Alb. Inst., vol. 10, p. 27, and Pal. N. Y., vol. 6, p. 165, Up. Held. Gr.

idothea, Hall, 1879, (*Fenestella idothea*.) 32d Rep. N. Y. St. Mus. Nat. Hist., p. 97, Low. Held. Gr.

inbriicata, Prout, 1866, Trans. St. Louis Acad. Sci., vol. 2, p. 412, Devonian.

impressa, Ulrich, 1888, Bull. Denison Univ., vol. 4, p. 72, Cuyaboga Shale.

incepta, Hall, 1852, Pal. N. Y., vol. 2, p. 167, Niagara Gr.

intermedia, Prout, 1858, Trans. St. Louis Acad. Sci., vol. 1, p. 272, Up. Held. Gr.

laevinodata, Hall, 1881, (*Fenestella laevinodata*.) Trans. Alb. Inst., vol. 10, p. 28, and Pal. N. Y., vol. 6, p. 169, Up. Held. Gr.

levistriata, Hall, 1883, Rep. St. Geol. and Pal. N. Y., vol. 6, p. 159, Up. Held. Gr.

largissima, Hall, 1881, (*Fenestella largissima*.) Trans. Alb. Inst., vol. 10, p. 22, and Pal. N. Y., vol. 6, p. 156, Up. Held. Gr.

lilaea, Hall, 1874, 26th Rep. N. Y. St. Mus. Nat. Hist., p. 62, Low. Held. Gr.

maccoyana, Ulrich, (in press,) Geo. Sur. Ill., vol. 8, pl. 59, Keokuk Gr.

megastoma, DeKoninck, 1863, Quar. Jour. Geol. Soc., vol. 19, p. 5, Carboniferous.

mexicana, Prout, 1858, Trans. St. Louis Acad. Sci., vol. 1, p. 270, Permian Gr.

mutabilis, Hall, 1881, (*Fenestella mutabilis*.) Trans. Alb. Inst., vol. 10, p. 25, and Pal. N. Y., vol. 6, p. 166, Up. Held. Gr.

nexa, Hall, 1881, (*Fenestella nexa*.) Trans. Alb. Inst., vol. 10, p. 25, and Pal. N. Y., vol. 6, p. 165, Up. Held. Gr.

nodocarinata, Ulrich, (in press,) Geo. Sur. Ill., vol. 8, pl. 61, Coal Meas.
 obliqua, Hall, 1887, Pal. N. Y., vol. 6, p. 64, Low. Held. Gr.
 papillata, McCoy, 1862, Carb. Foss. of Ireland, p. 226, Up. Coal Meas.
 paxillata, Hall, 1879, (Fenestella paxillata,) 32d Rep. N. Y. St. Mus. Nat. Hist., p. 164, Low. Held. Gr.
 perangulata, Hall, 1881, (Fenestella perangulata,) Trans. Alb. Inst., vol. 10, p. 23, and Pal. N. Y., vol. 6, p. 162, Up. Held. Gr.
 perundata, Hall, 1881, (Fenestella perundata,) Trans. Alb. Inst., vol. 10, p. 27, and Pal. N. Y., vol. 6, p. 163, Up. Held. Gr.
 porosa, Hall, 1881, (Fenestella porosa,) Trans. Alb. Inst., vol. 10, p. 26, and Pal. N. Y., vol. 6, p. 163, Up. Held. Gr.
 propria, Hall, 1881, (Fenestella propria,) Trans. Alb. Inst., vol. 10, p. 22, and Pal. N. Y., vol. 6, p. 157, Up. Held. Gr.
 (?) psyche, Billings, 1874, Pal. Foss., vol. 2, p. 11, Gaspe limestone No. 8, Devonian.
 pulchella, Nicholson, 1874, Geo. Mag. Lond. n. s., vol. 1, p. 161, Corniferous Gr.
 quadrangularis, Hall, 1881, (Fenestella quadrangularis,) Trans. Alb. Inst., vol. 10, p. 21, and Pal. N. Y., vol. 6, p. 158, Up. Held. Gr.
 radialis, Ulrich, (in press,) Geo. Sur. Ill., vol. 8, pl. 60, Keokuk Gr.
 retrorsa, Ulrich, (in press,) Geo. Sur. Ill., vol. 8, pl. 59, Keokuk Gr.
 rigida, Prout, 1866, Trans. St. Louis Acad. Sci., vol. 2, p. 412, Up. Held. Gr.
 rigida, Hall, 1881, (Fenestella rigida,) Trans. Alb. Inst., vol. 10, p. 22, and Pal. N. Y., vol. 6, p. 155, Up. Held. Gr.
 robusta, Hall, 1881, (Fenestella robusta,) Trans. Alb. Inst., vol. 10, p. 22, and Pal. N. Y., vol. 6, p. 156, Up. Held. Gr.
 rustica, Hall, 1887, Pal. N. Y., vol. 6, p. 169, Up. Held. Gr.
 separata, Hall, 1882, Rep. St. Geol. and Pal. N. Y., vol. 6, p. 166, Up. Held. Gr.
 shumardi, Prout, 1858, Trans. St. Louis Acad. Sci., vol. 1, p. 271, Up. Held. Gr.
 simulatrix, Ulrich, (in press,) Geo. Sur. Ill., vol. 8, pl. 59, Keokuk Gr.
 spinulifera, Ulrich, (in press,) Geo. Sur. Ill., vol. 8, pl. 61, Kaskaskia Gr. and Coal Meas.
 stragula, White, 1874, Rep. Invert. Foss., p. 19, and Geo. Sur. W. 100th Mer. vol. 4, p. 108, Coal Meas.
 striatopora, Hall, 1881, (Fenestella striatopora,) Trans. Alb. Inst., vol. 10, p. 23, and Pal. N. Y., vol. 6, p. 168, Up. Held. Gr.

stricta, Hall, 1887, Pal. N. Y., vol. 6, p. 59, Low. Held. Gr.
 submarginata, Meek, 1872, Pal. E. Neb., p. 154, Coal Meas.
 submutans, Hall, 1881, (Fenestella submutans,) Trans. Alb. Inst., vol. 10, p. 21, and Pal. N. Y., vol. 6, p. 167, Up. Held. Gr.
 tenella, Nicholson, 1874, Geo. Mag. Lond. n. s., vol. 1, p. 162, Corniferous Gr.
 transversa, Ulrich, 1886, Cont. to Am. Pal., p. 18, Up. Held. Gr.
 tuberculata, Prout, 1859, Trans. St. Louis Acad. Sci., vol. 1, p. 449, Kaskaskia Gr.
 tuberculata, Nicholson, see P. arkonensis.
 varsoviensis, Prout, 1858, Trans. St. Louis Acad. Sci., vol. 1, p. 237, Warsaw Gr.
 varsoviensis var. spininodata, Ulrich, (in press,) Geo. Sur. Ill., vol. 8, pl. 60, Warsaw Gr.
 whitii, Ulrich, (in press,) Geo. Sur. Ill., vol. 8, pl. 62, Coal Meas.
 whitii var. eximia, Ulrich, (in press,) Geo. Sur. Ill., vol. 8, pl. 62, Coal Meas.
PRISMOPORA, Hall, 1881, Bryozoans of the Up. Held. Gr., p. 17. [Ety. *prismos*, the hole made by a cylindrical saw; *poros*, pore.] Ramose, branches triangular, dichotomous, each side celluliferous; tubes radiate from the center to each angle, margins noncelluliferous; interstitial spaces smooth, vesicular. Type P. triquetra.
 dilatata, Hall, 1884, Rep. St. Geol., p. 50, Ham. Gr.
 lata, Hall, 1887, Pal. N. Y., vol. 6, p. 266, Ham. Gr.
 minima, Ulrich, (in press,) Geo. Sur. Ill., vol. 8, pl. 78, Coal Meas.
 paucirama, Hall, 1881, Bryozoans of the Up. Held. Gr., p. 17, and Rep. St. Geol., 1883, pl. 25, fig. 11, Up. Held. Gr.
 serrata, Meek, 1875, (Ptilodictya serrata,) Pal. Ohio, vol. 2, p. 327, Coal Meas.
 serrulata, Ulrich, 1884, Jour. Cin. Soc. Nat. Hist., vol. 7, p. 41, Kaskaskia Gr. Perhaps the same as P. serrata.
 sparsipora, Hall, 1881, (Thallostigma sparsipora,) Trans. Alb. Inst., vol. 10, p. 13, and Pal. N. Y., vol. 6, p. 288, Up. Held. Gr.
 triquetra, Hall, 1881, Bryozoans of the Up. Held. Gr., p. 17, and Rep. St. Geol. 1883, pl. 25, fig. 8-10, Up. Held. Gr.
PROTOCRISINA, Ulrich, (in press,) Geo. Sur. Ill., vol. 8, p. 369. [Ety. *protos*, first; *Crisina*, a genus.] Ramose, celluliferous on one side only; cells subtubular, with prominent circular apertures; reverse finely grano-striate; small pores, apparently communicating with the interior of the zoecia, are rather irregularly distributed over both sides of the branches; axis thin, cruciform in transverse section; external walls thick. Type P. exigua.
 exigua, Ulrich, (in press,) Geo. Sur. Ill., vol. 8, pl. 29 and 53, Trenton and Hud. Riv. Gr.

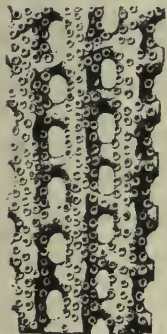


FIG. 501.—Polypora shumardi. Enlarged.

PROUTELLA, Ulrich, (in press.) *Geo. Snr. Ill.*, vol. 8, p. 403. [Ety. proper name.] Discoid, thin, free, lower surface convex and lined with a concentrically wrinkled epitheca; primary zoecia sub-tubular, the succeeding ones shorter, all rather thin-walled; aperture broad-elliptical, surrounded by a narrow, sloping area, hexagonal in outline; when perfect, with a depressed delicate calcareous plate, that closes a little less than two-thirds of the opening, the orifice left being subtriangular in form, without thickened margins, and situated at the anterior side; with age, a second, third, and more layers of zoecia are developed directly over the first, so that they gradually form a zoecial tube seemingly having the cavity intersected by incomplete diaphragms; these appear to spring from the posterior wall, and extend about one-half the distance across. Type *Cyclopora discoidea*. Syn.? for *Cyclopora*.

discoidea, Prout, 1860, (*Cyclopora discoidea*.) *Trans. St. Louis Acad. Sci.*, vol. 1, p. 578, Keokuk Gr.

Pteropora duogeneris, Hall, syn. for *Tæniopora exigua*.

Ptilionella, Hall, 1884, *Rep. St. Geol.*, p. 56, syn. for *Reptaria*.

nodata, see *Reptaria nodata*.

penniformis, see *Reptaria penniformis*.

PTILODICTYA, Lonsdale, 1839, *Murch. Sil. Syst.*, p. 676. [Ety. *ptilon*, feather; *dictyon*, net.] The correct orthography is *Ptilodictyon*. Zoarium pointed below, articulating into a spreading base, above a leaf-like expansion, which is sometimes lobed at the distal extremity, cellulariferous on both faces, divided by a mesial lamina; margin without cells; apertures circular or subquadrate; no intercellular tissue. Type *P. lanceolata*.

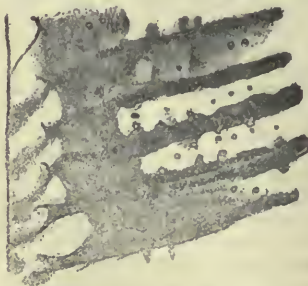


FIG. 502.—*Ptilodictya maculata*. Vertical section x 35, showing spinous process.

acuminata, James, 1876, *Int. Catal. Cin. Foss.*, p. 3, Hud. Riv. Gr. Not well defined.

alcyone, see *Pachydictya alcyone*.

arctipora, see *Bythopora arctipora*.

arguta, see *Stictopora arguta*.

bipunctata, Van Cleve, 1883, 12th Rep. Ind. Geol. and Nat. Hist., p. 266, Niagara Gr.

briareus, Ulrich, 1882, *Jour. Cin. Soc. Nat. Hist.*, vol. 5, p. 164, Trenton Gr.

canadensis, Billings, 1866, *Catal. Sil. Foss. Antic.*, p. 9, Hud. Riv. Gr.

carbonaria, see *Stictopora carbonaria*.
cosciniformis, see *Coscinella cosciniformis*.

dictyota, Meek, 1873, Hayden's 6th Rep. Geo. Sur. Terr., p. 465, Subcarboniferous.

emacerata, see *Dicranopora emacerata*.

excellens, see *Phænopora excellens*.

explicans, Safford, 1869, *Geo. of Tenn.* Not defined.

falciformis, Nicholson, 1875, *Ohio Pal.*, vol. 2, p. 259, Hud. Riv. Gr.

fenestelliformis, Nicholson, 1875, *Ohio Pal.*, vol. 2, p. 263, Hud. Riv. Gr.

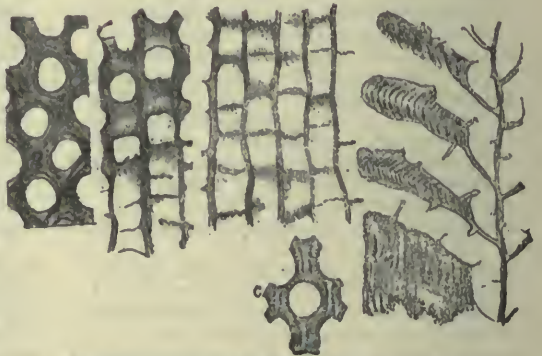


FIG. 503.—*Ptilodictya magnifica*. Sections x 50.

flagellum, Nicholson, 1875, *Ohio Pal.*, vol. 2, p. 262, Hud. Riv. Gr.

fragilis, see *Dicranopora fragilis*.

gladiola, Billings, 1866, *Catal. Sil. Foss. Antic.*, p. 10, Anticosti Gr.

hilli, James, 1882, (as figured by Ulrich.) *Jour. Cin. Soc. Nat. Hist.*, vol. 5, pl. 7, Trenton Gr.

internodia, see *Dicranopora internodia*.

libana, Safford, 1869, *Geo. of Tenn.* p. 286, Trenton Gr.

lirata, Hall, 1874, (*Escharopora lirata*.) 26th Rep. N. Y. St. Mus. Nat. Hist., p. 100, Low. Held. Gr.

maculata, Ulrich, 1882, *Jour. Cin. Soc. Nat. Hist.*, vol. 5, p. 163, Hud. Riv. Gr.

magnifica, S. A. Miller, 1878, *Jour. Cin. Soc. Nat. Hist.*, vol. 1, p. 100, Hud. Riv. Gr.

meeki, Nicholson, 1874, *Geo. Mag. n. s.*, vol. 1, p. 123, Corniferous and Ham. Gr.

multiramis, Safford. Not defined.

nebulosa, Hall, 1874, (*Escharopora nebulosa*.) 26th Rep. N. Y. St. Mus. Nat. Hist., p. 99, Low. Held. Gr.

nitidula, see *Dicranopora nitidula*.

nodosa, James, 1882, (as figured by Ulrich.) *Jour. Cin. Soc. Nat. Hist.*, vol. 5, pl. 7, Hud. Riv. Gr. The name was preoccupied. See *P. variabilis*.

obliqua, Ringuenberg, 1884, (Stictopora obliqua,) Proc. Acad. Nat. Sci., p. 146, Clinton Gr. Not well defined.
parallela, Hall, 1887, Pal. N. Y., vol. 6, p. 270, Ham. Gr.

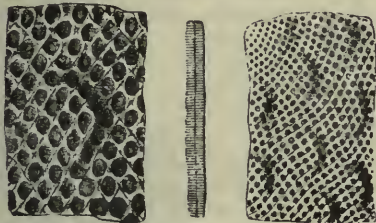


FIG. 504.—*Ptilodictya pavonia*. Natural size, and magnified.

pavonia, D'Orbigny, 1850, Prodr. de Paleont., t. 1, p. 22, Hud. Riv. Gr.
perelegans, see *Graptodictya perelegans*.
plumaria, James, 1882, (as figured by Ulrich,) Jour. Cin. Soc. Nat. Hist., vol. 5, pl. 7, Hud. Riv. Gr.
plumea, Hall, 1887, Pal. N. Y., vol. 6, p. 271, Ham. Gr.
punctata, Nicholson & Hinde, 1874, Can. Jour., p. 7, Clinton Gr.
ramosa, Ulrich, 1882, Jour. Cin. Soc. Nat. Hist., vol. 5, p. 164, Trenton Gr.
retiformis, Hall, 1887, Pal. N. Y., vol. 6, p. 272, Ham. Gr.
rustica, see *Stictopora rustica*.
scutulata, Hall, 1884, (Stictopora scutulata,) Rep. St. Geol., p. 47, Ham. Gr.
serrata, see *Prismopora serrata*.
subrecta, Ulrich, 1886, 14th Rep. Geo. Sur. Minn., p. 63, Trenton Gr.
sulcata, Billings, 1886, Catal. Sil. Foss. Antic., p. 35, Anticosti Gr.
superba, Billings, 1866, Catal. Sil. Foss. Antic., p. 35, Anticosti Gr.
symmetra, Safford. Not defined.
tarda, Billings, 1874, Pal. Foss., vol. 2, p. 13, Gaspe Limestone No. 8, Devonian.



FIG. 505.—*Ptilodictya variabilis*. Transverse section x 50, showing the basal portion of the two layers of zoecia, and the duplex character of the median lamina. Between the plates there is no series of median tubuli.

tenera, see *Stictopora tenera*.
tenuis, see *Phaenopora tenuis*.
triangulata, White, 1878, Proc. Acad. Nat. Sci., p. 35, and Cont. to Pal. No. 6, p. 131, Coal Meas.
variabilis, Ulrich, instead of *P. nodosa*, James, that was preoccupied, Hud. Riv. Gr.
whiteavesi, Ulrich, (in press,) Micropalaeontology, p. 18, Hud. Riv. Gr. (?)

PTILOPORA, McCoy, 1844, Syn. Carb. Foss. Ireland, p. 200. [Ety. *ptilon*, plume; *poros*, pore.] Flabelliform attached by roots, from which a strong midrib

arises, giving origin on each side to thin, equidistant rays, connected by regular dissepiments; external face of the rays carinate and bearing two rows of pores. Type *P. flustriformis*.
acuta, Ulrich, (in press,) Geo. Sur. Ill., vol. 8, pl. 65, Burlington and Keokuk Gr.
cylindracea, Ulrich, (in press,) Geo. Sur. Ill., vol. 8, pl. 66, Keokuk Gr.
infrequens, Hall, 1887, Pal. N. Y., vol. 6, p. 284, Ham. Gr.
nodosa, Hall, 1884, Rep. St. Geol., p. 59, Ham. Gr.
paupera, Ulrich, (in press,) Geo. Sur. Ill., vol. 8, pl. 66, Keokuk Gr.
prouti, Hall, 1858, Geo. Rep. Iowa, p. 653, Warsaw Gr.
striata, Hall, 1884, Rep. St. Geol., p. 58, Ham. Gr.
valida, Ulrich, (in press,) Geo. Sur. Ill., vol. 8, pl. 65 and 66, Keokuk Gr.



FIG. 506.—*Ptilodictya variabilis*. Vertical section x 35, showing hemisepta.

PTILOPORELLA, Hall, 1887, Pal. N. Y., vol. 6, p. xxiv. [Ety. from the genus *Ptilopora*.] Bryozoum growing in the same manner as *Ptilopora*, but with only two ranges of cell apertures on the branches. Type *P. laticrescens*.
inaequalis, Hall, 1887, Pal. N. Y., vol. 6, p. 171, Up. Held. Gr.
laticrescens, Hall, 1887, Pal. N. Y., vol. 6, p. 171, Up. Held. Gr.
nervata, Nicholson, 1875, (Fenestella *nervata*,) Ohio Pal., vol. 2, p. 264, Niagara Gr.
PTILOPORINA, Hall, 1887, Pal. N. Y., vol. 6, p. xxiv. [Ety. from the genus *Ptilopora*.] Resembling *Fenestella*, some branches larger than others; ordinary branches originate laterally from one or both sides of the primary branches, not bifurcating as in ordinary forms of *Fenestella*; cell apertures in three or more ranges. Type *P. conica*.
conica, Hall, 1887, Pal. N. Y., vol. 6, p. 172, Up. Held. Gr.
disparilis, Hall, 1887, Pal. N. Y., vol. 6, p. 173, Up. Held. Gr.
pinnata, Hall, 1887, Pal. N. Y., vol. 6, p. 172, Up. Held. Gr.

- sinistralis, Hall, 1887, Pal. N. Y., vol. 6, p. 174, Up. Held. Gr.
- PTILOTRYPA**, Ulrich, (in press,) Geo. Sur. Ill., vol. 8, p. 393. [Ety. *ptilon*, feather; *trupa*, an opening.] Bifoliate, forming large ramose expansions. Zoecial tubes and apertures very oblique; at the upper extremity of the acutely ovate aperture there is a small cell which is best seen in tangential sections; surface with irregular, longitudinally channeled spots. Type *P. obliquata*.
- obliquata*, Ulrich, (in press,) Geo. Sur. Ill., vol. 8, pl. 30, Hud. Riv. Gr.
- RAMIPORA**, Toula, 1875, Permo-Carbon-Fossilien von der West Küste von Spitzbergen, p. 6. [Ety. *ramus*, branch; *poros*, pore.] Staff in cross section, rounded, rhombic, with keel on both sides; branches in pairs, one on each side, and these connected in like manner by rays, upward and downward; pores on one side, on each side of the keel. Type *R. hochstetteri*.
- hochstetteri*, Toula, 1875, Permo-Carbon-Fossilien von der West Küste von Spitzbergen, p. 6, Carboniferous.
- REPTARIA**, Rolle, 1851, Leonhard & Bronn, Neues Jahrb., p. 810. [Ety. *repto*, to creep.] Zoarium parasitic, procumbent, attached its entire length; consisting of a rachis, from which proceed laterally, at regular intervals, cylindrical cell tubes, and at irregular distances tubes which have the same manner of growth as the primary rachis; cell-tubes turn abruptly outward at their distal extremities, and open in an aperture parallel with the axis of the branch. Type *R. stolonifera*.
- nodata*, Hall, 1884, (Ptilionella *nodata*.) Rep. St. Geol., p. 57, Ham. Gr.
- penniformis*, Hall, 1884, (Ptilionella *penniformis*.) Rep. St. Geol., p. 56, Ham. Gr.
- stolonifera*, Rolle, 1851, Leonhard & Bronn, Neues Jahrb., p. 810, Ham. Gr.
- Retepora**, Lamarck, 1801, Syst. An. sans. Vert. [Ety. *rete*, net; *poros*, pore.] Not a Palaeozoic genus.
- angulata*, see Subretepora *angulata*.
- antiqua*, as identified by d'Archiac & Verneuil. Not American.
- archimedes*, see Archimedes.
- asperato-striata*, see Subretepora *asperato-striata*.
- clintoni*, Vanuxem, 1842, Geo. Rep. 3d Dist. N. Y. Not recognized.
- diffusa*, see Thamniscus *diffusa*.
- fenestrata*, see Subretepora *fenestrata*.
- foliacea*, Hall, 1847. This name Prof. Hall says may be erased from the list.
- gracilis*, see Subretepora *gracilis*.
- hamiltonensis*, see Reteporina *hamiltonensis*.
- incepta*, see Subretepora *incepta*.
- phillipsi*, see Reteporina *phillipsi*.
- prisca*, see Reteporina *prisca*.
- trentonensis*, see Subretepora *trentonensis*.

- RETEPORINA**, D'Orbigny, 1850, Prodr. d. Paléont., t. 1, p. 101. [Ety. from *Retepora*.] Resembling *Retepora*, but having on the greater part of the branches only two ranges of cell apertures; branches connected by anastomosis or by dissepiments so short as to be essentially wanting. Type *R. prisca*.
- coalescens*, Hall, 1887, Pal., N. Y., vol. 6, p. 120, Up. Held. Gr.
- hamiltonensis*, Prout, 1866, (Retepora *hamiltonensis*.) Trans. St. Louis, Acad. Sci., vol. 2, p. 412, Ham. Gr.
- perundulata*, Hall, 1884, (Fenestella *perundulata*.) 36th Rep. N. Y. St. Mus. Nat. Hist., p. 63, Ham. Gr.
- phillipsi*, Nicholson, 1874, (Retepora *phillipsi*.) Geo. Mag. n. s., vol. 1, p. 163, Corniferous Gr.
- prisca*, Goldfuss, 1831, (Retepora *prisca*.) Petref. Germ., vol. 1, p. 103, Ham. Gr.
- rhombifera*, Hall, 1881, (Fenestella *rhombifera*.) Trans. Alb. Inst., vol. 10, p. 32, and Pal. N. Y., vol. 6, p. 120, Up. Held. Gr.
- striata*, Hall, 1884, (Fenestella *striata*.) 36th Rep. N. Y. St. Mus. Nat. Hist., p. 72, Ham. Gr.
- RHINDICTYA**, Ulrich, 1882, Jour. Cin. Soc. Nat. Hist., vol. 5, p. 152. [Ety. *rhine*, file; *dictyon*, net.] Zoarium narrow, branching at long intervals; cells surrounded by a close series of small spiniform tubuli; otherwise like *Stictopora*. Type *R. nicholsoni*. Syn. for *Sulcopora* probably.

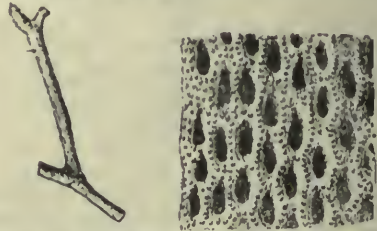


FIG. 507.—*Rhindictya nicholsoni*. Natural size and magnified 18 diam.

- granulosa*, Hall, 1887, Pal. N. Y., vol. vi, p. 40, Low. Held. Gr.

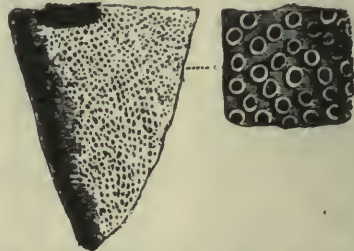


FIG. 508.—*Rhinopora verrucosa*. Natural size and enlarged.

- nicholsoni*, Ulrich, 1882, Jour. Cin. Soc. Nat. Hist., vol. 5, p. 170, Trenton Gr.

RHINOPORA, Hall, 1852, Pal. N. Y., vol. 2, p. 48. [Ety. *rhine*, file; *poros*, pore.] Expanded or subcylindrical and hollow; cellular on two sides; cells arranged in quincunx order, roundish or oval, and raised in little pustules over the surface. Type *R. verrucosa*.
curvata, Ringueberg, 1886, Bull. Buf. Soc. Nat. Sci., vol. 5, p. 19, Niagara Gr.
frondosa, Hall & Whitfield, 1875, Ohio Pal., vol. 2, p. 112, Niagara Gr.

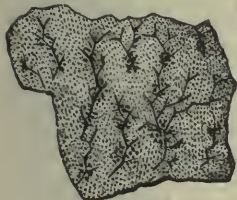


FIG. 509.—*Rhinopora frondosa*.

tuberculosa, Hall, 1852, Pal. N. Y., vol. 2, p. 170, Niagara Gr.
tubulosa, Hall, 1852, Pal. N. Y., vol. 2, p. 49, Clinton Gr.
venosa, Spencer, 1884, Bull. No. 1, Mus. Univ. St. Mo., p. 54, Clinton Gr.
verrucosa, Hall, 1852, Pal. N. Y., vol. 2, p. 48, Clinton Gr.

RHOMBOPORA, Meek, 1872, Pal. Eastern Nebraska, p. 141. [Ety. *rhombos*, rhomb; *poros*, pore.] Ramose, tubular, cells short; septa none; corallites radiating obliquely outward and upward on all sides from an imaginary axis; mouths rhombic or rhombic oval, and arranged in longitudinal and oblique spiral rows; interspaces thick, with minute pores visible in microscopic sections. Type *R. lepidodendroidea*.

armata, Ulrich, 1884, Jour. Cin. Soc. Nat. Hist., vol. 7, p. 31, Kaskaskia Gr.
 (?) *asperima*, Ulrich, (in press,) Geo. Sur. Ill., vol. 8, pl. 70, Keokuk Gr.
attenuata, Ulrich, (in press,) Geo. Sur. Ill., vol. 8, pl. 70, Keokuk or Warsaw Gr.
confluens, see *Acanthochelema confluens*.
crassa, Ulrich, 1884, Jour. Cin. Soc. Nat. Hist., vol. 7, p. 25, Up. Coal Meas.
decipiens, Ulrich, (in press,) Geo. Sur. Ill., vol. 8, pl. 71, St. Louis Gr.
dichotoma, Ulrich, (in press,) Geo. Sur. Ill., vol. 8, pl. 70, Burlington Gr.
elegantula, Ulrich, 1884, Jour. Cin. Soc. Nat. Hist., vol. 7, p. 33, Kaskaskia Gr.
exigua, Ulrich, (in press,) Geo. Sur. Ill., vol. 8, pl. 70, Burlington Gr.



FIG. 510.—*Rhombopora lepidodendroidea*.

gracilis, Ulrich, (in press,) Geo. Sur. Ill., vol. 8, pl. 70, Burlington Gr.
incrassata, Ulrich, 1888, Bull. Denison Univ., p. 89, Cuyahoga shales.
lepidodendroidea, Meek, 1872, Pal. Eastern Nebraska, p. 141, Up. Coal Meas.

ohioensis, Ulrich, 1888, Bull. Denison Univ., p. 90, Cuyahoga Shales.
persimilis, Ulrich, 1884, Jour. Cin. Soc. Nat. Hist., vol. 7, p. 30, Kaskaskia Gr.
pulchella, Ulrich, 1884, Jour. Cin. Soc. Nat. Hist., vol. 7, p. 31, Kaskaskia Gr.
simulatrix, Ulrich, (in press,) Geo. Sur. Ill., vol. 8, pl. 71, St. Louis Gr.
 (?) *spiralis*, Ulrich, (in press,) Geo. Sur. Ill., vol. 8, pl. 71, Keokuk Gr.
subannulata, Ulrich, (in press,) Geo. Sur. Ill., vol. 8, pl. 45, Ham. Gr.
sulcifera, Ulrich, (in press,) Geo. Sur. Ill., vol. 8, pl. 45, Ham. Gr.
tabulata, Ulrich, (in press,) Geo. Sur. Ill., vol. 8, pl. 70, Kaskaskia Gr.
tenuirama, Ulrich, (in press,) Geo. Sur. Ill., vol. 8, pl. 70, Kaskaskia Gr.
transversalis, Ulrich, (in press,) Geo. Sur. Ill., vol. 8, pl. 71, Keokuk Gr.
varia, Ulrich, (in press,) Geo. Sur. Ill., vol. 8, pl. 71, Keokuk Gr.
wortheni, Ulrich, 1884, Cin. Soc. Nat. Hist., vol. 7, p. 32, Kaskaskia Gr.

RHOPALONARIA, Ulrich, 1879, Jour. Cin. Soc. Nat. Hist., vol. 2, p. 26. [Ety. *ropalon*, a club.] Cells slender, fusiform, in single anastomosing series; cell mouths near the middle of the cells. Type *R. venosa*.
pertenuis, see *Stomatopora pertenuis*.



FIG. 511.—*Rhopalonaria venosa*.

venosa, Ulrich, 1879, Jour. Cin. Soc. Nat. Hist., vol. 2, p. 26, Hud. Riv. Gr.

SAGENELLA, Hall, 1852, Pal. N. Y., vol. 2, p. 172. [Ety. *sagenella*, a little drag-net.] Membranous net incrusting other bodies; cells in parallel or diverging series, more or less oblong-quadrangular, and separated by a thin lamina. Type *S. membranacea*.
ambigua, Walcott, 1879, Utica Slate and related formations, p. 22, Utica Slate.
elegans, Hall, 1876, 28th Rep. N. Y. St. Mus. Nat. Hist., p. 118, Niagara Gr.
membranacea, Hall, 1852, Pal. N. Y., vol. 2, p. 172, Niagara Gr.

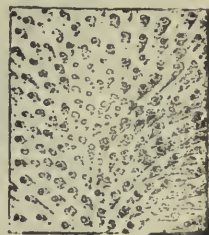


FIG. 512.—*Sagenella elegans*. Magnified.

SCALARIPORA, Hall, 1881, Bryozoans of Up. Held. Gr., p. 17. [Ety. *scalare*, ladder; *porus*, pore.] Irregular groups of triangular branches, more or less concave, traversed transversely by sharp, elevated laminae at regular distances; cel-

luliferous on each face; cells radiating from the center to each angle of the branch; margins and summit of laminae noncelluliferous. Type *S. scalariformis*.

approximata, Ulrich, (in press,) *Geo. Sur. Ill.*, vol. 8, pl. 43, Ham. Gr.

scalariformis, Hall, 1881, *Bryozoans of Up. Held. Gr.*, p. 18, and *Pal. N. Y.*, vol. 6, p. 100, *Up. Held. Gr.*

separata, Ulrich, (in press,) *Geo. Sur. Ill.*, vol. 8, pl. 43, Ham. Gr.

subconca, Hall, 1881, *Bryozoans of Up. Held. Gr.*, p. 18, and *Pal. N. Y.*, vol. 6, p. 100, *Up. Held. Gr.*

SCENELLOPORA, Ulrich, 1882, *Jour. Cin. Soc. Nat. Hist.*, vol. 5, p. 150. [Ety. *scene*, tent; *ellus*, diminutive; *poros*, pore.] Zoarium broad, obconical; cell apertures on ridges, which radiate from the subsolid and depressed center of the upper surface. Type *S. radiata*.

radiata, Ulrich, 1882, *Jour. Cin. Soc. Nat. Hist.*, vol. 5, p. 153, Trenton Gr.

SCEPTROPORA, Ulrich, 1888, *Am. Geo.*, vol. 1, p. 228. [Ety. *skeptron*, staff; *poros*,

SEMICOSCINIUM, Prout, 1859, *Trans. St. Louis Acad. Sci.*, vol. 1, p. 443. [Sig. somewhat like *Cosciniium*.] Leaf-like expansion, somewhat penniform, without a shaft; sole formed of longitudinal and horizontal parallel ridges, surmounted by a cellular tissue, divided perpendicularly by thin, longitudinal septa, corresponding to the ridges, and supporting parallel lines of tortuous tubes alternately approximating and receding from each other; covered by a dense, strong crust, divided into a network of rays and dissepiments bounding rhomboidal or ovate fenestrules, giving passage to oblique cells; the tortuous tubes give place to quincuncial, oval openings in the fenestrules; each tortuous tube has a line of cells on each side. Type *S. rhomboideum*.

eriense, Prout, *Trans. St. Louis Acad. Sci.*, vol. 1, p. 579, *Up. Held. Gr.*

obliquatum, Ulrich, 1886, *Cont. to Am. Pal.* p. 13, *Up. Held. Gr.*

planodoratum, Ulrich, (in press,) *Geo. Sur. Ill.*, vol. 8, pl. 45, *Up. Held. Gr.*

rhomboideum, Prout, 1859, *Trans. St. Louis Acad. Sci.*, vol. 1, p. 443, *Up. Held. Gr.*

rhombicum, Ulrich, (in press,) *Geo. Sur. Ill.*, vol. 8, pl. 45-54, Ham. Gr.

tuberculatum, Prout, 1860, *Trans. St. Louis Acad. Sci.*, vol. 1, p. 579, *Up. Held. Gr.*

SEMIOPORA, Hall, 1884, *Rep. St. Geol.*, p. 51. [Ety. *semi*, half; *poros*, pore.] Bryozoum

ramose; branches infrequent, bifurcating or tribifurcating; margins parallel; celluliferous on both sides; cells arising from a mesial epitheca; apertures in longitudinal parallel rows, separated by ridges; two minute pits on the transverse space between adjacent apertures; apertures near the margin larger and more oblique than the others; margin striated; noncelluliferous. Type *S. bistigmata*.

bistigmata, Hall, 1884, *Rep. St. Geol.*, p. 57, Ham. Gr.

SEPTOPORA, Prout, 1859, *Trans. St. Louis Acad. Sci.*, vol. 1, p. 448. [Ety. *septum*, partition; *porus*, pore.] Zoarium like *Fenestella*, but distinguished by the dissepiments, which have from one to four rows of cells. Type *S. cestriensis*.

cestriensis, Prout, 1859, *Trans. St. Louis Acad. Sci.*, vol. 1, p. 448, Kaskaskia Gr.

decipiens, Ulrich, (in press,) *Geo. Sur. Ill.*, vol. 8, pl. 66, Kaskaskia Gr.

delicatula, Ulrich, (in press,) *Geo. Sur. Ill.*, vol. 8, pl. 64, Low Coal Meas.



FIG. 513.—*Sceptropora facula*, x 18. *a*, Segment; *b*, vertical section; *c*, transverse section; *d*, transverse section of expanded part.

pore.] Zoarium articulated; segments short, numerous, club-shaped, lower half striated, noncelluliferous; upper half expanded, celluliferous, and having one or more articulating sockets; zoecia subtubular, radially arranged about a central axis; apertures subovate. Type *S. facula*.

facula, Ulrich, 1888, *Am. Geo.*, vol. 1, p. 228, Hud. Riv. Gr.

SELENOPORA, Hall, 1887, *Pal. N. Y.*, vol. 6, p. xvii. [Ety. *selene*, moon; *poros*, pore.] Zoarium explanate, incrusting; apertures subcircular, with an elevated denticulate peristome, and situated within polygonal vestibular areas formed by connecting walls, which traverse the surface; interior structure as in *Lichenalia*. Type *S. circincta*.

circincta, Hall, 1881, (*Lichenalia circincta*), *Trans. Alb. Inst.*, vol. 10, p. 11, and *Pal. N. Y.*, vol. 6, p. 86, *Up. Held. Gr.*

complexa, Hall, 1881, (*Lichenalia complexata*), *Trans. Alb. Inst.*, vol. 10, p. 11, and *Pal. N. Y.*, vol. 6, p. 87, *Up. Held. Gr.*

robusta, Ulrich, (in press,) Geo. Sur. Ill., vol. 8, pl. 64, Up. Coal. Meas.

subquadrans, Ulrich, (in press,) Geo. Sur. Ill., vol. 8, pl. 64, Kaskaskia Gr.

SPATIOPIORA, Ulrich, 1882, Jour. Cin. Soc. Nat. Hist., p. 155. [Ety. *spatium*, spread out; *poros*, pore.] Thin, incrusting; surface smooth or tuberculated; cells shallow; interstitial cells and spiniform tubuli. Type *S. aspera*.

areolata, Foord, 1883, Cont. to Micropalæontology, p. 21, Trenton Gr.

aspera, Ulrich, 1883, Jour. Cin. Soc. Nat. Hist., vol. 6, p. 166, Hud. Riv. Gr.

lineata, Ulrich, 1883, Jour. Cin. Soc. Nat. Hist., vol. 6, p. 167, Hud. Riv. Gr.

maculosa, Ulrich, 1883, Jour. Cin. Soc. Nat. Hist., vol. 6, p. 167, Hud. Riv. Gr.

montifera, Ulrich, 1883, Jour. Cin. Soc. Nat. Hist., vol. 6, p. 168, Hud. Riv. Gr.



FIG. 514.—*Spatiopora tuberculata* on an *Orthoceras*.

tuberculata, Edwards & Haime, 1851, (*Chetetes tuberculatus*.) Pol. Foss. d. Terr. Pal., p. 268, Hud. Riv. Gr.

SPHRAGIOPORA, (in press,) Ulrich, Geo. Sur. Ill., vol. 8, p. 398. Parasitic, forming very small subhemispheric patches on foreign bodies; cells with circular apertures and slight peristome, arranged in a subradial manner, in single or double rows. Type *S. parasitica*.

parasitica, Ulrich, (in press,) Geo. Sur. Ill., vol. 8, pl. 65, Kaskaskia Gr. and Coal Meas.

STICTOPORA, Hall, 1847, Pal. N. Y., vol. 1, p. 73. [Ety. *stictos*, punctured; *poros*, pore.] Zoarium attached to foreign objects by an expanded base, ramose, branches thin, furnishing an acutely elliptical transverse section, and composed of two layers of cells, separated by epithelial laminæ; cell apertures oval or circular, surrounded by peristome, separated by raised longitudinal lines; no interstitial cells; margins nonporiferous and striated. Type *S. elegantula*.

acuta, Hall, 1847, Pal. N. Y., vol. 1, p. 74, Trenton Gr.

alcyone, Billings, 1865, (*Ptilodictya alcyone*.) Catal. Sil. Foss. Antic., p. 36, Anticosti Gr.

alternata, Hall, 1887, Pal. N. Y., vol. 6, pl. xxiii, A, Low. Held. Gr.

angularis, Hall, 1887, Pal. N. Y., vol. 6, p. 252, Ham. Gr.

arguta, Billings, 1865, (*Ptilodictya arguta*.) Catal. Sil. Foss. Antic., p. 36, Anticosti Gr.

basalis, Ulrich, 1882, Jour. Cin. Soc. Nat. Hist., vol. 5, p. 169, Trenton Gr.

bifurcata, VanCleve, 1883, 12th Rep. Ind. Geo. and Nat. Hist., p. 267, Niagara Gr.

bifurcata, Hall, see *S. bristolensis*.

bristolensis, n. sp. Ham. Gr. Proposed instead of *S. bifurcata*, Hall, 1887, Pal. N. Y., vol. 6, p. 254, which name was preoccupied.

carbonaria, Meek, 1871, Proc. Acad. Nat. Sci. Phil., p. 160, and Ohio Pal., vol. 2, p. 328, Coal. Meas.

compressa, VanCleve, 1883, 12th Rep. Ind. Geol., and Nat. Hist., p. 267, Niagara Gr.

crassa, Hall, 1852, Pal. N. Y., vol. 2, p. 45, Clinton Gr.

crescens, Hall, 1887, Pal. N. Y., vol. 6, p. 91, Up. Held. Gr.

crenulata, Hall, 1884, Rep. St. Geol., p. 44, Ham. Gr.

dichotoma, Hall, syn. for *Stictopora carbonaria*.

divergens, Hall, 1887, Pal. N. Y., vol. 6, p. 257, Ham. Gr.

elegantula, Hall, 1847, Pal. N. Y., vol. 1, p. 75, Trenton Gr.

fenestrata, see *Sulcopora fenestrata*.

fidelis, Ulrich, 1886, 14th Rep. Geo. Sur. Minn., p. 68, Trenton Gr.

fragilis, see *Dicranopora fragilis*.

fruticosa, Hall, 1881, Bryozoans of the Up. Held. Gr., p. 14, and Rep. St. Geol., pl. 25, fig. 12, 13, Up. Held. Gr.

gilberti, Meek, 1871, Proc. Acad. Nat. Sci. Phil., p. 63, and Ohio Pal., vol. 1, p. 94, Up. Held. Gr.

glomerata, Hall, 1847, Pal. N. Y., vol. 1, p. 17, Chazy Gr.

granatula, Hall, 1887, Pal. N. Y., vol. 6, p. 38, Low. Held. Gr.

granifera, Hall, 1884, Rep. St. Geol., p. 45, Ham. Gr.

graminifolia, Ringueberg, 1884, Proc. Acad. Nat. Sci., p. 147, Niagara Gr.

Very poorly defined.

incisurata, Hall, 1884, Rep. St. Geol., p. 38, Ham. Gr.

incrassata, Hall, 1884, Rep. St. Geol., p. 47, Ham. Gr.

indenta, Hall, syn. for *S. incisurata*.

interstriata, Hall, 1884, Rep. St. Geol., p. 45, Ham. Gr.

invertis, Hall, 1881, Bryozoans of the Up. Held. Gr., p. 15, and Rep. St. Geol., pl. 25, fig. 24-26, Up. Held. Gr.

labyrinthica, Hall, 1847, Pal. N. Y., vol. 1, p. 50, Birdseye Gr.

lichenoides, Meek, 1873, Ohio Pal., vol. 1, p. 194, Up. Held. Gr.

basalis, Ulrich, 1882, Jour. Cin. Soc. Nat. Hist., vol. 5, p. 169, Trenton Gr.

bifurcata, VanCleve, 1883, 12th Rep. Ind. Geo. and Nat. Hist., p. 267, Niagara Gr.

bifurcata, Hall, see *S. bristolensis*.

bristolensis, n. sp. Ham. Gr. Proposed instead of *S. bifurcata*, Hall, 1887, Pal. N. Y., vol. 6, p. 254, which name was preoccupied.

carbonaria, Meek, 1871, Proc. Acad. Nat. Sci. Phil., p. 160, and Ohio Pal., vol. 2, p. 328, Coal. Meas.

compressa, VanCleve, 1883, 12th Rep. Ind. Geol., and Nat. Hist., p. 267, Niagara Gr.

crassa, Hall, 1852, Pal. N. Y., vol. 2, p. 45, Clinton Gr.

crescens, Hall, 1887, Pal. N. Y., vol. 6, p. 91, Up. Held. Gr.

crenulata, Hall, 1884, Rep. St. Geol., p. 44, Ham. Gr.

dichotoma, Hall, syn. for *Stictopora carbonaria*.

divergens, Hall, 1887, Pal. N. Y., vol. 6, p. 257, Ham. Gr.

elegantula, Hall, 1847, Pal. N. Y., vol. 1, p. 75, Trenton Gr.

fenestrata, see *Sulcopora fenestrata*.

fidelis, Ulrich, 1886, 14th Rep. Geo. Sur. Minn., p. 68, Trenton Gr.

fragilis, see *Dicranopora fragilis*.

fruticosa, Hall, 1881, Bryozoans of the Up. Held. Gr., p. 14, and Rep. St. Geol., pl. 25, fig. 12, 13, Up. Held. Gr.

gilberti, Meek, 1871, Proc. Acad. Nat. Sci. Phil., p. 63, and Ohio Pal., vol. 1, p. 94, Up. Held. Gr.

glomerata, Hall, 1847, Pal. N. Y., vol. 1, p. 17, Chazy Gr.

granatula, Hall, 1887, Pal. N. Y., vol. 6, p. 38, Low. Held. Gr.

granifera, Hall, 1884, Rep. St. Geol., p. 45, Ham. Gr.

graminifolia, Ringueberg, 1884, Proc. Acad. Nat. Sci., p. 147, Niagara Gr.

Very poorly defined.

incisurata, Hall, 1884, Rep. St. Geol., p. 38, Ham. Gr.

incrassata, Hall, 1884, Rep. St. Geol., p. 47, Ham. Gr.

indenta, Hall, syn. for *S. incisurata*.

interstriata, Hall, 1884, Rep. St. Geol., p. 45, Ham. Gr.

invertis, Hall, 1881, Bryozoans of the Up. Held. Gr., p. 15, and Rep. St. Geol., pl. 25, fig. 24-26, Up. Held. Gr.

labyrinthica, Hall, 1847, Pal. N. Y., vol. 1, p. 50, Birdseye Gr.

lichenoides, Meek, 1873, Ohio Pal., vol. 1, p. 194, Up. Held. Gr.



FIG. 515.—*Stictopora carbonaria*.



FIG. 516.—*Stictopora gilberti*. Tangential section, showing lunarium.

limata, Hall, 1887, Pal. N. Y., vol. 6, p. 250, Ham. Gr.
 linearis, Hall, 1881, Bryozoans of the Up. Held. Gr., p. 15, and Rep. St. Geol., 1883, pl. 25, fig. 4-5, Up. Held. Gr.
 lobata, Hall, 1887, Pal. N. Y., vol. 6, p. 256, Ham. Gr.
 magna, Hall & Whitfield, 1875, Ohio Pal., vol. 2, p. 112, Niagara Gr.
 multifida, VanCleve, 1883, 12th Rep. Ind. Geol. and Nat. Hist., p. 268, Niagara Gr.
 multipora, Hall, syn. for *S. incisurata*.

ovata, Hall, 1887, Pal. N. Y., vol. 6, p. 248, Ham. Gr.
 ovatipora, Hall, 1881, Bryozoans of the Up. Held. Gr., p. 14, and Rep. St. Geol., pl. 25, fig. 23, 23a, Up. Held. Gr.
 palmipes, Hall, 1884, Rep. St. Geol., p. 41, Ham. Gr.
 papillosa, Hall, 1883, Rep. St. Geol., pl. 13, fig. 12-13, Low. Held. Gr.
 paupera, Ulrich, 1886, 14th Rep. Geo. Sur. Minn., p. 69, Trenton Gr.
 perarcta, Hall, 1881, Bryozoans of the Up. Held. Gr., p. 15, and Pal. N. Y., vol. 6, p. 96, Up. Held. Gr.
 permarginata, Hall, 1884, Rep. St. Geol., p. 46, Ham. Gr.
 punctipora, Hall, 1852, Pal. N. Y., vol. 2, p. 157, Niagara Gr.
 ramosa, Hall, 1847, Pal. N. Y., vol. 1, p. 51, Birdseye Gr.
 raripora, Hall, 1852, Pal. N. Y., vol. 2, p. 46, Clinton Gr.
 recta, Hall, 1887, Pal. N. Y., vol. 6, p. 253, Ham. Gr.
 rectilinea, Hall, 1887, Pal. N. Y., vol. 6, p. 245, Ham. Gr.
 rectilatera, Hall, syn. for *S. linearis*.
 recubans, Hall, 1884, Pal. N. Y., vol. 6, p. 260, Ham. Gr.
 rhomboidea, Hall, 1881, Bryozoans of the Up. Held. Gr., p. 15, and Pal. N. Y., vol. 6, p. 95, Up. Held. Gr.

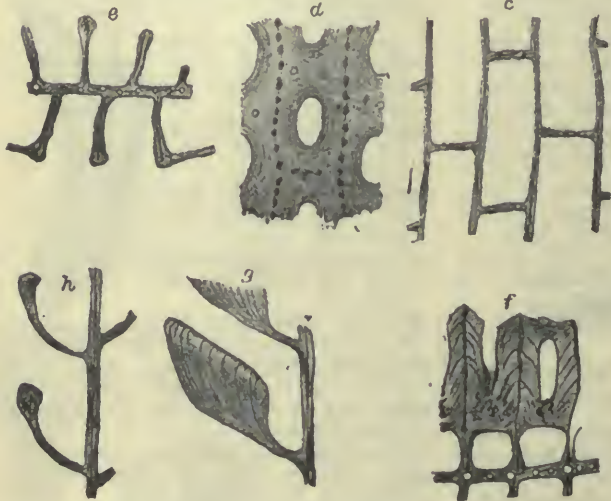


FIG. 517.—*Stictopora mutabilis*. Deep tangential section x 50, showing the primitive portion of the zoecia and the median tubullus in their walls; d, tangential section x 50; e, transverse section x 50, showing median tubullus; f, transverse section x 50; g, vertical section x 50; h, vertical section x 50.

mutabilis, Ulrich, 1886, 14th Rep. Geo. Sur. Minn., p. 66, Trenton Gr.
 nitidula, see *Dicranopora nitidula*.
 obliqua, syn. for *S. incisurata*.
 obliqua, Ringueberg, see *Ptilodictya obliqua*.
 obsoleta, Hall, 1887, Pal. N. Y., vol. 6, p. 37, Low. Held. Gr.

rigida, Hall, 1881, Bryozoans of the Up. Held. Gr., p. 14, and Rep. St. Geol., 1883, pl. 25, fig. 15-16, Up. Held. Gr.
 rustica, Billings, 1865, (*Ptilodictya rustica*), Catal. Sil. Foss. Anticosti, p. 36, Anticosti Gr.
 scitula, Hall, 1887, Pal. N. Y., vol. 6, pl. lxi, Niagara Gr.
 scutulata, see *Ptilodictya scutulata*.
 semistriata, Hall, 1881, Bryozoans of the Up. Held. Gr., p. 14, and Rep. St. Geol., 1883, pl. 25, fig. 17-20, Up. Held. Gr.
 serrata, see *Prismopora serrata*.

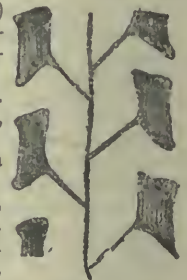


FIG. 519.—*Stictopora punctipora*. Section x 50.

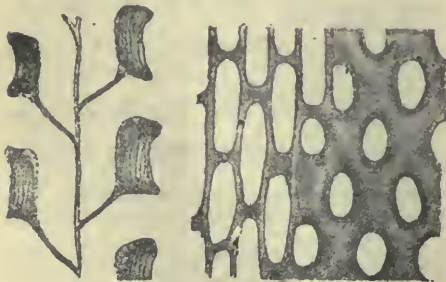


FIG. 518.—*Stictopora ovatipora*.

orbipora, Hall, 1879, Desc. New Spec. Foss., p. 5, and 11th Rep. Ind. Geo. and Nat. Hist., p. 248, Niagara Gr.

shafferi, see *Arthropora shafferi*.
 similis, Hall, 1876, 28th Rep. N. Y. St. Mus. Nat. Hist., p. 122, Niagara Gr.
 sinuosa, Hall, 1884, Rep. St. Geol., p. 42, Ham. Gr.

striata, Hall, 1887, Pal. N. Y., vol. 6, p. 246, Ham. Gr.

subcarinata, see *Tæniopora subcarinata*.
subrigida, Hall, 1884, Rep. St. Geol., p. 43, Ham. Gr.

sulcata, Winchell, 1866, Rep. Low. Penin. Mich., p. 92, Ham. Gr.

tenera, Billings, 1865, (*Ptilodictya tenera*.)
Catal. Sil. Foss. Antic., p. 36, Anticosti Gr.

trilineata, Hall, 1887, Pal. N. Y., vol. 6, p. 243, Ham. Gr.

triserialis, see *Acanthoclema triseriale*.
tumulosa, Hall, 1887, Pal. N. Y., vol. 6, p. 246, Ham. Gr.

vancelevi, Hall, 1883, 12th Rep. Ind. Geol. and Nat. Hist., p. 268, Niagara Gr.

variabilis, Prout, 1866, Trans. St. Louis Acad. Sci., vol. 2, p. 413, Up. Held. Gr.

vermicula, Hall, 1887, Pal. N. Y., vol. 6, p. 93, Up. Held. Gr.

STICTOPORELLA, Ulrich, 1882, Jour. Cin. Soc. Nat. Hist., vol. 5, p. 152. [Ety. diminutive of *Stictopora*.] Distinguished from *Stictopora* by interstitial pits between the longer diameters of the cell apertures. Type *S. interstincta*.

angularis, Ulrich, 1886, 14th Rep. Geo. Sur. Minn., p. 71, Trenton Gr.

? basalis, Ulrich, (in press.) Geo. Sur. Ill., vol. 8, pl. 68, 69, and 75, Keokuk Gr.

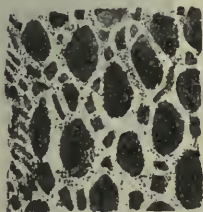


FIG. 520.—*Stictoporella interstincta*. Natural size and magnified 18 diam.

cribrosa, Ulrich, 1886, 14th Rep. Geo. Sur. Minn., p. 69, Trenton Gr.

frondifera, Ulrich, 1886, 14th Rep. Geo. Sur. Minn., p. 72, Trenton Gr.



FIG. 521.—*Stictoporella interstincta*.

interstincta, Ulrich, 1882, Jour. Cin. Soc. Nat. Hist., vol. 5, p. 169, Utica Slate Gr.

? undulata, Ulrich, (in press.) Geo. Sur. Ill., vol. 8, pl. 69, Kaskaskia Gr.

STICTOPORINA, Hall, 1887, Pal. N. Y., vol. 6, p. xx. [Ety. diminutive of *Stictopora*.]

Zoarium obtusely pointed at the base, enlarging above and becoming flattened; bifurcations, few; cells tubular arising from a mesotheca; apertures oval; interapertural space elevated, angular, inclosing the apertures in rhomboidal or polygonal areas. Type *S. claviformis*.
claviformis, Hall, 1881, (*Trematopora claviformis*.) Trans. Alb. Inst., vol. 10, p. 181, and Pal. N. Y., vol. 6, p. 269, Ham. Gr.

Stictotrypa, Ulrich, (in press.) Geo. Sur. Ill., vol. 8. Syn. (?) for *Stictopora*.

STOMATOPORA, Bronn, 1825, System d. urwetl. Pflanzenthier. [Ety. *stoma*, mouth; *poros*, perforation.] Zoarium adnate; cells in single branching series, mouths elevated, and at the end of the tubular cells. Type *S. dichotoma*.

alternata, Hall & Whitfield, 1873, 23d Rep. N. Y. St. Mus. Nat. Hist., p. 235, Chemung Gr.

auloporoides, Nicholson, 1875, (*Alecto auloporoides*.) Ohio Pal., vol. 2, p. 267, Hud. Riv. Gr.

confusa, Nicholson, 1875, (*Alecto confusa*.) Ohio Pal., vol. 2, p. 267, Hud. Riv. Gr.

frondosa, Nicholson, 1875, (*Alecto frondosa*.) Ohio Pal., vol. 2, p. 266, Hud. Riv. Gr.

inflata, Hall, 1847, (*Alecto inflata*.) Pal. N. Y., vol. 1, p. 77, Trenton and Hud. Riv. Grs.

nexilis, James, 1875, (*Alecto nexilis*.) Int. to Catal. Cin. Foss., p. 3, Hud. Riv. Gr.

pertenuis, Ulrich, 1886, (*Rhopalonaria pertenuis*.) 14th Ann. Rep. Geol. Sur. Minn., p. 59, Trenton Gr.

proutana, S. A. Miller, 1882, Jour. Cin. Soc. Nat. Hist., vol. 5, p. 39, Hud. Riv. Gr.

STREBLOTRYPA, Ulrich, (in press.) Geo. Sur. Ill., vol. 8, p. 403. [Ety. *streblos*, turned about; *trupa*, an opening.] Ramose, slender, solid; cells radiating from an imaginary axis, their primitive portion long, tubular; or from a linear axis when they are somewhat shorter; inferior hemisepta best developed, situated rather far down; apertures regularly elliptical, or somewhat truncated at the posterior margin, surrounded by a slight peristome and, within this, sometimes a narrow sloping area; arranged usually in rather regular longitudinal series; back of the aperture, occupying the depressed front of the cell, there are from one to twelve or more small pits, which, when numerous, are arranged in two or three rows; small acanthopores occasionally present. Type *S. nicklesi*.



FIG. 522.—*Stomatopora inflata*. Natural size and magnified.

- denticulata, Ulrich, 1888, (in press.) Bull. Denison Univ., vol. 4, p. 85, Cuyahoga shale.
- distincta, Ulrich, Geo. Sur. Ill., vol. 8, pl. 71, Kaskaskia Gr.
- hamiltonensis, Nicholson, 1874, (Ceriopora hamiltonensis.) Geo. Mag., vol. 1, p. 161, Ham. Gr.
- hertzeri, Ulrich, 1888, Bull. Denison Univ., vol. 4, p. 85, Cuyahoga shale.
- major, Ulrich, (in press.) Geo. Sur. Ill., vol. 8, pl. 71, Keokuk Gr.
- multiporata, Ulrich, 1888, Bull. Denison Univ., vol. 4, p. 87, Waverly Gr.
- nicklesi, Ulrich, (in press.) Geo. Sur. Ill., vol. 8, pl. 71, Kaskaskia Gr.
- obliqua, Ulrich, 1888, Bull. Denison Univ., vol. 4, p. 85, Cuyahoga shale.
- radialis, Ulrich, (in press.) Geo. Sur. Ill., vol. 8, pl. 72, Keokuk Gr.
- regularis, Ulrich, 1888, Bull. Denison Univ., vol. 4, p. 88, Waverly Gr.
- striata, Ulrich, 1888, Bull. Denison Univ., vol. 4, p. 87, Waverly Gr.
- subspinosa, Ulrich, (in press.) Geo. Sur. Ill., vol. 8, pl. 71, Kaskaskia Gr.
- STROTOPORA**, Ulrich, (in press.) Geo. Sur. Ill., vol. 8, p. 383. [Ety. *strotos*, spread; *poros*, pore.] Ramose, branches large, irregular, solid or hollow; large, abruptly spreading cells, which are supposed to represent oecia, are distributed among the ordinary zoecia; when well-preserved they appear on the zoarial surface as strongly convex nodes, about 0.5 mm. in diameter, with an opening on one side. In all other respects like *Fistulipora*. Type *S. foveolata*.
- dermata, Ulrich, (in press.) Geo. Sur. Ill., vol. 8, pl. 77, Keokuk Gr.
- foveolata, Ulrich, (in press.) Geo. Sur. Ill., vol. 8, pl. 77, Keokuk Gr.
- perminuta, Ulrich, (in press.) Geo. Sur. Ill., vol. 8, pl. 47, Up. Held. Gr.
- SUBRETEPORA**, D'Orbigny, 1850, Prodr. d. Paléont., t. 1, p. 22. [Ety. from *Retepora*.] Filiform, cylindrical branches, irregularly anastomosing; cells in a single row on the upper side of the branches (Ulrich says from 2 to 8 rows); apertures circular or oval. Type *S. reticulata*.
- angulata, Hall, 1852, (Retepora angulata.) Pal. N. Y., vol. 2, p. 163, Niagara Gr.
- aspera, Hall, 1847, (Gorgonia (?) aspera.) Pal. N. Y., vol. 1, p. 16, Chazy Gr.
- asperatostriata, Hall, 1852, (Retepora asperatostriata.) Pal. N. Y., vol. 2, p. 161, Niagara Gr.
- clathrata, Miller & Dyer, 1878, (Intricaria clathrata.) Cont. to Pal., No. 2, p. 7, Hud. Riv. Gr.
- corticosa, Ulrich, 1886, (Phylloporina corticosa.) 14th Rep. Geo. Sur. Minn., p. 61, Trenton Gr.

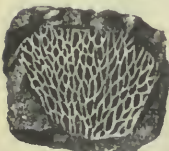


FIG. 523.—Subretepora angulata.

- dawsoni, Ulrich, (in press.) (Phylloporina dawsoni.) Geo. Sur. Ill., vol. 8, pl. 54, Trenton Gr.
- dichotoma, Hall, 1852, (Hornera dichotoma.) Pal. N. Y., vol. 2, p. 163, Niagara Gr.
- fenestrata, Hall, 1850, (Retepora fenestrata.) 3d Rep. N. Y. St. Mus. Nat. Hist., p. 178, Trenton Gr.
- gracilis, Hall, 1847, (Retepora gracilis.) Pal. N. Y., vol. 1, p. 15, Chazy Gr.
- incepta, Hall, 1847, (Retepora incepta.) Pal. N. Y., vol. 1, p. 15, Chazy Gr.
- reticulata, Hall, 1847, (Intricaria reticulata.) Pal. N. Y., vol. 1, p. 77, Trenton Gr.
- trentonensis, Nicholson, 1875, (Retepora trentonensis.) Geo. Mag., vol. 2, p. 37, Trenton Gr.
- variolata, Ulrich, 1882, (Phylloporina variolata.) Jour. Cin. Soc. Nat. Hist., vol. 5, p. 160, Hud. Riv. Gr.

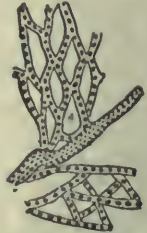


FIG. 524.—Subretepora reticulata. Natural size and magnified.

- SULCOPORA**, D'Orbigny, 1850, Prodr. d. Paléont., t. 1, p. 22. [Ety. *sulcus*, furrow; *poros*, pore.] Distinguished from *Stictopora* by the obtuse extremities of the branches, and by the perpendicular rows of apertures separated by elevated ridges and cross bars. Type *S. fenestrata*.



FIG. 525.—Sulcopora fenestrata. Natural size and magnified.

- fenestrata, Hall, 1847, (Stictopora fenestrata.) Pal. N. Y., vol. 1, p. 16, Chazy Gr.

- SYNOCLADIA**, King, 1849, Ann. and Mag. Nat. Hist., 2d ser., vol. 3, p. 389. [Ety. *syn*, together; *klados*, young branch.] Cup-shaped,

with a central root-like base; reticulated, composed of rounded, narrow, often branched interstices, bearing on the inner face from 3 to 5 alternating, longitudinal rows of prominent edged cells, separated by narrow keels, studded with vesicles; dissepiments thin, spur-shaped, extending upward, and meeting those from the adjoining interstice, and bearing two rows of cells. Type *S. virgulacea*.

biserialis, Swallow, 1858, Trans. St. Louis Acad. Sci., p. 179, Up. Coal Meas.

rectistyla, Whitfield, 1882, Ann. N. Y. Acad. Sci., vol. 2, p. 220, Kaskaskia Gr.

TÆNODICTYA, Ulrich, (in press,) Geo. Sur. Ill., vol. 8. [Ety. *tainia*, ribbon; *dictyon*, net.] Zoaria growing from a basal expansion into dichotomously divided narrow branches or broad fronds; cell structure very much as in some species of Ptilodictya (*P. pavonia*, D'Orb.); apertures elliptical or subcircular, surrounded by a sloping area; interspaces ridge-like; both "hemisepta" present. Type *T. ramulosa*.



FIG. 526.—Tæniodictya cingulata. Tangential section $\times 50$, showing a transverse lining of the central region of the walls, a character often present among the Ptilodictyonidae.

cingulata, Ulrich, (in press,) Geo. Sur. Ill., vol. 8, pl. 67, Keokuk Gr.

frondosa, Ulrich, (in press,) Geo. Sur. Ill., vol. 8, pl. 70, Keokuk Gr.

interpolata, Ulrich, 1888, Bull. Denison Univ., vol. 4, p. 80, Cuyahoga Shale.

ramulosa, Ulrich, (in press,) Geo. Sur. Ill., vol. 8, pl. 67, Keokuk Gr.

ramulosa var. burlingtonensis, Ulrich, (in press,) Geo. Sur. Ill., vol. 8, pl. 67, Burlington Gr.

subrecta, Ulrich, (in press,) Geo. Sur. Ill., vol. 8, pl. 67, St. Louis Gr.

TÆNIOFORA, Nicholson, 1874, Geo. Mag. Lond. n. s., vol. 1, p. 120. [Ety. *tainia*, ribbon; *poros*, pore.] Flattened linear expansion; dichotomous; celluliferous on both sides. Distinguished from Ptilodictya and Stictopora by a central, longitudinal keel, which divides the frond into two lateral halves, and by prominent cell-mouths. Type *T. exigua*. *exigua*, Nicholson, 1874, Geo. Mag. Lond. n. s., vol. 1, p. 122, Ham. Gr.

occidentalis, Ulrich, (in press,) Geo. Sur. Ill., vol. 8, pl. 42, Ham. Gr.

penniformis, Nicholson, 1874, Geo. Mag. Lond. n. s., vol. 1, p. 123, Ham. Gr.

subcarinata, Hall, 1881, (Stictopora subcarinata,) Trans. Alb. Inst., vol. 10, p. 191, and Pal. N. Y., vol. 6, p. 261, Ham. Gr.



FIG. 527.—Tæniofora penniformis. a, Natural size; b, transverse section enlarged; c, fragment enlarged.

confertipora, see *Fistulipora confertipora*.

decipiens, see *Fistulipora decipiens*.

densa, see *Fistulipora densa*,

digitata, see *Fistulipora digitata*.

inclusa, see *Favicella inclusa*.

intercellatum, see *Fistulipora intercellata*.

lamellatum, see *Fistulipora lamellata*.

longimacula, see *Fistulipora longimacula*.

micropora, see *Fistulipora micropora*.

multaculeata, see *Fistulipora multaculeata*.

plana, see *Fistulipora plana*.

scrobiculata, see *Fistulipora scrobiculata*.

segregata, see *Fistulipora segregata*.

serrulata, see *Fistulipora serrulata*.

sparsipora, see *Prismopora sparsipora*.

spheroidea, see *Fistulipora spheroidea*.

subtilis, see *Fistulipora subtilis*.

triangularis, see *Fistulipora triangularis*.

umbilicata, see *Fistulipora umbilicata*.

variopora, see *Fistulipora variopora*.

THAMNISCUS, King, 1849, Ann. and Mag. Nat. Hist., 2d ser., vol. 3, p. 389. [Ety. *thamniskos*, little shrub.] Stems frequently bifurcating more or less on one plane; celluliferous on the side overlooking the imaginary axis; cells imbricated and arranged in quincunx; gemmuliferous vesicles overlying the cell apertures. Type *T. dubius*.

cisseis, Hall, 1883, Rep. St. Geol., pl. 22, fig. 23-30, Low. Held. Gr.

diffusus, Hall, 1852, (Retepora diffusa,) Pal. N. Y., vol. 2, p. 160, Niagara Gr.

fruticella, Hall, 1883, Rep. St. Geol. pl. 22, fig. 33, Low. Held. Gr.

divaricans, Ulrich, (in press,) Geo. Sur. Ill., vol. 8, pl. 62, Keokuk Gr.

furcillatus, Ulrich, (in press,) Geo. Sur. Ill., vol. 8, pl. 62, Kaskaskia Gr.

multiramus, Hall, 1881, Bryozoans of the Up. Held. Gr., p. 19, and Rep. St. Geol. 1883, pl. 26, fig. 1-5, Up. Held. Gr.

nanus, Hall, 1881, Bryozoans of the Up. Held. Gr., p. 19, Up. Held. Gr.

niagarensis, Hall, 1876, 28th Rep. N. Y. St. Mus. Nat. Hist., p. 126, Niagara Gr.

nysa, Hall, 1883, Rep. St. Geol., pl. 22, fig. 47-48, Lower Held. Gr.

octonarius, Ulrich, (in press,) Geo. Sur. Ill., vol. 8, pl. 62, Up. Coal Meas.

pauciramus, Hall, 1884, Rep. St. Geol., p. 60, Ham. Gr.

ramulosus, Ulrich, (in press,) Geo. Sur. Ill., vol. 8, pl. 62, Kaskaskia Gr.

ramulosus var. sevillensis, Ulrich, (in press,) Geo. Sur. Ill., vol. 8, pl. 62, Low. Coal Meas.



FIG. 528.—Thamniscus niagarensis.

Thallistigma, Hall, syn for *Fistulipora*.

- variolata*, Hall, 1883, Rep. St. Geol., pl. 22, fig. 34-46, Low. Held. Gr.
sculptilis, Ulrich, (in press.) Geo. Sur. Ill., vol. 8, pl. 62, Keokuk Gr.
Thamnopora, Hall. This name was preoccupied. See *Thamnotrypa*.
divaricata, see *Thamnotrypa divaricata*.
THAMNOTRYPA, Hall, 1887, Pal. N. Y., vol. 6, p. 101. [Ety. *thamnos*, bush; *trupa*, perforation.] Narrow, branching stipe, celluliferous on both sides; the divisions are not by bifurcation, as in *Stictopora*, but by lateral and abrupt divergence from the main stipe. Type *T. divaricata*.
divaricata, Hall, 1881, Trans. Alb. Inst., vol. 10, p. 16, and Pal. N. Y., vol. 6, p. 101, Up. Held. Gr.
TREMATELLA, Hall, 1886, Rep. St. Geol. and Pal. N. Y., vol. 6, p. xiv. [Ety. *trema*, hole; *ellus*, diminutive.] Ramose, solid; cells tubular, in contact below, diverging near the surface, intersected by septa; interapertural surface marked by pseudo-pores. Type *T. annulata*.
annulata, Hall, 1881, (*Trematopora annulata*,) Bryozoans of the Up. Held. Gr., p. 5, and Pal. N. Y., vol. 6, p. 69, Up. Held. Gr.
arborea, Hall, 1881, (*Trematopora arborea*,) Bryozoans of the Up. Held. Gr., p. 5, and Pal. N. Y., vol. 6, p. 69, Up. Held. Gr.
glomerata, Hall, 1887, Pal. N. Y., vol. 6, p. 70, Up. Held. Gr.
nodosa, Hall, 1887, Pal. N. Y., vol. 6, p. 176, Ham. Gr.
perspinulata, Hall, 1881, (*Trematopora perspinulata*,) Trans. Alb. Inst., vol. 10, p. 181, and Pal. N. Y., vol. 6, p. 175, Ham. Gr.
TREMATOPORA, Hall, 1852, Pal. N. Y., vol. 2, p. 149. [Ety. *trema*, hole; *poros*, pore; Ramose, branches solid, tuberculated or smooth; interstitial cells, spiniform tubuli, and diaphragms present. Type *T. tuberculosa*.
alternata, see *Acanthoclema alternatum*.
americana, S. A. Miller, Jour. Cin. Soc. Nat. Hist., p. 312, Burlington Gr.
annulifera, Whitfield, 1878, Ann. Rep. Geo. Sur. Wis., p. 67, and Geo. Wis., vol. 4, p. 254, Hud. Riv. Gr.
annulata, see *Trematella annulata*.
annulata var. *pronaspina*, Hall, 1881, Bryozoans of the Up. Held. Gr., p. 6, Up. Held. Gr.
arborea, see *Trematella arborea*.
aspera, Hall, 1852, Pal. N. Y., vol. 2, p. 154, Niagara Gr.
calloporoides, Ulrich, (in press.) Geo. Sur. Ill., vol. 8, pl. 38, Galena Gr.
camerata, see *Diamesopora camerata*.
canaliculata, Hall, 1883, Rep. St. Geol. pl. 11, fig. 12, Low. Held. Gr.
carinata, Hall, 1887, Pal. N. Y., vol. 6, p. 179, Ham. Gr.
claviformis, see *Stictopora claviformis*.
coalescens, Hall, 1852, Pal. N. Y., vol. 2, p. 150, Niagara Gr.
constricta see *Diamesopora constricta*.
corticosa, Hall, 1874, 26th Rep. N. Y. St. Mus. Nat. Hist., p. 105, and Pal. N. Y., vol. 6, p. 15, Low. Held. Gr.
crassa, see *Lichenalia crassa*.
crebripora, Hall, 1879, Desc. New Spec., Foss., p. 3, and 11th Rep. Ind., Geol. and Nat. Hist., p. 236, Niagara Gr.
debilis, Ulrich, (in press.) Geo. Sur. Ill., vol. 8, pl. 34, Galena Gr.
densa, Hall, 1874, 26th Rep. N. Y. St. Mus. Nat. Hist., p. 105, Low. Held. Gr.
dispersa, see *Diamesopora dispersa*.
echinata, Hall, 1876, 26th Rep. N. Y. St. Mus. Nat. Hist., p. 112, Niagara Gr.
elongata, Hall, 1887, Pal. N. Y., vol. 6, p. 183, Ham. Gr.
fragilis, Winchell, 1863, Proc. Acad. Nat. Sci., p. 3, Waverly Gr.
granifera, Hall, 1887, Pal. N. Y., vol. 6, p. 186, Ham. Gr.
granistriata, see *Bactropora granistriata*.
granulata, Whitfield, 1878, Ann. Rep. Geo. Sur. Wis., vol. 4, p. 253, Hud. Riv. Gr.
granulifera, Hall, 1852, Pal. N. Y., vol. 2, p. 154, Niagara Gr. The same species is marked "n. sp." in 28th Rep. N. Y. St. Mus. Nat. Hist., probably by mistake.
halli, Ulrich, 1883, Jour. Cin. Soc. Nat. Hist., vol. 6, p. 261, Niagara Gr.
hexagona, Hall, 1852, Pal. N. Y., vol. 2, p. 149, Infrequens. Much enlarged.
immersa, Hall, 1887, Pal. N. Y., vol. 6, p. 185, Ham. Gr.
infrequens, Hall, 1876, 28th Rep. N. Y. St. Mus. Nat. Hist., p. 111, Niagara Gr.
interplana, Hall, 1887, Pal. N. Y., vol. 6, p. 186, Ham. Gr.
lineata, Hall, 1887, Pal. N. Y., vol. 6, p. 181, Ham. Gr.
macropora, Hall, 1879, Desc. New Spec., Foss., p. 4, and 11th Rep. Ind. Geo. and Nat. Hist., p. 236, Niag. Gr.
maculosa, see *Lichenalia maculosa*.
minuta, Hall, 1876, 28th Rep. N. Y. St. Mus. Nat. Hist., p. 113, Niagara Gr.
nitida, Ulrich, (in press.) Geo. Sur. Ill., vol. 8, pl. 34, Hud. Riv. Gr.
nodosa, Hall, 1887, Pal. N. Y., vol. 6, pl. xxiii, Low. Held. Gr.
orbipora, Hall, 1884, Rep. St. Geol., p. 12, Ham. Gr.
ornata, Ulrich, 1886, 14th Rep. Geo. Sur. Minn., p. 98, Trenton Gr.
osculum, Hall, 1876, 28th Rep. N. Y. St. Mus. Nat. Hist., p. 110, Niagara Gr.
ostiolata, see *Chilotrypa ostiolata*.



FIG. 529. — *Trematopora* 1887, Pal. N. Y., Infrequens. Much enlarged.

ovatipora, Hall, 1883, Rep. St. Geol., pl. 11, fig. 13-14, Low. Held. Gr.
 parallela, Hall, 1883, Rep. St. Geol., pl. 11, fig. 13-14, Low. Held. Gr.
 perspinulata, Hall, 1884, Rep. St. Geol., p. 11, Ham. Gr.
 polygona, Hall, 1884, Rep. St. Geol., p. 9, Ham. Gr.
 ponderosa, Hall, 1874, 26th Rep. N. Y. St. Mus. Nat. Hist., p. 106, Low. Held. Gr.
 punctata, Hall, 1852, Pal. N. Y., vol. 2, p. 151, Niagara Gr.
 primigenia, Ulrich, 1886, 14th Rep. Geo. Sur. Minn., p. 97, Trenton Gr.

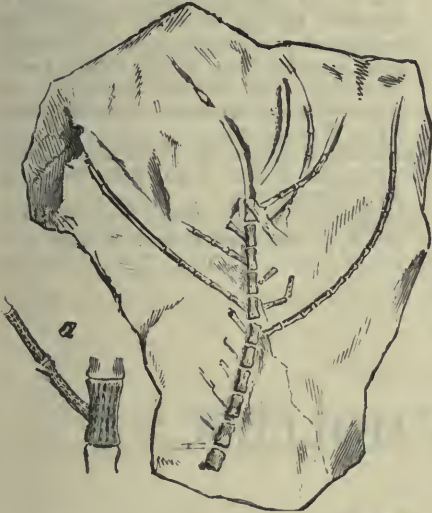


FIG. 530.—*Arthroclema pulchellum*. a, Magnified view. (See page 293.)

rectilinea, Hall, 1881, Bryozoans of the Up. Held. Gr., p. 6, Up. Held. Gr.
regularis, see *Orthopora regularis*.
rhombifera, see *Orthopora rhombifera*.
scutulata, see *Acanthoclema scutulatum*.
scutulata, see *Orthopora scutulata*.
signata, see *Callotrypa macropora* var. *signata*.
solida, Hall, 1852, Pal. N. Y., vol. 2, p. 153, Niagara Gr.
sparsa, Hall, 1852, Pal. N. Y., vol. 2, p. 155, Niagara Gr.
spiculata, Hall, 1877, 1st Ed. Am. Pal. Foss., p. 245, Niagara Gr.
spinulosa, Hall, 1852, Pal. N. Y., vol. 2, p. 155, Niagara Gr.
spinulosa, Hall, 1876, 28th Rep. N. Y. St. Mus. Nat. Hist. The name was preoccupied. See *T. spiculata*.
striata, Hall, 1852, Pal. N. Y., vol. 2, p. 153, Niagara Gr.
subimbricata, Hall, 1879, Desc. New Spec. Foss., p. 4, and 11th Rep. Ind. Geo., p. 234, Niagara Gr.
subquadrata, Hall, 1884, Rep. St. Geol., p. 11, Ham. Gr.
superba, Billings, 1866, Catal. Sil. Foss. Antic., p. 93, Clinton and Niagara Grs.

tortilinea, Hall, 1884, Rep. St. Geol., p. 10, Ham. Gr.
transversa, Hall, 1884, Rep. St. Geol., p. 8, Ham. Gr.
tuberculosa, Hall, 1852, Pal. N. Y., vol. 2, p. 149, Niagara Gr.
tubulosa, Hall, 1852, Pal. N. Y., vol. 2, p. 151, Niagara Gr.
varia, Hall, 1876, 28th Rep. N. Y. St. Mus. Nat. Hist., p. 111, Niagara Gr.
variolata, Hall, 1876, 28th Rep. N. Y. St. Mus. Nat. Hist., p. 113, Niagara Gr.
vesiculosa, Winchell, 1863, Proc. Acad. Nat. Sci., p. 3, Burlington Gr.
whitfieldi, Ulrich, 1883, Jour. Cin. Soc. Nat. Hist., vol. 6, p. 262, Niagara Gr.
TROPIDOPORA, Hall, 1887, Pal. N. Y., vol. 6, p. 71. [Ety. *tropis*, keel; *poros*, pore.]
 Ramose, solid, cells in irregular longitudinal rows, separated by sinuous ridges; peristomes thin, slightly elevated. Type *T. nana*.
nana, Hall, 1887, Pal. N. Y., vol. 6, p. 71, Up. Held. Gr.
Tuberculopora, Ringueberg, 1886, Bull. Buf. Soc. Nat. Sci., vol. 5, p. 21. Not properly defined.
inflata, Ringueberg, 1886, Bull. Buf. Soc. Nat. Sci., vol. 5, p. 21. Not properly defined.

UNITRYPA, Hall, 1885, Rep. St. Geol., p. 36. [Ety. *unus*, one; *trupa*, perforation.]
 Form like *Fenestella*, having the branches connected by dissepiments; cell apertures, in two ranges, separated by carine, which are elevated, widened at the summit, and connected by thin, lateral processes or scalæ more or less numerous. Type *U. lata*.

acaulis, Hall, 1881, (*Fenestella acaulis*), Bryozoans of Up. Held. Gr., p. 33, and Pal. N. Y., vol. 6, p. 131, Up. Held. Gr.
acaulis var. *inclinis*, Hall, 1887, Pal. N. Y., vol. 6, p. 132, Up. Held. Gr.

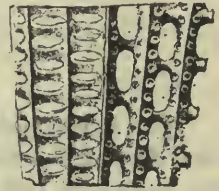


FIG. 531.—*Unitrypa lata*

acclivis, Hall, 1887, Pal. N. Y., vol. 6, p. 138, Up. Held. Gr.
biserialis, Hall, 1882, (*Fenestella biserialis*), Rep. St. Geol. and Pal. N. Y., vol. 6, p. 57, Low. Held. Gr.
conferta, Ulrich, 1886, Cont. to Am. Pal., p. 17, Up. Held. Gr.
consimilis, Hall, 1887, Pal. N. Y., vol. 6, p. 142, Up. Held. Gr.
elegantissima, Hall, 1881, (*Fenestella elegantissima*), Trans. Alb. Inst., vol. 10, p. 36, and Pal. N. Y., vol. 6, p. 140, Up. Held. Gr.
fastigata, Hall, 1881, (*Fenestella fastigata*), Trans. Alb. Inst., vol. 10, p. 36, and Pal. N. Y., vol. 6, p. 141, Up. Held. Gr.
ficticius, Hall, 1887, Pal. N. Y., vol. 6, p. 137, Up. Held. Gr.

- lata, Hall, 1881, (*Fenestella lata*.) Trans. Alb. Inst., vol. 10, p. 34, and Pal. N. Y., vol. 6, p. 136, Up. Held. Gr.
- nana, Hall, 1887, Pal. N. Y., vol. 6, p. 133, Up. Held. Gr.
- nervia, Hall, 1874, (*Fenestella nervia*.) 26th Rep. N. Y. St. Mus. Nat. Hist., p. 93, Low. Held. Gr.
- nervia var. constricta, Hall, 1879, (*Fenestella nervia* var. *constricta*.) 32d Rep. N. Y. St. Mus. Nat. Hist., p. 174, Low. Held. Gr.
- præcursor, Hall, 1874, (*Fenestella præcursor*.) 26th Rep. N. Y. St. Mus. Nat. Hist., p. 94, Low. Held. Gr.
- pernodosa, Hall, 1881, (*Fenestella pernodosa*.) Trans. Alb. Inst., vol. 10, p. 35, Pal. N. Y., vol. 6, p. 139, Up. Held. Gr.
- projecta, Hall, 1887, Pal. N. Y., vol. 7, p. 132, Up. Held. Gr.
- retrorsa, Ulrich, 1886, Cont. to Am. Pal., p. 15, Up. Held. Gr.
- scalaris, Hall, 1884, (*Fenestella scalaris*.) 36th Rep. N. Y. St. Mus. Nat. Hist., p. 68, Ham. Gr.
- spatiosa, Hall, syn. for *U. lata*.
- stipata, Hall, 1881, (*Fenestella stipata*.) Trans. Alb. Inst., vol. 10, p. 34, and Pal. N. Y., vol. 6, p. 134, Up. Held. Gr.
- tegulata, Hall, 1881, (*Fenestella tegulata*.) Trans. Alb. Inst., vol. 10, p. 34, and Pal. N. Y., vol. 6, p. 135, Up. Held. Gr.
- transversa, Hall, 1887, Pal. N. Y., vol. 7, p. 132, Up. Held. Gr.
- WORTHENOPORA, Ulrich, (in press,) Geo. Sur. Ill., vol. 8, p. 403. [Ety. proper name.] Bifoliate, branching or palmate; cells regularly arranged, sub-tubular or elongate rhomboidal, with the aperture semi-elliptical; on the surface the line of junction between the cells is marked by an elevated ridge; the truncated posterior margin of the aperture is raised into a less strong transverse bar; the elongate triangular depressed front appears perfectly plane. Type *W. spinosa*.
- spatulata, Prout, 1859, (*Flustra spatulata*.) Trans. St. Louis Acad. Sci., vol. 1, p. 446, Warsaw Gr.
- spinosa, Ulrich, (in press,) Geo. Sur. Ill., vol. 8, pl. 68, Keokuk and Warsaw Grs.

SUBKINGDOM MOLLUSCA.

CLASS BRACHIOPODA.

[Ety. *brachium*, arm; *pous*, foot.]

THE Brachiopoda are all marine animals, having a bivalve shell and a pair of long, ciliated, and usually spiral arms, with which they produce a current of water that carries the food to the mouth, which is close to the middle of the base of the shell. The valves of the shell, instead of being placed on each side of the animal, as in the Lamellibranchiata, are placed above and below it; so they are dorsal and ventral valves, instead of right and left valves. The ventral valve is generally larger than the dorsal, and projects beyond it at the beak. The beak is generally perforated, for the passage of a muscular peduncle, for the attachment of the animal; but in the Lingulidæ, the peduncle projects from the interior of the shell, between the umbones. When there is no peduncle, the shell attaches by the beak, or by the whole surface of the ventral valve. The dorsal valve is always free and imperforate. There is generally a pair of teeth in the ventral valve, developed from the hinge margin, that lock in corresponding cavities in the dorsal valve. Some genera have no teeth or hinge.

The shells of the living Rhychonellidæ and of many fossil genera consist of flattened prisms, parallel with each other, and directed obliquely to the surface of the shells, the interior of which is imbricated by their outcrop. The substance of

the shell is traversed by small canals from one surface to the other, through which little cœcal processes of the outer layer of the mantle pass, and are covered externally by a thickening of the epidermis.

They have no special branchial apparatus. The respiratory function is performed by the mantle, which is traversed by numerous blood-vessels. The arms are frequently supported upon a calcareous framework on the interior of the dorsal valve, as shown in the illustration of *Waldheimia australis*. The valves are opened by cardinal muscles, which originate on each side of the center of the ventral valve, and converge toward the hinge margin of the dorsal valve, behind the dental sockets, where there is usually a prominent cardinal process. The valves are closed by adductor muscles, of which there are four in *Crania* and *Discina*. In many fossil genera there are spiral processes, or loops, upon which are founded family distinctions.

Shells are sometimes silicified, and become so transparent that they show the coils when held up to the light. Sometimes the coils are preserved in empty shells; and when shells are found wholly filled with spar, both valves may be removed, and the sparry matrix scraped away on either side until the spirals may be clearly seen by holding the specimen up to the light.

The class was divided by King into two orders—the *Clistenterata* and *Tretenterata*—which correspond with the *Arthropomata* and *Lyropomata* of other authors. These divisions include the families as follows:

ORDER ARTHROPOMATA.

Athyridæ, *Atrypidæ*, *Orthidæ*, *Nucleospiridæ*, *Pentameridæ*, *Porambonitidæ*, *Productidæ*, *Rhynchonellidæ*, *Spiriferidæ*, *Strophomenidæ*, *Terebratulidæ*, *Triplesiidæ*.

ORDER LYOPOMATA.

Craniidæ, *Discinidæ*, *Lingulidæ*, *Obolidæ*, *Pholidopidæ*, *Siphonotretidæ*, *Trimerellidæ*.

FAMILY ATHYRIDÆ.—*Acambona*, *Athyris*, *Eumetria*, *Merista*, *Meristella*, *Whitfieldia*.

FAMILY ATRYPIDÆ.—*Anazyga*, *Atrypa*, *Cœlospira*, *Glassia*, *Koninckia*, *Zygospira*.

FAMILY CRANIIDÆ.—*Crania*, *Pseudocrania*.

FAMILY DISCINIDÆ.—*Discina*, *Orbiculoidea*, *Schizocrania*, *Schizobolus*, *Trematis*.

FAMILY LINGULIDÆ.—*Dignomia*, *Lingula*, *Lingulella*, *Lingulasma*, *Lingulepis*.

FAMILY NUCLEOSPIRIDÆ.—*Hindella*, *Meristina*, *Nucleospira*, *Retzia*, *Trematospira*.

FAMILY OBOLIDÆ.—*Dicellomus*, *Elkania*, *Leptobolus*, *Linnarsonia*, *Obolella*, *Obolus*.

FAMILY ORTHIDÆ.—*Meeckella*, *Orthis*, *Orthisina*, *Skenidium*, *Vitulina*.

FAMILY PENTAMERIDÆ.—*Amphigenia*, *Anastrophia*, *Gypidula*, *Pentamerella*, *Pentamerus*, *Stenoschisma*.

FAMILY PHOLIDOPIDÆ.—*Pholidops*.

FAMILY PORAMBONITIDÆ.—*Porambonites*.

FAMILY PRODUCTIDÆ.—*Aulosteges*, *Chonetes*, *Productella*, *Productus*, *Strophalosis*.

FAMILY RHYNCHONELLIDÆ.—Camarella, Camarophoria, Eatonia, Eichwaldia, Leiorhynchus, Rhynchonella, Rhynchotreta, Stenoschisma.

FAMILY SIPHONOTRETIDÆ.—Acrothele, Acrotreta, Iphidæ, Kutorgina, Schizambon, Siphonotreta.

FAMILY SPIRIFERIDÆ.—Ambocœlia, Cyrtia, Cyrtina, Martinia, Spirifera, Spiriferina, Syntrielasma, Syringothyris, Trigonotreta.

FAMILY STROPHOMENIDÆ.—Leptæna, Streptorhynchus, Strophodonta, Strophomena, Strophonella.

FAMILY TEREBRATULIDÆ.—Centronella, Cryptonella, Leptocœlia, Rensselæria, Terebratula, Tropidoleptus, Vitulina, Waldheimia.

FAMILY TRIMERELLIDÆ.—Dinobolus, Lingulops, Monomerella, Trimerella.

FAMILY TRIPLESIDÆ.—Triplesia.

ACAMBONA, White, 1862, Proc. Bost. Soc. Nat. Hist., vol. 9, p. 27. [Ety *ake*, point; *ambon*, umbo.] Syn. for Eumetria.

prima, see Eumetria *prima*.

ACROTHELE, Linnarsson, 1876, Bihangtill K. Vet. Akad. Handl., p. 20, Swed. Acad. Sci. on the Brachiopoda of the Paradoxides beds. [Ety. *akros*, pointed; *thele*, nipple; from the apex of the valve.] Shell thin, corneous, subcircular in outline, depressed, concentrically marked, and sometimes radiated; apex of ventral valve teat-like; subcentral or near the posterior margin, perforated; dorsal valve slightly convex, posterior margin slightly reflexed, and internally a low median longitudinal septum represented by an impression in the cast.

Type A. coriacea.

dichotoma, Walcott, 1885, Monogr. U. S. Geo. Sur., vol. 8, p. 14, Up. Taconic.

matthewi, Hartt, 1868, (Lingula *matthewi*.) Acad. Geol., p. 644, St. John Gr.

subsida, White, 1874, (Acrotreta *subsida*.)

Rep. Invert. Foss., p. 6, and Geo. Sur. W. 100th Mer., vol. 4, p. 34, Up. Taconic.

Acrotreta, *a*

Kutorga, 1848, Über die Siphonotreta aus den Verhandlungen der Kaiserlichen Mineralogischen Gesellschaft für Jahr, p. 260, and Davidson's Brachiopoda, vol.

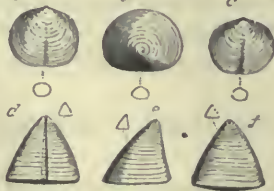


FIG. 533. — *Acrotreta gemma*. Small outline figures natural size; *a* and *c*, dorsal valves; *b*, ventral valve; *d*, area of ventral valve, which shows a central groove; *e*, area of another specimen having no groove; *f*, side view.

1, p. 133. [Ety. *akros*, the top or summit; *tretos*, perforated.] Shell triangu-

lar, larger valve conical, false area flat, bent back at right angles to the margin of the valve, longitudinally grooved along the center, and perforated at its extremity by a small circular aperture, the lines of growth encircle the shell and pass uninterruptedly over the false area; the smaller valve flat, operculiform, smooth, marked by concentric lines of growth; valves unarticulated. Type A. *subconica*.

attenuata, 1873, 6th Rep. Hayden's Geo. Sur. Terr., p. 463, Up. Taconic.

baileyi, Matthew, 1885, Trans. Roy. Soc. Can., p. 36, St. John Gr.

gemma, Billings, 1865, Pal. Foss., vol. 1, p. 216, Quebec Gr.

guelielma, Matthew, 1885, Trans. Roy. Soc. Can., p. 37, St. John Gr.

pyxidicula, White, 1874, Rep. Invert. Foss., p. 9, and Geo. Sur. W. 100th Mer., vol. 4, p. 53, Potsdam Gr.

subsida, see *Acrothele subsida*.

Ægilops, Hall, 1850, 3d Rep. N. Y. St. Mus. Nat. Hist., p. 179. The name was pre-occupied for a genus in botany; beside it was founded on the cast of a Lamelibranch.

subcarinata. Name not to be retained.

AMBOCÆLIA, Hall, 1860, 13th Rep. N. Y. St. Mus. Nat. Hist., p. 71. [Ety. *ambon*, umbo; *koiolos*, the belly.] Distinguished from *Orthis*, *Spirifera*, etc., by the interior markings in the ventral valve, the thickened margins of the fissure are produced in short, strong teeth, but there is scarcely any extension of the dental plates; in the dorsal valve the bases of the crura continue attached to the inner surface of the valve for more than one-third of its length before becoming free; there is a lateral projection from these crural bases bounding the teeth sockets; the cardinal process is elongate, lying between the crura, and is bifurcated at the outer extremity as in *Cyrtina*; the muscular impressions are below the middle of the valve, often near the front and quadruple; the dorsal valve being concave, flat or de-

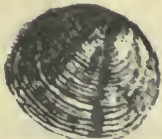


FIG. 532.—*Acrothele subsida*. Interior of dorsal valve enlarged.

pressed convex, the spires lie in the ventral valve. Type *A. umbonata*.

fimbriata, Claypole, 1883, Proc. Am. Phil. Soc., p. 232, Portage Gr.

gemmula, syn. for *Spirifera planocovexa*.

gregaria, Hall, 1860, 13th Rep. N. Y. St. Mus. Nat. Hist., p. 81, and Pal. N. Y., vol. 4, p. 261, Chemung Gr.

minuta, White, 1862, Proc. Bost. Soc. Nat. Hist., vol. 9, p. 26, Waverly Gr.

nucleus, syn for *Ambocelia umbonata*.

præumbona, Hall, 1857, (*Orthis præumbona*), 10th Rep. N. Y. St. Mus. Nat. Hist., p. 167, and Pal. N. Y., vol. 4, p. 262, Ham. Gr.

subumbona, see *Spirifera subumbona*.

umbonata, Conrad, 1842, Fig. 534—(*Orthis umbonata*), Jour. Acad. Nat. Sci., vol. 3, p. 264, and Pal. N. Y., vol. 4, p. 259, Marcellus Shale and Ham. Gr.

umbonata var. gregaria, see *A. gregaria*.



and Pal. N. Y., vol. 4, p. 383, Schoharie grit and Up. Held. Gr.



FIG. 536.—*Amphigenia elongata*.

elongata var. undulata, Hall, 1867, Pal. N. Y., vol. 4, p. 384, Up. Held. Gr.

elongata var. subtrigonalis, Hall, 1857, (*Meganteris subtrigonalis*), 10th Rep. N. Y. St. Mus. Nat. Hist., p. 123, Up. Held. Gr.



ANASTROPHIA, Hall, 1867, Pal. N. Y., vol. 4, p. 373. [Ety. *ana*, with; *strophe*, a turning round; the relation of the valves is the reverse of that of *Pentamerus*.] Gibbous; ventral valve the smaller, gibbous in its upper part, depressed or sinuate below, with the V-shaped pit sessile for nearly its entire length; small flattened space on each side of the fissure; dorsal valve ventricose, with prominent umbo; hinge-plate extended in gradually converging vertical lamellæ which are joined to the shell throughout their length, while the crura are extended into the cavity, in thin free lamellæ. Type *A. verneuili*.

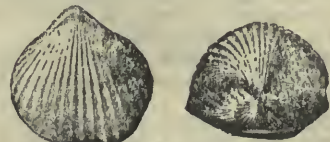


FIG. 538.—*Anastrophia internascens*.

internascens, Hall, 1879, 28th Rep. N. Y. St. Mus. Nat. Hist., p. 168, Niagara Gr.



FIG. 535.—*Amphigenia elongata*.

on their dorsal sides, forming an angular pit, which opens by a triangular fissure beneath the beak, and in its anterior extension is supported on a central septum; dorsal valve with a thickened cardinal process bordered by teeth sockets anchored to the bottom and supporting the crura, which extend into the cavity of the shell. Type *A. elongata*.

curta, Meek & Worthen, 1868, (*Stricklandinia elongata var. curta*), Geo. Sur. Ill., vol. 3, p. 402, Oriskany sandstone.

elongata, Vanuxem, 1842, (*Pentamerus elongata*), Geo. 3d Dist. N. Y., p. 132,

- interplicata*, Hall, 1852, (*Atrypa interplicata*,) Pal. N. Y., vol. 2, p. 275, Niagara Gr.
- reversa*, Billings, 1857, (*Pentamerus reversus*,) Rep. of Prog. Geo. Sur. Can., p. 215, Mid. Sil.
- verneuili*, Hall, 1857, 10th Rep. N. Y. St. Mus. Nat. Hist., p. 104, and Pal. N. Y., vol. 3, p. 260, Low. Held. Gr.
- ANAZYGA, Davidson, 1883, Supp. to Brit. Brachiopoda, vol. 5, pt. 1, p. 128. [Ety. *ana*, upward; *zygos*, a connecting band.] Small, longitudinally oval and striated; position of spiral cones as in *Zygospira*; about four coils in each spiral cone; stems attach to the hinge plate of the dorsal valve, extend parallel for a short distance, and then, bending at right angles, form two large curves facing the lateral parts of the valve; before reaching their furthest extension in front, they give off a circular band or loop, which is directed upward toward the beak, and is exterior to the spiral cones on their dorsal side. Type *A. recurvirostra*.
- recurvirostra*, Hall, 1847, (*Atrypa recurvirostra*,) Pal. N. Y., vol. 1, p. 140, Trenton Gr.
- Anomia*, Linnæus, 1767, Syst. Nat., 12th Ed. [Ety. *anomios*, unequal.] Not Paleozoic.
- biloba*, see *Orthis biloba*.
- pecten*, see *Strophomena pecten*.
- reticularis*, see *Atrypa reticularis*.
- Anomites*, Wahlenberg, 1821, Act., Upsal.
- exporrectus*, see *Cyrtia exporrecta*.
- glaber*, see *Spirifera glabra*.
- punctatus*, see *Productus punctatus*.
- resupinatus*, see *Orthis resupinatus*.
- reticularis*, see *Atrypa reticularis*.
- rhomboidalis*, see *Strophomena rhomboidalis*.
- scabriculus*, see *Productus scabriculus*.
- semireticulatus*, see *Productus semireticulatus*.
- ATHYRIS, McCoy, 1844, Carb. Foss. Ireland, pp. 128 and 146. [Ety. *a*, without; *thuris*, a small door; in allusion to the absence of a deltidium or door. But the name is erroneous.] Nearly orbicular or ovate, both valves convex; no cardinal area, foramen, or hinge-line; spiral appendages attached to the hinge plate of the dorsal valve, very large, nearly filling the shell; a strong mesial septum in rostral part of dorsal valve; dental lamellæ moderate; pallial and ovarian impressions thick, numerous, dichotomous; tissue of shell fibrous. Type *A. spiriferoides*.
- americana*, Swallow, 1863, Trans. St. Louis Acad. Sci., vol. 2, p. 89, Kaskaskia Gr.
- angelica*, Hall, 1861, 14th Rep. N. Y. St. Mus. Nat. Hist., p. 99, and Pal. N. Y., vol. 4, p. 292, Chemung Gr.
- argentea*, Shepard, 1838, Am. Jour. Sci. and Arts, vol. 34, p. 152, Up. Coal Meas.
- biloba*, Winchell, 1865, (*Spirigera biloba*,) Proc. Acad. Nat. Sci., p. 118, Kinderhook Gr.
- blancha*, Billings, 1863, Proc. Port. Soc. Nat. Hist., vol. 1, p. 115, Low. Held. Gr.
- caputserpentis*, Swallow, 1863, Trans. St. Louis Acad. Sci., vol. 2, p. 90, Up. Coal Meas.
- charitonensis*, Swallow, 1860, (*Spirigera charitonensis*,) Trans. St. Louis Acad. Sci., vol. 1, p. 651, Coal Meas.
- chloe*, Billings, 1860, Can. Jour., vol. 5, p. 282, Ham. Gr.
- clara*, Billings, 1860, Can. Jour., vol. 5, p. 274, Up. Held. Gr.
- claytoni*, Hall & Whitfield, 1877, U. S. Geo. Expl. 40th parallel, vol. 4, p. 256, Waverly Gr.
- clintonensis*, Swallow, 1863, Trans. St. Louis Acad. Sci., vol. 2, p. 89, Kaskaskia Gr.
- clusia*, Billings, 1860, Can. Jour., vol. 5, p. 279, Up. Held. Gr.
- cora*, Hall, 1860, 13th Rep. N. Y. St. Mus. Nat. Hist., p. 94, and Pal. N. Y., vol. 4, p. 291, Ham. and Chemung Grs.
- corpulenta*, Winchell, 1863, (*Spirigera corpulenta*,) Proc. Acad. Nat. Sci., p. 6, Waverly Gr.
- crassicardinalis*, White, 1860, Bost. Jour. Nat. Hist., vol. 7, p. 229, Waverly Gr.
- eborea*, Winchell, 1866, (*Spirigera eborea*,) Rep. Low. Peninsula Mich., p. 94, Ham. Gr.
- euzona*, Swallow, 1863, Trans. St. Louis Acad. Sci., vol. 2, p. 91, Kaskaskia Gr.
- differens*, McChesney, 1860, New Pal. Foss., p. 47, syn. for *A. subtilita*.
- formosa*, Swallow, 1863, Trans. St. Louis Acad. Sci., vol. 2, p. 91, Kaskaskia Gr.
- fultonensis*, Swallow, 1860, (*Spirigera fultonensis*,) Trans. St. Louis Acad. Sci., vol. 1, p. 650, Ham. Gr.
- hannibalensis*, Swallow, 1860, (*Spirigera hannibalensis*,) Trans. St. Louis Acad. Sci., vol. 1, p. 649, Waverly or Kinderhook Gr.
- hawni*, Swallow, 1860, (*Spirigera hawnii*,) Trans. St. Louis Acad. Sci., vol. 1, p. 652, Coal Meas.
- headi*, see *Zygospira headi*.
- headi* var. *anticostiensis*, see *Zygospira headi* var. *anticostiensis*.
- headi* var. *borealis*, see *Zygospira headi* var. *borealis*.
- harpalyce*, Billings, 1863, Proc. Port. Soc. Nat. Hist., vol. 1, p. 116, Low. Held. Gr.
- hirsuta*, Hall, 1858, Trans. Alb. Inst., vol. 4, p. 8, and Bull. Am. Mus. Nat. Hist., p. 49, Warsaw Gr.
- incrassata*, Hall, 1858, Geo. Rep. Iowa, p. 600, Burlington Gr.
- intervarica*, McChesney, 1860, Pal. Foss., p. 78, Burlington Gr. Not recognized.
- jacksoni*, Swallow, 1860, (*Spirigera jacksoni*,) Trans. St. Louis Acad. Sci., vol. 1, p. 651, Coal Meas.
- julia*, see *Meristella julia*.

junia, Billings, 1866, Catal. Sil. Foss. Antic., p. 46, Anticosti Gr.
 lamellosa, Leveille, 1835, (Spirifer lamellosus,) Mem. Geol. Soc. France, vol. 2, p. 39, Waverly Gr.
 lara, Billings, 1866, Catal. Sil. Foss. Antic., p. 47, Anticosti Gr.
 maconensis, Swallow, 1860, (Spirigera maconensis,) Trans. St. Louis Acad. Sci. vol. 1, p. 651, Coal Meas.
 maia, see Spirifera maia.
 minima, Swallow, 1860, (Spirigera minima,) Trans. St. Louis Acad. Sci., vol. 1, p. 649, Ham. Gr.
 missouriensis, Swallow, 1860, (Spirigera missouriensis,) Trans. St. Louis Acad. Sci., vol. 1, p. 650, Coal Meas.
 missouriensis, Winchell, 1865, (Spirigera missouriensis,) Proc. Acad. Nat. Sci., p. 117, Lithographic limestone. This name was preoccupied.
 monticola, White, 1874, (Spirigera monticola,) Rep. Invert. Foss., p. 16, and Geo. Sur. W. 100th Mer., vol. 4, p. 91, Subcarboniferous.
 naviformis, Hall, 1843, (Atrypa naviformis,) Geo. 4th Dist. N. Y., p. 71, and Pal. N. Y., vol. 2, p. 76, Clinton Gr.
 obmaxima, McChesney, 1860, Desc., New Pal. Foss., p. 80, and Geo. Sur. W. 100th Mer., vol. 4, p. 92, Waverly Gr.
 obvia, McChesney, 1860, Pal. Foss. p. 81, Kaskaskia Gr. Not recognized.
 ohioensis, Winchell, 1865, Proc. Acad. Nat. Sci., p. 118, Waverly Gr.
 orbicularis, McChesney, 1860, New Pal. Foss., Coal Meas. Not recognized.
 papilioniformis, McChesney, 1867, Trans. Chi. Acad. Sci., vol. 1, Kaskaskia Gr.
 parvirostris, Meek and Worthen, 1860, Proc. Acad. Nat. Sci. Phil., p. 451, Keokuk Gr. Referred later to A. planosulcata.
 pectinifera, Swallow, 1863, Trans. St. Louis Acad. Sci., vol. 2, p. 88, Keokuk Gr.
 perinflata, McChesney, 1860, Desc. New Pal. Foss., p. 81, Keokuk Gr. Not recognized.
 persinuata, Meek, 1877, U. S. Geo. Sur., 40th parallel, p. 81, Carboniferous.
 planosulcata, Phillips, 1836, Geo. York., vol. 2, p. 220, Keokuk Gr.
 plattensis, Swallow, 1863, Trans. St. Louis Acad. Sci., vol. 2, p. 87, Up. Coal. Meas.
 polita, Hall, 1843, (Atrypa polita,) Geo. 4th Dist. N. Y., pl. 65, fig. 5, and Pal. N. Y., vol. 4, p. 293, Chemung Gr.
 prinstana, see Meristella prinstana.
 prouti, Swallow, 1860, (Spirigera proutii,) Trans. St. Louis Acad. Sci., vol. 1, p. 649, Kinderhook or Waverly Gr.
 reflexa, Swallow, 1863, Trans. St. Louis Acad. Sci., vol. 2, p. 88, Warsaw Gr.
 singletoni, Swallow, 1863, Trans. St. Louis Acad. Sci., vol. 2, p. 87, Low. Coal Meas.
 solitaria, Billings, 1866, Catal. Sil. Foss. Antic., p. 48, Anticosti Gr.

spiriferoides, Eaton, 1831, (Terebratula spiriferoides,) Am. Jour. Sci., vol. 21, p.

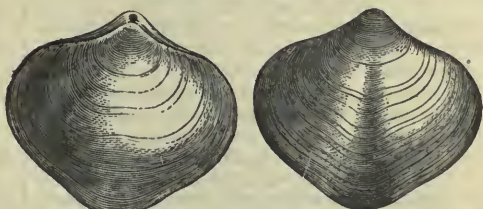


FIG. 539.—Athyris spiriferoides. Dorsal and ventral view.

137, and Pal. N. Y., vol. 4, p. 285, Cornif. and Ham. Gr.
 squamosa, Worthen, 1884, Bull. No. 2, Ill. St. Mus. Nat. Hist., p. 24, and Geo. Sur. Ill., vol. 8, p. 103, St. Louis Gr.
 sublamellosa, Hall, 1858, Geo. Rep. Iowa, p. 702, Kaskaskia Gr.
 subquadrata, Hall, 1858, Geo. Rep. Iowa, p. 703, Kaskaskia Gr.
 subtilita, Hall, 1852, Stansbury's Exped. to Great Salt Lake, p. 409, Coal Meas.

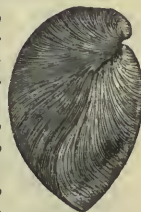


FIG. 540.—Athyris spiriferoides. Side view.

trinuclea, Hall, 1858, (Terebratula trinuclea,) Trans. Alb. Inst., vol. 4, p. 7, and Geo. Sur. Iowa, p. 659, Warsaw Gr.
 tumida, Dalman, 1827, (Atrypa tumida.) The fossil usually referred to this species is Whitfieldia maria, which Davidson regarded as a synonym for W. tumida.
 tumidula, Billings, 1866, Catal. Sil. Foss. Antic., p. 47, Anticosti Gr.
 turgida, Shaler, 1865, Bulletin No. 4, M. C. Z., Anticosti Gr. Not defined so as to be recognized.
 ultravarica, McChesney, 1861, Desc. New Pal. Foss., p. 79, Keokuk Gr. Not recognized.

umbonata, see Hindella umbonata.
 vittata, Hall, 1860, 13th Rep. N. Y. St. Mus. Nat. Hist., p. 89, and Pal. N. Y., vol. 4, p. 289, Cornif. and Ham. Grs.

ATRYPA, Dalman, 1827, Vet. Acad. Handl., p. 102. [Ety. a, without; trypa, a hole or perforation. It was supposed the shells had no foramen in the beak. The name is erroneous.] Suborbicular, transverse or elongated; articulating by teeth and sockets; beak of the ventral valve produced and incurved, the apex truncated by a small, round perforation, sometimes separated from the hinge-line by a deltidium; valve more or less convex with or without a defined sinus; a strong tooth on each side at the base of the broad fissure is somewhat bilobed at the summit, with a crenulated groove on the back; from the base of the teeth a curving ridge extends forward and partially incloses a broad, muscular

scar; dorsal valve convex, with or without a mesial fold; hinge plate divided in the middle with a tooth-like plate on each side, the crura originating outside of these close to the dental sockets, and outside of the latter, close to the shell margins, there is a crenulated fold, which occupied the groove at the base of the tooth; the spires originating from the crura form two hollow cones, directed into the cavity of the dorsal valve, their adjacent sides being flattened and apices brought close together near the center of the bottom of the cavity; the processes at the base of the crura are directed into the cavity of the dorsal valve, and unite to form a loop; surface smooth, striate, or costate; structure fibrous. Type *A. reticularis*.

acutiplicata, see *Leptocoelia acutiplicata*.

aculostra, see *Rhynchonella aculostra*.

æquiradiata, Conrad, 1842, Jour. Acad. Nat. Sci., vol. 8, p. 266, Low. Held. Gr.

æquiradiata, see *Rhynchonella æquiradiata*.

affinis, syn. for *Atrypa reticularis*.

atilis, see *Rhynchonella atilis*.

ambigua, see *Camarella ambigua*.

aprinis, see *Rhynchonella aprinis*.

arata, see *Pentamerella arata*.

aspera, Schlotheim, 1813, (Terebratula aspera,) Petrefaktenkunde, p. 263, Ham. and Chemung Grs.

aspera var. *occidentalis*, Hall, 1858, Geo. Rep. Iowa, vol. 1, pt. 2, p. 515, Ham. Gr.

bidens, see *Rhynchonella bidens*.

bisulcata, see *Camarella bisulcata*.

borealis, Schlotheim, as identified by d'Archiac & Verneuil. Not American.

brevirostris, as identified by Hall, Pal. N. Y., vol. 2, p. 278. See *Pentamerus brevis* and *Anastrophia verneuili*.

camura, see *Trematospira camura*.

capax, see *Rhynchonella capax*.

cassidea, as identified by d'Archiac & Verneuil. Not American.

chemungensis, Conrad, 1842, Jour. Acad. Nat. Sci., vol. 8, p. 265, Chemung Gr.

circulus see *Camarella circulus*.

concinna, see *Nucleospira concinna*.

comis, see *Pentamerus comis*.

concentrica, syn. for *Athyris spiriferoides*.

congesta, see *Triplesia congesta*.

congregata, see *Stenochisma congregatum*.

contracta, see *Stenochisma contractum*.

corallifera, see *Eichwaldia corallifera*.

crassiostrea, Hall, 1852, Pal. N. Y., vol. 2, p. 269, Niagara Gr.

crenulata see *Terebratula crenulata*.

cuboides, as identified by Hall and others. See *Rhynchonella venustula*.

cuneata, see *Rhynchonella cuneata*.

cuspidata, see *Triplesia cuspidata*.

cylindrica, see *Meristella cylindrica*.

deflecta, Hall, 1847, Pal. N. Y., vol. 1, p. 140, Trenton Gr.

dentata, see *Rhynchonella dentata*.

disparilis, see *Cælospira disparilis*.

dubia, see *Rhynchonella dubia*.

dumosa, Hall, 1843, Geo. Rep., 4th Dist. N. Y., p. 272, Chemung Gr.

duplicata, see *Stenochisma duplicatum*.

elongata, syn. for *Renssæleria ovoides*.

emacerata, see *Rhynchonella emacerata*.

exigna, Hall, 1847, Pal. N. Y., vol. 1, p. 141, Trenton Gr.

eximia, see *Stenochisma eximium*.

extans, see *Triplesia extans*.

flabella, syn. for *Leptocoelia hemispherica*.

flabellites, see *Leptocoelia flabellites*.

galeata, see *Pentamerus galeatus*.

gibbosa, Hall, 1852, Pal. N. Y., vol. 2, p. 79, Clinton Gr.

globuliformis, see *Leiorhynchus globuliforme*.

hemiplicata, see *Camarella hemiplicata*.

hemispherica, see *Leptocoelia hemispherica*.

hirsuta, see *Trematospira hirsuta*.

hystrix, Hall, 1843, Geo. Rep. 4th Dist. N. Y., p. 272, and Pal. N. Y., vol. 4, p. 326, Chemung Gr.

impressa, Hall, 1857, 10th Rep. N. Y. St. Mus. Nat. Hist., p. 122, and Pal. N. Y., vol. 4, p. 315, Schoharie Grit.

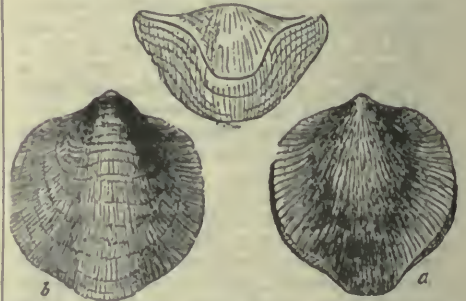


FIG. 541.—*Atrypa reticularis*. *a*, Dorsal valve; *b*, ventral valve; *c*, anterior view.

impressa, Shaler. The name was preoccupied.

increbescens, syn. for *Rhynchonella capax*.

inflata, Conrad, 1843, Geo. Rep. 3d Dist. N. Y. Not defined.

intermedia, Hall, 1852, Pal. N. Y., vol. 2, p. 77, Clinton Gr.

interplicata, see *Anastrophia interplicata*.

lævis, see *Meristella lævis*.

lamellata, see *Rhynchonella lamellata*.

laticosta, Phillips, 1841, (Terebratula laticosta,) Pal. Foss., Chemung Gr. This species is not clearly identified in America.

lentiformis, syn. for *Atrypa reticularis*.

limitaris, see *Leiorhynchus limitare*.

mansonii, Salter, 1852, (Rhynchonella mansonii,) Sutherland's Jour., vol. 2, p. cccxi, Devonian.

marginalis, (?) Dalman, 1827, (Terebratula marginalis,) Vet. Acad. Handl., p. 143, Niagara Gr.

medialis, see *Eatonia medialis*.

mesacostalis, see *Leiorhynchus mesacostale*.

modesta, see *Zygospira modesta*.

nasuta, see *Meristella nasuta*.

naviformis, see *Athyris naviformis*.

neglecta, see *Rhynchonella neglecta*.
nitida, see *Meristina nitida*.
nitida var. *oblata*, see *Meristina nitida* var. *oblata*.
nodostrata, Hall, 1852, Pal. N. Y., vol. 2, p. 272, Niagara Gr.
nucleolata, Hall, 1852, Pal. N. Y., vol. 2, p. 328, Coralline limestone.
nucleus, see *Triplesia nucleus*.
nustella, Castelnau, 1843, Syst. Sil., p. 39. Not recognized.
oblata, Hall, 1852, Pal. N. Y., vol. 2, p. 9, Medina Gr.

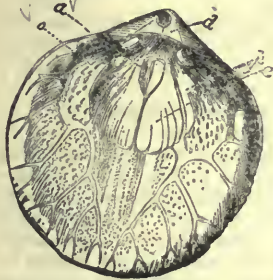


FIG. 542.—*Atrypa reticularis*. Interior of ventral valve; a, Impression of adductor muscle; c, cardinal muscle; p, pedicle muscle; o, ovarian sinus; d, deltidium.

planoconvexa, see *Leptococlea planoconvexa*.
plebeia, Conrad, 1843, Geo. Rep. 3d Dist. N. Y., Ham. Gr. Preoccupied name.
pleiopleura, see *Rhynchonella pleiopleura*.
plena, see *Rhynchonella plena*.
plicata, see *Rhynchonella plicata*.
plicatella, (?) Linnaeus, as identified by Hall, in Pal. N. Y., vol. 2, p. 279. May be stricken from the list as an erroneous identification.

plicatula, see *Rhynchonella plicatula*.
plicifera, see *Rhynchonella plicifera*.
polita, see *Athyris polita*.
prisca, syn. for *Atrypa reticularis*.
pseudomarginalis, Hall, 1860, 13th Rep. N. Y. St. Mus. Nat. Hist., p. 84, and Pal. N. Y., vol. 4, p. 327, Up. Held. Gr.
quadrucostata, see *Leiorhynchus quadrucostatum*.

quadrucostata, Hall, 1852, see *Rhynchonella quadrucostata*.

rectiplicata, Conrad, 1842, Jour. Acad. Nat. Sci., vol. 8, p. 265, Low. Held. Gr.

recurvirostra, see *Anazyga recurvirostra*.

reticularis, Linnaeus, 1767, (Anomia reticularis,) Syst. Nat., ed. 12, p. 1132, and Pal. N. Y., vol. 2, p. 72. It



FIG. 543.—*Atrypa reticularis*. Interior of dorsal valve, showing spirals; p, hinge plate.

obtusiplicata, see *Rhynchonella obtusiplicata*.
octocostata, see *Pentamerella arata*.
peculiaris, see *Eatonia peculiaris*.
phoca, Salter, 1852, (Rhynchonella phoca,) Sutherland's Jour., vol. 2, p. ccxxvi, Devonian.

occurs, with its varieties, in all the Groups of the Upper Silurian and Devonian formations, except the Oriskany sandstone. Some of its varieties or synonyms are, *Atrypa affinis*, *A. lentiformis*, *A. prisca*, *A. tribulis*, *Hipparionyx constimilis*, etc.

robusta, see *Rhynchonella robusta*.

rostrata, see *Meristella rostrata*.

rugosa, see *Rhynchonella rugosa*.

scitula, see *Meristella scitula*.

semplicata, see *Rhynchonella simplicata*.

singularis, see *Eatonia singularis*.

sordida, see *Rhynchonella sordida*.

spinosa, Hall, 1843, Geo. 4th Dist. N. Y., p. 200, Cornif., Ham., Tully, and Chemung Grs. Equal to *Atrypa aspera* var. *occidentalis*.

subcuboides, D'Orbigny, see *Rhynchonella venustula*.

subtrigonalis, see *Rhynchonella subtrigonalis*.

sulcata, see *Meristella sulcata*.

tenuilineata, Hall, 1843, Geo. 4th Dist. N. Y., p. 272, Chemung Gr.

tribulis, syn. for *Atrypa reticularis*.

tumida, see *Athyris tumida*.

unquiformis, syn. for *Orthis proximus*.

uniscalata, see *Meristella uniscalata*.

AULOSTEGES, Helmerston, 1847, Bull. de la Classe Physi. Math. Acad. Sci. St. Petersburg, vol. 6, p. 135. [Ety. *aulos*, tube; *steges*, chamber.] Shell subpentagonal; ventral valve most convex,

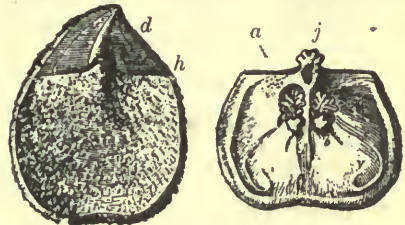


FIG. 541.—*Autosteges wangenheimi*. h, Triangular hinge area; d, convex pseudodeltidium; j, cardinal process; a, adductor impression.

beak produced, twisted, area triangular, interrupted by a pseudodeltidium not reaching the hinge-line, which is straight and toothless; dorsal valve convex at the umbo, depressed or concave laterally; cardinal edge more or less developed; surface of valves with short tubular spires; in the interior of the dorsal valve a trifold cardinal process is made to fill the uncovered portion of the fissure, and serve as the point of attachment to the cardinal muscle; under this process a longitudinal mesial ridge extends nearly to the margin, and on either side are elongated, ramified adductor scars; the reniform impressions, after dividing the above named muscle, extend by an outward oblique curve to near the margin, when, turning backward and inward, termi-

nate some distance from their origin; two brachial elevations under the adductor move toward the center of the valve. Type *A. wangenheimi*.

guadalupensis, Shumard, 1858, Trans. St. Louis Acad. Sci., vol. 1, p. 292, Permian Gr.

spondyliiformis, White & St. John, 1868, Trans. Chi. Acad. Sci., p. 118, Up. Coal. Meas.

Billingsia, Ford, 1885. The name being preoccupied, see *Elkania*.

Brachymerus, Shaler: The name was preoccupied for a genus of Coleoptera. See *Anastrophia*.

Brachyprion, Shaler, syn. for *Strophomena geniculatum*, see *Strophomena geniculata leda*, see *Strophomena leda*.

ventricosum, see *Strophomena ventricosa*.

CAMARELLA, Billings, August, 1858, Can. Nat. and Geol., vol. 4, p. 301. [Ety. *kamara*, arching chamber; *ellus*, diminutive.] Shell ovate or subcircular, beaks small, hinge-line short; mesial fold and sinus becoming obsolete in the middle part of the shell, below which the radiating striae are more or less numerous, while above concentric striae occur. Type *C. volborthi*.



FIG. 545.—*Camarella hemiplicata*. Dorsal, ventral, and side views.

ambigua, Hall, 1847, (*Atrypa ambigua*), Pal. N. Y., vol. 1, p. 143, Trenton Gr.

antiquata, Billings, 1861, Pal. Foss., vol. 1, p. 10, Georgia Gr.

bisulcata, Emmons, 1842, (*Orthis bisulcata*), Geo. Rep. N. Y., p. 395, and Pal. N. Y., vol. 1, p. 139, Trenton Gr.

breviplicata, Billings, 1865, Pal. Foss., vol. 1, p. 304, Quebec Gr.

calcifera, Billings, 1861, Can. Nat. and Geo., vol. 6, p. 318, Calif. Gr.

circulus, Hall, 1847, (*Atrypa circulus*), Pal. N. Y., vol. 1, p. 142, Trenton Gr.

congesta, see *Triplesia congesta*.

costata, Billings, 1865, Pal. Foss., vol. 1, p. 305, Quebec Gr.

cuspidata, see *Triplesia cuspidata*.

extans, see *Triplesia extans*.

hemiplicata, Hall, 1847, (*Atrypa hemiplicata*), Pal. N. Y., vol. 1, p. 144, Trenton Gr.

lenticularis, Billings, 1866, Catal. Sil. Foss. Antic., p. 45, Anticosti Gr.

longirostra, Billings, 1858, Can. Nat. and Geo., vol. 4, p. 302, Chazy Gr.

nucleus, see *Triplesia nucleus*.

ops, Billings, 1862, Pal. Foss., vol. 1, p. 148, Mid. Sil.

ortoni, see *Triplesia ortonii*.

panderi, Billings, 1858, Can. Nat. and Geo., vol. 4, p. 301, Black Riv. Gr.

parva, Billings, 1865, Pal. Foss., vol. 1, p. 219, Quebec Gr.

polita, Billings, 1865, Pal. Foss., vol. 1, p. 305, Quebec Gr.

primordialis, see *Triplesia primordialis*.

reversa, see *Anastrophia reversa*.

varians, Billings,

1859, Can. Nat.

and Geo., vol.

4, p. 445,

Chazy Gr.

volborthi, Bill.

ings, 1859,

Can. Nat. and

Geo., vol. 4, p. 301, Black Riv. Gr.

waldronensis, see *Triplesia waldronensis*.

Camarium, Hall, 1859, Pal. N. Y., vol. 3, p. 486, syn. for *Merista*.

elongatum, see *Merista elongata*.

typum, see *Merista typum*.

CAMAROPHORIA, King, 1844, Ann. and Mag. Nat. Hist., vol. 14, p. 313. [Ety. *kamara*, an arched chamber; *phoreo*, I carry.]

Subtrigonal, convex longitudinally; mesial fold and sinus; beak acute, more or less incurved, small fissure beneath; no area or deltidium; plicated, impunctate, articulating by teeth and sockets; dental plates in the ventral valve, conjoined at their dorsal margins, forming a trough-shaped process affixed to a low, medio-longitudinal plate; the space between the sockets in the dorsal valve is occupied by a small, cardinal, muscular protuberance, on either side of which two slender processes curve upward; from beneath the cardinal process a vertical mesial septum, a third or more of the length of the valve, supporting along its upper edge a spatula-shaped process, dilated toward its free extremity, and projected with a curve to near the center of the shell. Type *C. schlotheimi*.

bisulcata, Shumard, 1858, Trans. St. Louis Acad. Sci., vol. 1, p. 296, Permian Gr.

eucharis, Hall, 1867, Pal. N. Y., vol. 4, p. 368, Corniferous Gr.



FIG. 547.—*Camarophoria giffordi*. a, Dorsal view; b, ventral valve; c, profile view.

giffordi, Worthen, 1882, Bull. No. 1, Ill. St. Mus. Nat. Hist., p. 39, and Geo. Sur. Ill., vol. 7, p. 318, Middle Coal Meas.

globulina, Phillips, 1844, as identified by Geinitz, is *Rhynchonella* *nta*.

occidentalis, S. A. Miller, 1881, Jour. Cin. Soc. Nat. Hist., vol. 4, p. 313, Burlington Gr.

- schlotheimi, Von Buch, 1834, (Terebratulites schlotheimi,) Mem. de la Soc. Geol., vol. 3, p. 133, Permian Gr.
- subtrigona, Meek & Worthen, 1860, (Rhynchonella subtrigona,) Proc. Acad. Nat. Sci. Phil., p. 451, and Geo. Sur. Ill., vol. 2, p. 251, Keokuk Gr.
- swallowana, Shumard, 1859, Trans. St. Louis Acad. Sci., vol. 1, p. 394, Permian Gr.
- wortheni, Hall, 1858, (Rhynchonella wortheni,) Trans. Alb. Inst., vol. 4, p. 11, and Bull. Am. Mus. Nat. Hist., p. 54, Warsaw Gr.
- CENTRONELLA**, Billings, 1859, Can. Nat. and Geo., vol. 4, p. 131. [Ety. a little point.] General form like Terebratula; dorsal valve with a loop consisting of two ribbon-like lamellæ, which extend about half the length of the shell, at first curving outward and then approaching until their lower extremities meet at an acute angle; here they unite and are reflected backward toward the beak in a thin, flat, vertical plate; near their origin each bears upon the ventral side a single triangular crural process. Type *C. glansfagea*.
- allii, Winchell, 1865, Proc. Acad. Nat. Sci., p. 123, Waverly or Marshall Gr.
- alveata, Hall, 1857, (Rhynchonella alveata,) 10th Rep. N. Y. St. Mus. Nat. Hist., p. 124, Onondaga Gr.
- anna, Hartt, 1868, Acad. Geol., p. 300, Subcarb.
- billingsana, Meek & Worthen, 1868, Geo. Sur. Ill., vol. 3, p. 352, Niagara Gr.
- crassicardinalis, Whitfield, 1882, Bull. Ann. Mus. Nat. Hist., No. 3, p. 55, Warsaw Gr.
- flora, Winchell, 1879, Proc. Am. Phil. Soc., vol. 12, p. 254, Marshall Gr.
- glansfagea, Hall, 1857, (Rhynchonella glansfagea,) 10th Rep. N. Y. St. Mus. Nat. Hist., p. 125, and Pal. N. Y., vol. 4, p. 399, Schoharie grit, Cornif. Gr. and Oriskany sandstone.
- glaucia, Hall, 1867, Pal. N. Y., vol. 4, p. 403, Ham. Gr.
- hecate, Billings, 1861, Can. Jour. Vol. 6, p. 272, Up. Held. Gr.
- impressa, Hall, 1861, 14th Rep. N. Y. St. Mus. Nat. Hist., p. 102, and Pal. N. Y., vol. 4, p. 402, Ham. Gr. Prof. Billings said this is a syn. for *C. hecate*.
- julia, Winchell, 1862, Proc. Acad. Nat. Sci. vol. 14, p. 405, and Pal. N. Y., vol. 4, p. 419, Marshall Gr.
- ovata, Hall, 1867, Pal. N. Y., vol. 4, p. 419, Up. Held. Gr.
- Charionella*, Billings, 1861, Can. Jour. Ind. Sci., and Art., p. 148, syn. for *Meristella circe*, see *Meristella circe*.
- doris*, see *Meristella doris*.
- (?) *hyale*, see *Meristella hyale*.
- CHONETES**, Fischer, 1837, Oryckt. Moscou, p. 134. [Ety. *chone*, a little cup.] Shell thin, semi-cylindrical, transverse section semi-oval, ventral valve convex, dorsal concave hinge-line straight; external margin of the area of ventral valve bearing a row of tubular spines, foramen distinct but partially closed by a pseudo-deltidium; dorsal valve with a cardinal process, simple at the base, but bifid or grooved at the extremity; valves articulated by teeth, surface radiately striated, often spinous, interior pustulose or papillose. Type *C. arcinulatus acutiradiatus*, Hall, 1843, (Strophomena acutiradiata,) Geo. Rep. 4th Dist. N. Y., p. 171, and Pal. N. Y., vol. 4, p. 120, Up. Held. Gr.
- antiope, Billings, 1874, Pal. Foss., vol. 2, p. 19, Low Devonian.
- arcuatus, Hall, 1857, 10th Rep. N. Y. St. Mus. Nat. Hist., p. 116, and Pal. N. Y., vol. 4, p. 119, Up. Held. Gr.
- armatus, DeKoninck, the specimens referred to this species belong to *C. pusillus*.
- canadensis, Billings, 1874, Pal. Foss., vol. 2, p. 17, Lower Devonian.
- carinatus, Conrad, 1842, (Strophomena carinata,) Jour. Acad. Nat. Sci., vol. 8, p. 257, and Pal. N. Y., vol. 4, p. 133, Ham. Gr.
- complanatus, Hall, 1857, 10th Rep. N. Y. St. Mus. Nat. Hist., p. 56, and Pal. N. Y., vol. 3, p. 418, Oriskany sandstone.
- cornutus, Hall, 1843, (Strophomena cornuta,) Geo. Rep. 4th Dist. N. Y., and Pal. N. Y., vol. 2, p. 64, Clinton Gr.
- dawsoni, Billings, 1874, Pal. Foss., vol. 2, p. 18, Low Devonian.
- deflectus, Hall, 1857, 10th Rep. N. Y. St. Mus. Nat. Hist., p. 149, and Pal. N. Y., vol. 4, p. 126, Ham. Gr.
- emmetensis, Winchell, 1866, Rep. Low. Penin. Mich., p. 92, Ham. Gr.
- filistriatus, Walcott, 1885, Monogr. U. S. Geo. Sur., vol. 8, p. 127, Devonian.
- fischeri, Norwood & Pratten, 1854, Jour. Acad. Nat. Sci., vol. 3, p. 25, Kinderhook Gr.
- flemingi, Norwood & Pratten, 1854, Jour. Acad. Nat. Sci., vol. 3, p. 26, Permian Gr.
- geinitzanus, N. Sp., Up. Coal Meas. Proposed instead of *C. glabra* of Geinitz in Carb. und Dyas in Neb., p. 60, tab. 4, fig. 15 to 18, which name was preoccupied.
- geniculatus, White, 1862, Proc. Bost. Soc. Nat. Hist., vol. 9, p. 29, Waverly or Marshall Gr.
- gibbosa*, syn. for *C. deflectus*.
- glaber, Hall, 1857, 10th Rep. N. Y. St. Mus. Nat. Hist., p. 117, Up. Held. Gr.
- glabra*, Geinitz, 1866, Carb. und Dyas. The name was preoccupied. See *C. geinitzanus*.
- granuliferus, Owen, 1852, Geo. Rep. Wis. Iowa, and Minn., p. 583, Coal Meas



FIG. 548.—*Centronella hecate*. a. Showing loop; b, c, and d, different views.

- hemisphericus, Hall, 1857, 10th Rep. N. Y. St. Mus. Nat. Hist., p. 116, and Pal. N. Y., vol. 4, p. 118, Schoharie grit and Cornif. Gr.
- illinoisensis, Worthen, 1860, Trans. St. Louis Acad. Sci., vol. 1, p. 571, and Geo. Sur. Ill., vol. 3, p. 505, Kaskaskia Gr.
- iowensis, Owen, 1852, Geo. Rep. Iowa, Wis. and Minn., p. 584, Carb.
- koninckanus, Norwood & Pratten, 1854, Jour. Acad. Nat. Sci., vol. 3, 2d ser., p. 30, Devonian.
- lævis, Keyes, 1888, Proc. Acad. Nat. Sci. Phil., pl. xii, figs. 3a, 3b, Coal Meas.
- laticosta, syn. for *C. mucronatus*.
- lepidus, Hall, 1857, 10th Rep. N. Y. St. Mus. Nat. Hist., p. 148, and Pal. N. Y., vol. 4, p. 132, Marcellus shale and Ham. Gr.
- lineatus, Conrad, 1839, (*Strophomena lineata*.) Ann. Geo. Rep. N. Y., p. 64, and Pal. N. Y., vol. 4, p. 121, Up. Held. Gr.
- littoni, Norwood & Pratten, 1854, Jour. Acad. Nat. Sci., vol. 3, p. 25, Ham. Gr.
- loganensis, Hall & Whitfield, 1877, U. S. Geo. Expl. 40th Parallel, vol. 4, p. 253, Waverly Gr.
- logani, Norwood & Pratten, 1854, Jour. Acad. Nat. Sci. vol. 3, p. 30, Burlington Gr.
- logani var. aurora, Hall, 1867, Pal. N. Y., vol. 4, p. 137, Tully limestone and Ham. Gr.
- maclurii, Norwood & Pratten, 1854, Jour. Acad. Nat. Sci., vol. 3, p. 28, Ham. Gr.
- macrostriatus, Walcott, 1885, Monogr. U. S. Geo. Sur., vol. 8, p. 126, Devonian.
- martini, Norwood & Pratten, 1854, Jour. Acad. Nat. Sci., vol. 3, p. 29, Ham. Gr.
- melonicus, Billings, 1874, Pal. Foss., vol. 2, p. 15, Gaspé limestone No. 8, Devonian.
- mesolobus, Norwood & Pratten, 1854, Jour. Acad. Nat. Sci., vol. 3, p. 27, Coal Meas.
- michiganensis, Stevens, 1858, Am. Jour. Sci., vol. 25, p. 262, Marshall Gr.
- millepunctatus, Meek & Worthen, 1870, Proc. Acad. Nat. Sci., p. 35, and Geo. Sur. Ill., vol. 5, p. 566, Coal Meas.
- minimum, Hall. Being preoccupied by Sowerby. See *C. undulatus*.
- mucronatus, Hall, 1843, Geo. Rep. 4th Dist. N. Y., p. 180, and Pal. N. Y., vol. 4, p. 124, Corniferous and Ham. Grs.
- mucronata, Meek & Hayden, 1858, Proc. Acad. Nat. Sci., p. 262, Coal Meas. This name was preoccupied; moreover it is a syn. for *C. granuliferus*.
- multicosta, Winchell, 1863, Proc. Acad. Nat. Sci., p. 5, Marshall Gr.
- muricatus, Hall, 1867, Pal. N. Y., vol. 4, p. 143, Chemung Gr.
- novascotieus, Hall, 1860, Can. Nat. and Geo., vol. 5, p. 144, Niagara Gr.
- ornatus, Shumard, 1855, Geo. of Mo., p. 202, Waverly or Kinderhook Gr.
- parvus, Shumard, 1855, Geo. of Mo., p. 201, Coal Meas.
- permianus, Shumard, 1859, Trans. St. Louis Acad. Sci., vol. 1, p. 390, Permian Gr.
- planumbonus, Meek & Worthen, 1860, Proc. Acad. Nat. Sci., p. 450, and Geo. Sur. Ill., vol. 2, p. 253, Keokuk Gr.
- platynotus, White, 1874, Rep. Invert. Foss., p. 19, and Geo. Sur. W. 100 Mer., vol. 4, p. 121, Subcarboniferous.
- pulchellus, Winchell, 1862, Proc. Acad. Nat. Sci., p. 410, Marshall Gr.
- pusillus, Hall, 1857, 10th Rep. N. Y. St. Mus. Nat. Hist., p. 149, and Pal. N. Y., vol. 4, p. 128, Ham. Gr.
- reversus, Whitfield, 1882, Desc. New Spec. Foss., from Ohio, p. 213, Marcellus shale.
- scitulus, Hall, 1857, 10th Rep. N. Y. St. Mus. Nat. Hist., p. 147, and Pal. N. Y., vol. 4, p. 130, Ham. Gr.
- setigera, Hall, 1843, (*Strophomena setigera*.) Geo. Rep. 4th Dist. N. Y., p. 180, and Pal. N. Y., vol. 4, p. 129, Ham. and Chemung Grs.
- shumardanus, DeKoninck, 1847, Recherches sur les Anim. Foss., p. 192, Waverly Gr.
- smithi, Norwood & Pratten, 1854, Jour. Acad. Nat. Sci., vol. 3, p. 24, Coal Meas.
- striatellus, Dalman, 1827, (*Orthis striatella*.) Kongl. Svenska Ak. Handl., p. 111, Up. Sil.
- styrialis, syn. for *C. carinata*.
- tenuistriatus, Hall, 1860, Can. Nat. and Geo., vol. 5, p. 144, Up. Sil.
- tuomeyi, Norwood & Pratten, 1854, Jour. Acad. Nat. Sci., vol. 3, 2d ser., p. 28, Ham. Gr.
- undulatus, Hall, 1879, 28th Rep. N. Y. St. Mus. Nat. Hist., p. 155, Niagara Gr.
- variolatus, DeKoninck, 1847, Monogr. du genre Chonetes, p. 206, Coal Meas.
- verneuilanus, Norwood & Pratten, 1854, Jour. Acad. Nat. Sci., vol. 3, p. 26, Coal Meas.
- verneuilanus var. utahensis, Meek, 1876, Simpson's Rep. on Gt. Basin of Utah, p. 348, Carboniferous.
- yandellanus, Hall, 1857, 10th Rep. N. Y. St. Mus. Nat. Hist., p. 118, and Pal. N. Y., vol. 4, p. 123, Corniferous Gr.

CÆLOSPIRA, Hall, 1858, Trans. Alb. Inst., vol. 4, p. 146. [Ety. *koilos*, hollow; *spira*, spire.] Ovate or suborbicular, concavo-convex, surface finely plicated, usually undefined mesial fold and sinus, beak small, foramen triangular; internal spires forming two flattened coils connected by a strong loop. Type *C. concava*.



FIG. 549.—*Chonetes mesolobus*. Ventral valve.

concaua, Hall, 1857, (*Leptocœlia concaua*,) 10th Rep. N. Y. St. Mus. Nat. Hist., p.



FIG. 550.—*Cœlospira concaua*. Magnified view of spirals.

107, and Pal. N. Y., vol. 3, p. 245, Corniferous Gr.



FIG. 551.—*Cœlospira disparillis*. Dorsal and ventral views.

disparillis, Pal. N. Y., vol. 2, p. 277, Niagara Gr.

CRANIA, Retzius, 1781, *Schriften der Berliner Gesellschaft Naturforschende Freund*, vol. 2, p. 72. [Ety. *kranion*, the upper part of a skull.] Shell circular, subquadrate, transverse, or elongated, attached by its ventral valve to some foreign object; upper or dorsal valve more or less convex or conical; apex central or subcentral; surface smooth, spiny, radiated, or concentrically lined, and not unfrequently having the markings of the object to which the lower valve is attached; no articulating hinge or ligament, but valves held in place by four muscles; anterior adductor scars approximate and close to the center; posterior pair near the cardinal edge, and widely separated; structure calcareous and tubular. Type *C. brattenburgensis*.

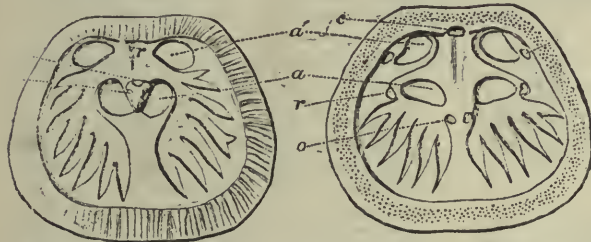


FIG. 552.—*Crania anomala*, 2 diam. *a*, Anterior adductors; *â* posterior adductors; *c*, protractor sliding muscles; *é*, cardinal muscle; *r*, *o*, retractor sliding muscles.

acadiensis, Hall, 1860, *Can. Nat. and Geo.*, vol. 5, p. 144, Up. Sil.
anna, Spencer, 1884, *Bull. No. 1, Mus. Univ. St. Mo.*, p. 57, Niagara Gr.
aurora, Hall, 1863, 16th Rep. N. Y. St. Mus. Nat. Hist., p. 30, Schoharie Grit.

bella, Billings, 1874, *Pal. Foss.*, vol. 2, p. 15, passage beds between Up. Sil. and Devonian.

bordeni, Hall & Whitfield, 1872, 24th Rep. N. Y. St. Mus. Nat. Hist., p. 187, Up. Held. Gr.

carbonaria, Whitfield, 1882, *Desc. New Spec. Foss.*, from Ohio, p. 229, Coal Meas.

corrugata, Hall, 1843, (*Orbicula corrugatus*,) *Geo. Rep. N. Y.*, p. 109, Niagara Gr.

crenistriata, Hall, 1860, 13th Rep. N. Y. St. Mus. Nat. Hist., p. 78, and Pal. N. Y., vol. 4, p. 28, Ham. Gr.

deformata, Hall, 1847, (*Orbicula deformata*,) Pal. N. Y., vol. 1, p. 23, Chazy Gr. Is it a *Crania*?

dentata, Ringueberg, 1886, *Bull. Buf. Soc. Nat. Sci.*, vol. 5, p. 16, Niagara Gr.

dyeri, S. A. Miller, 1875, *Cin. Quar. Jour. Sci.*, vol. 2, p. 13, Hud. Riv. Gr.



eccentrica, Emmons, 1856, (*Orbicula eccentrica*,) *Am. Geol.*, p. 112, Up. Taconic.

famelica, Hall & Whitfield, 1873, 23d Rep. N. Y. St. Mus. Nat. Hist., p. 236, Chemung Gr.

gracilis, Ringueberg, 1886, *Bull. Buf. Soc. Nat. Sci.*, vol. 5, p. 17, Niagara Gr.

granulosa, Winchell, 1880, 8th Rep. Geo. Sur. Minn., p. 63, Trenton Gr.

gregaria, Hall, 1863, 16th Rep. N. Y. St. Mus. Nat. Hist., p. 31, Ham. Gr.

hamiltoniae, Hall, 1860, 13th Rep. N. Y. St. Mus. Nat. Hist., p. 77, and Pal. N. Y., vol. 4, p. 27, Ham. Gr.

lælia, Hall, 1866, 24th Rep. N. Y. St. Mus. Nat. Hist., p. 220, Hud. Riv. Gr.

leoni, Hall, 1860, 13th Rep. N. Y. St. Mus. Nat. Hist., p. 78, and Pal. N. Y., vol. 4, p. 30, Chemung Gr.

modesta, White & St. John, 1868, *Trans. Chi. Acad. Sci.*, p. 118, Up. Coal Meas.

multipunctata, S. A. Miller, 1875, *Cin. Quar. Jour. Sci.*, vol. 2, p. 13, Hud. Riv. Gr.



pannosa, Ringueberg, 1886, *Bull. Buf. Soc. Nat. Sci.*, vol. 5, p. 17, Niagara Gr.

parallela, Ulrich, 1878, *Jour. Cin. Soc. Nat. Hist.*, vol. 1, p. 98, Hud. Riv. Gr.

percarinata, Ulrich, 1878, *Jour. Cin. Soc. Nat. Hist.*, vol. 1, p. 98, Hud. Riv. Gr.

permiana, Shumard, 1859, *Trans. St. Louis Acad. Sci.*, vol. 1, p. 395, Permian Gr.

prima, Owen, 1852, (*Orbicula prima*,) *Geo. Sur. Iowa, Wis., and Minn.*, p. 583, Potsdam Gr.

radicans, Winchell, 1866, *Rep. Low. Peninsula Mich.*, p. 92, Ham. Gr.

FIG. 554.—*Crania multipunctata*.

reposita, White, 1866, Proc. Bost. Soc. Nat. Hist., vol. 9, p. 8, Ham. Gr.
 reticularis, S. A. Miller, 1875, Cin. Quar. Jour. Sci., vol. 2, p. 230, Hud. Riv. Gr.
 rowleyi, Gurley, 1883, New Carb. Foss. Kinderhook Gr. Not defined and published as required by the rules of nomenclature.
 scabiosa, Hall, 1866, 24th Rep. N. Y. St. Mus. Nat. Hist., p. 220, Hud. Riv. Gr.
 setifera, Hall, 1863, Trans. Alb. Inst., vol. 4, p. 209, Niagara Gr.
 setigera, Hall, 1866, 24th Rep. N. Y. St. Mus. Nat. Hist., p. 220, Trenton Gr.
 sheldoni, White, 1862, Proc. Bost. Soc. Nat. Hist., vol. 9, p. 8, Ham. Gr.
 siluriana, Hall, 1863, Trans. Alb. Inst., vol. 4, p. 208, Niagara Gr.
 socialis, Ulrich, 1873, Jour. Cin. Soc. Nat. Hist., vol. 1, p. 99, Hud. Riv. Gr.
 spinigera, Hall, 1879, Desc. New Spec. Foss., p. 13, and 11th Rep. Geo. and Nat. Hist. Ind., p. 283, Niagara Gr.
 trentonensis, Hall, 1866, 24th Rep. N. Y. St. Mus. Nat. Hist., p. 219, Trenton Gr.
 truncata, Emmons, 1856, (Orbicula truncata,) Am. Geol., p. 200, Trenton Gr.
CRYPTONELLA, Hall, 1861, 14th Rep. N. Y. St. Mus. Nat. Hist., p. 102. [Sig. a little cavity.] Equilateral, inequivalve, elongate oval or ovoid; valves unequally convex, no mesial fold or sinus; ventral valve with beak extended or incurved, perforate; foramen terminal; punctate smooth or with concentric striae; articulating by teeth and sockets; dental lamellæ of the ventral valve extending downward into the cavity of the shell; crura extend in a long recurved loop, with long processes into the ventral valve, between which and the apex they are united by a transverse band. Type *C. rectirostra*.
 calvini, Hall & Whitfield, 1870, 23d Rep. N. Y. St. Mus. Nat. Hist., p. 239, Chemung Gr.
 circula, Walcott, 1885, Monogr. U. S. Geo. Sur., p. 163, Devonian.
 endora, Hall, 1867, Pal. N. Y., vol. 4, p. 398, Chemung Gr.
 iphis, Hall, 1867, Pal. N. Y., vol. 4, p. 396, Up. Held. Gr.
 lens, Hall, 1860, (Terebratula lens,) 13th Rep. N. Y. St. Mus. Nat. Hist., p. 89, Up. Held. Gr.
 lincklæni, Hall, 1860, (Terebratula lincklæni,) 13th Rep. N. Y. St. Mus. Nat. Hist., p. 88, Ham. Gr.
 pinonensis, Walcott, 1885, Monogr. U. S. Geo. Sur., p. 163, Devonian.
 planirostra, Hall, 1860, (Terebratula planirostra,) 13th Rep. N. Y. St. Mus. Nat.

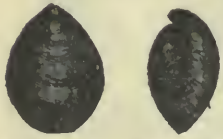


FIG. 556.—*Cryptonella lincklæni*. Dorsal and profile views.



FIG. 555.—*Cyrtina reticularis*.

Hist., p. 89, and Pal. N. Y., vol. 4, p. 395, Ham. Gr.
 rectirostra, Hall, 1860, (Terebratula rectirostra,) 13th Rep. N. Y. St. Mus. Nat. Hist., p. 88, and Pal. N. Y., vol. 4, p. 394, Ham. Gr.
CYRTIA, Dalman, 1827, Kongl. Vet. Acad. Handl., p. 93. [Ety. *kyrtia*, a fishing basket.] Shell somewhat trigonal, valves convex, hinge-line nearly as long as the width of the shell, articulating by teeth and sockets; ventral valve deep, more or less pyramidal, beak straight or slightly recurved, area wide and triangular, fissure covered by a convex pseudodeltidium, generally perforated close to the beak by a circular foramen, a longitudinal depression in the deltidium sometimes shows, at the extremity a circular aperture for the passage of pedicle muscular fibers; dorsal valve less convex; a mesial longitudinal septum, in the ventral valve, extends from the fissure to near the margin, to the sides of which the dental plates converge, and are united after having formed the fissure walls. Type *C. exporrecta*.
 acutirostris, see *Cyrtina acutirostris*.
 bicipitata, see *Cyrtina bicipitata*.
 curvilineata, see *Cyrtina curvilineata*.
 dalmani, see *Cyrtina dalmani*.
 exporrecta, Wahlenberg, 1821, Nova. Acta. Regiæ. Soc. Sci., vol. 8, p. 64, and 24th Rep. N. Y. St. Mus. Nat. Hist., p. 183, Niagara Gr.
 exporrecta var. arrecta, Hall & Whitfield, 1872, 24th Rep. N. Y. St. Mus. Nat. Hist., p. 183, Niagara Gr.
 hamiltonensis, see *Cyrtina hamiltonensis*.
 missouriensis, see *Cyrtina missouriensis*.
 myrtea, Billings, 1862, Pal. Foss., vol. 1, p. 165, Mid Sil.
 occidentalis, see *Cyrtina occidentalis*.
 rostrata, see *Cyrtina rostrata*.
 triquetra, see *Cyrtina triquetra*.
 umbonata, see *Cyrtina umbonata*.
CYRTINA, Davidson, 1858, Monogr. Brit. Carb. Brach., p. 66. [Ety. the diminutive of *Cyrtia* is *Cyrtidium*, but the author said he preferred bad Greek to a long name.] Spirifer-like shells; valves very unequal, ventral being extremely elevated, with high area and narrow fissure, closed by a pseudodeltidium; dental plates converge from the inner margins of the fissure, and, uniting, form a septum to the bottom of the internal cavity, thus dividing it into two parts; shell punctate. Type *C. heteroclyta*.
 acutirostris, Shumard, 1855, (Cyrtia acutirostris,) Geo. Rep. Mo., p. 204, Waverly or Choteau Gr.
 affinis, Billings, 1874, Pal. Foss., vol. 2, p. 49, Gaspé No. 8, Devonian.



FIG. 557.—*Cyrtina exporrecta*.

billingsi, Meek, 1868, Trans. Chi. Acad. Sci., p. 97, Ham. Gr.
biplicata, Hall, 1857, (*Cyrtia biplicata*), 10th Rep. N. Y. St. Mus. Nat. Hist., p. 165, Schoharie grit and Cornif. Gr.
crassa, Hall, 1867, Pal. N. Y., vol. 4, p. 267, Up. Held. Gr.
curvilineata, White, 1865, (*Cyrtia curvilineata*), Proc. Bost. Soc. Nat. Hist., vol. 9, p. 25, and Pal. N. Y., vol. 4, p. 270, Ham. Gr.
dalmani, Hall, 1857, (*Cyrtia dalmani*), 10th Rep. N. Y. St. Mus. Nat. Hist., p. 64, Low. Held. Gr.
davidsoni, Walcott, 1885, Monogr. U. S. Geo. Sur., vol. 8, p. 146, Devonian.
euphemia, Billings, 1863, Can. Nat. and Geol., vol. 8, p. 19, Corniferous Gr.

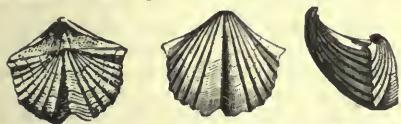


FIG. 558.—*Cyrtina hamiltonensis*. Dorsal, ventral, and side views.

hamiltonensis, Hall, 1857, (*Cyrtia hamiltonensis*), 10th Rep. N. Y. St. Mus. Nat. Hist., p. 166, and Pal. N. Y., vol. 4, p. 268, Schoharie grit, Cornif. and Ham. Grs.
hamiltonensis var. *recta*, Hall, 1867, Pal. N. Y., vol. 4, p. 270, Ham. Gr.
missouriensis, Swallow, 1860, (*Cyrtia missouriensis*), Trans. St. Louis Acad. Sci., vol. 1, p. 647, Ham. Gr.
occidentalis, Swallow, 1860, (*Cyrtia occidentalis*), Trans. St. Louis Acad. Sci., vol. 1, p. 648, Ham. Gr.
panda, Meek, 1868, Trans. Chi. Acad. Sci., p. 100, Ham. Gr.
pyramidalis, Hall, 1852, (*Spirifer pyramidalis*), Pal. N. Y., vol. 2, p. 266, Niagara Gr.
rostrata, Hall, 1857, (*Cyrtia rostrata*), 10th Rep. N. Y. St. Mus. Nat. Hist., p. 64, Oriskany sandstone.
triquetra, Hall, 1858, (*Cyrtia triquetra*), Geo. Rep. Iowa, vol. 1, pt. 2, p. 513, Ham. Gr.
umbonata, Hall, 1858, (*Cyrtia umbonata*), Geo. Rep. Iowa, vol. 1, pt. 2, p. 512, Ham. Gr.
Delthyris, Dalman, 1827, syn. for *Spirifera*.
acanthoptera, syn. for *Spirifera disjuncta*.
acuminata, Conrad, see *Spirifera acuminata*.
acuminata, Hall, syn. for *Spirifera mesacostalis*.
acutilirata, see *Orthis acutilirata*.
arenosa, see *Spirifera arenosa*.
audacula, see *Spirifera audacula*.
bialveata, see *Spirifera bialveata*.
bilobata, see *Orthis bilobata*.
brachynota, see *Spirifera brachynota*.
chemungensis, syn. for *Spirifera disjuncta*.
congesta, see *Spirifera congesta*.
cuspidata, syn. for *Spirifera disjuncta*.
decemplicata, see *Spirifera decemplicata*.

delloidea, syn. for *Orthis lynx*.
disjuncta, see *Spirifera disjuncta*.
duodenaria, see *Spirifera duodenaria*.
dupluplicata, see *Spirifera dupluplicata*.
euruteines, see *Spirifera euruteines*.
expansa, see *Pterotheca expansa*.
fimbriata, see *Spirifera fimbriata*.
granulifera, see *Spirifera granulifera*.
granulosa, see *Spirifera granulosa*.
inermis, see *Spirifera disjuncta*.
lavis, see *Spirifera lavis*.
macronota, see *Spirifera macronota*.
macropleura, see *Spirifera macropleura*.
medialis, see *Spirifera medialis*.
mesacostalis, see *Spirifera mesacostalis*.
mesastrialis, see *Spirifera mesastrialis*.
microptera, syn. for *Orthis lynx*.
mucronata, see *Spirifera mucronata*.
niagarensis, see *Spirifera niagarensis*.
pachyptera, see *Spirifera pachyptera*.
perlata, see *Spirifera disjuncta*.
prolata, see *Spirifera prolata*.
prora, see *Spirifera prora*.
radiata, see *Spirifera radiata*.
raricosta, see *Spirifera raricosta*.
rugatina, see *Spirifera rugatina*.
sculptilis, see *Spirifera sculptilis*.
staminea, see *Spirifera staminea*.
triloba, see *Spirifera triloba*.
undulata, see *Spirifera undulata*.
varica, see *Orthis varica*.
ziczac, see *Spirifera ziczac*.
Dicellomus, Hall, 1873, 23d Rep. N. Y. St. Mus. Nat. Hist., p. 246. A generic name proposed for the reception of *Obolella crassa* and *O. polita*, without distinguishing the generic characters.
Dicraniscus, Meek, syn. for *Triplesia*.
ortoni, see *Triplesia ortoni*.
DIGNOMIA, Hall, 1873, 23d Rep. N. Y. St. Mus. Nat. Hist., p. 245. [Ety. *di*, from; *gnom*, twice; *gnoma*, a sign.] Lingula-like shells having a longitudinal septum in one or both valves. Type *D. alveata*.
alveata, Hall, 1873, 23d Rep. N. Y. St. Mus. Nat. Hist., p. 245, Ham. Gr.
DINOBOLUS, Hall, March, 1871, 23d Rep. N. Y. St. Mus. Nat. Hist., p. 247. [Ety. *dis*, twice; *Obolus*, a genus of shells.] Shell subcircular, valves thick; umbo of the ventral valve slightly prominent; area wider than long; platform sinuated, widely V-shaped; crescent prominently marked in crown and sides; hinge moderately thick, edge rounded, with a pair of subcardinal scars in front of the cardinal facet; umbo of the brachial valve tumid; platform trilobed; outer margins raised; antemedian portion rounded, projecting, and terminating in a median plate; crescent a marked linear scar on the hinge; arching forward in front of the cardinal facet; an indentation on the inner border of its sides near the hinge, another further forward; outer border a fine line; subcardinal scar in the umbonal cavity; rhomboidal, postmedian scar in front of the latter. Type *D. conradi*.

canadensis, Billings, 1857, (Obolus canadensis,) Rep. of Progr. Geo. Sur. of Can., p. 189, and Can. Nat., vol. 6, p. 222, Black Riv. Gr.

conradi, Hall, 1868, (Obolus conradi,) 20th Rep. N. Y. St. Mus. Nat. Hist., p. 368, Niagara Gr.

galtensis, see Trimerella galtensis.

magnificus, Billings, 1872, (Obolus magnifica,) Canadian Naturalist, vol. 6, p. 330, Black Riv. Gr.

parvus, Whitfield, 1882, Geo. Wis., vol. 4, p. 347, Galena Gr.

DISCINA, Lamarck, 1819, Hist. Nat. Animaux Vert., vol. 6, p. 236. [Ety. *discus*, a flat, round plate; the termination *inus*, implying resemblance.] Circular, longitudinally or transversely oval; dorsal valve conical, with apex inclined toward the posterior margin; ventral valve opercular, flat, or partly convex, perforated by a narrow, oval, longitudinal slit, reaching to near the posterior margin, and placed in the

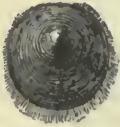


FIG. 559.—*Discina ostreoides*.

middle of an oval depressed disk; surface smooth, striated from the apex to the margin, or having concentric lines of growth produced in foliaceous expansions; structure horny, and perforated by minute tubuli. Type *D. ostreoides*.

acadica, see *Stenotheca acadica*.

alleghania, Hall, 1860, 13th Rep. N. Y. St. Mus. Nat. Hist., p. 77, and Pal. N. Y., vol. 4, p. 25, Chemung Gr.

ampla, Hall, 1867, Pal. N. Y., vol. 4, p. 17, Oriskany sandstone. Proposed instead of *D. grandis* of Hall.

capax, White, 1862, Proc. Bost. Soc. Nat. Hist., vol. 9, p. 30, Waverly or Marshall Gr.

capuliformis, McChesney, syn. for *D. nitida*.

circe, Billings, 1862, Pal. Foss., vol. 1, p. 51, Trenton Gr. See remarks on *D. lamellosa*.

clara, Spencer, 1884, Bull. No. 1, Mus. Univ. St. Mo., p. 56, Niagara Gr.

conata, Walcott, 1885, Monogr. U. S.

Geo. Sur., vol. 8, p. 214, Devonian.

conradi, Hall, 1859, Pal. N. Y., vol. 3, p. 161, Low. Held. Gr.

convexa, Shumard, 1858, Trans. St. Louis Acad. Sci., vol. 1, p. 221, Coal Meas.

discus, Hall, 1859, Pal. N. Y., vol. 3, p. 159, Low. Held. Gr.

doria, Hall, 1863, 16th Rep. N. Y. St. Mus. Nat. Hist., p. 26, Ham. Gr.

elmira, Hall, 1863, 16th Rep. N. Y. St. Mus. Nat. Hist., p. 29, Chemung Gr.

gallaheri, Winchell, 1865, Proc. Acad. Nat. Sci., p. 112, Marshall Gr.

grandis, Vanuxem, 1842, Geo. Rep. 3d Dist. N. Y., p. 152, and Pal. N. Y., vol. 4, p. 17, Cornif. and Ham. Gr.

grandis, Hall, 1859, Pal. N. Y., vol. 3. The name was preoccupied. See *D. ampla*.

humilis, Hall, 1863, 16th Rep. N. Y. St. Mus. Nat. Hist., p. 25, Marcellus Slate and Ham. Gr.

inutilis, Hall, 1863, 16th Rep. N. Y. St. Mus. Nat. Hist., p. 130, Potsdam Gr.

lamellosa, Hall, 1847, (Orbicula lamellosa.) The name was preoccupied by Broderick in 1833. Billings has described it as *D. circe*.

lodensis, Vanuxem, 1842, (Orbicula lodensis,) Geo. Rep. 3d Dist. N. Y., p. 168, and Pal. N. Y., vol. 4, p. 22, Genesee Slate.

manhattanensis, Meek and Hayden, 1859, Proc. Acad. Nat. Sci., p. 25, Coal Meas.

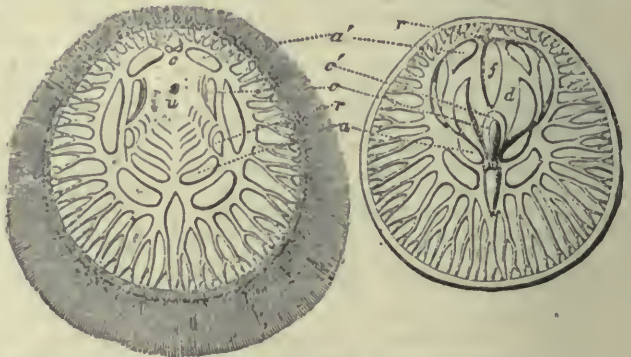


FIG. 561.—*Discina ostreoides*, 2 diam. *u*, Umbo; *f*, foramen; *d*, disk; *a*, anterior adductors; *a'*, posterior adductors; *c, c'*, protractor sliding muscles; *r*, retractor muscles.

marginalis, Whitfield, 1880, Ann. Rep. Geo. Sur. Wis., p. 70, and Geo. Wis., vol. 4, p. 325, Ham. Gr.

media, Hall, 1863, 16th Rep. N. Y. St. Mus. Nat. Hist., p. 27, Ham. and Chemung Grs.

meekana, Whitfield, 1882, Desc. New Spec. Foss. from Ohio, p. 228, Coal Meas.

microscopica, Shumard, 1861, Am. Jour. Sci. and Arts, vol. 32, p. 213, Potsdam Gr.

minuta, Hall, 1843, (Orbicula minuta,) Geo. Rep. 4th Dist. N. Y., p. 180, and Pal. N. Y., vol. 4, p. 16, Marcellus Shale.

missouriensis, Shumard, 1858, Trans. St. Louis Acad. Sci., Coal Meas. Syn. for *D. nitida*.



FIG. 560.—*Discina circe*.

neglecta, Hall, 1863, 16th Rep. N. Y. St. Mus. Nat. Hist., p. 29, Chemung Gr.
 newberryi, Hall, 1863, 16th Rep. N. Y. St. Mus. Nat. Hist., p. 30, Waverly Gr.
 nitida, Phillips, 1836, (Orbicula nitida,) Geo. of York., vol. 2, p. 221, and Geo. Sur. Ill., vol. 5, p. 572, Coal Meas.
 patellaris, Winchell, 1863, Proc. Acad. Nat. Sci., p. 4, Waverly or Marshall Gr.
 pelopea, Billings, 1862, Pal. Foss., vol. 1, p. 52, Trenton Gr.
 pleurites, Meek, 1875, Ohio Pal., vol. 2, p. 278, Waverly Gr.
 randalli, Hall, 1863, 16th Rep. N. Y. St. Mus. Nat. Hist., p. 25, Ham. Gr.
 saffordi, Winchell, 1869, Geo. of Tenn., and, in 1870, Proc. Am. Phil. Soc., p. 248, Marshall Gr.
 seneca, Hall, 1863, 16th Rep. N. Y. St. Mus. Nat. Hist., p. 26, Ham. Gr.
 sublamellosa, Ulrich, 1878, Jour. Cin. Soc. Nat. Hist., p. 97. Probably the cast of a Trematis.
 subtrigonalis, McChesney, 1865, Desc. New Pal. Foss., Coal Meas. Not recognized.
 tenuilamellata, Hall, 1852, (Orbicula tenuilamellata,) Pal. N. Y., vol. 2, p. 250, Niagara Gr.
 tenuilamellata var. subplana, Hall, 1860, Can. Nat. and Geol., vol. 5, p. 144, Up. Sil.
 tenuilineata, Meek & Hayden, 1859, Proc. Acad. Nat. Sci., p. 25, Coal Meas.
 tenuistriata, Ulrich, 1878, Jour. Cin. Soc. Nat. Hist., p. 96. Probably the cast of a Trematis.
 trigonalis, syn. for D. subtrigonalis.
 truncata, see Schizobolus truncatus.
 tullia, Hall, 1863, 16th Rep. N. Y. St. Mus. Nat. Hist., p. 28, Tully limestone.
 vanuxemi, Hall, 1859, Pal. N. Y., vol. 3, p. 162, Water-lime or Low. Held. Gr.
 varsoviensis, Worthen, 1884, Bull. No. 2, Ill. St. Mus. Nat. Hist., p. 23, and Geo. Sur. Ill., vol. 8, p. 102, Keokuk Gr.
EATONIA, Hall, 1857, 10th Rep. N. Y. St. Mus. Nat. Hist., p. 90, and 12th Rep., p. 35. [Ety. proper name.] Oval, ovoid, subcircular, elongate, or transverse; valves very unequally convex; mesial fold and sinus; beak of ventral valve small, perforate, closely incurved over the umbo of the dorsal valve; two teeth in the ventral, with corresponding sockets in the dorsal valve; a prominent bifurcating cardinal process and four crural processes in the dorsal valve distinguish this genus. Type E. medialis.
 eminens, Hall, 1857, N. Y. St. Mus. Nat. Hist., p. 92, and Pal. N. Y., vol. 3, p. 242, Low. Held. Gr.
 medialis, Vanuxem, 1842, (Atrypa mediaalis,) Geo. Rep. 3d Dist. N. Y., p. 121, and Pal. N. Y., vol. 3, p. 241, Low. Held. Gr.
 peculiaris, Conrad, 1841, (Atrypa peculiaris,) Ann. Rep. N. Y., p. 56, and

Pal. N. Y., vol. 3, p. 244, Oriskany and Low. Held. Gr.
 pumila, Hall, 1859, Pal. N. Y., vol. 3, p. 437, Oriskany sandstone.
 singularis, Vanuxem, 1842, (Atrypa singularis,) Geo. Rep. 3d Dist. N. Y., p. 120, and Pal. N. Y., vol. 3, p. 243, Low. Held. Gr.
 sinuata, Hall, 1857, 10th Rep. N. Y. St. Mus. Nat. Hist., p. 91, and Pal. N. Y., vol. 3, Oriskany sandstone.
 whitfieldi, Hall, 1859, Pal. N. Y., vol. 3, p. 437, Oriskany sandstone.



FIG. 563.—Eatonia singularis.

EICHWALDIA, Billings, 1858, Rep. of Progr. Geo. Sur. Can., p. 190. [Ety. proper name.] Ovate or subtrigonal, with or without mesial fold and sinus; ventral valve obscurely perforate on the umbo; apex acute and entire; space beneath occupied by an imperforate concave plate; interior of the rostral cavity containing a transverse septum; dorsal valve with a slender cardinal process and a very elevated medio-longitudinal septum; valves articulated in a narrow groove in the dorsal valve; surface of the shell reticulate, solid, and fibrous beneath. Type E. subtrigonalis.
 anticostiensis, Billings, 1866, Catal. Sil. Foss. Antic., p. 10, Hud. Riv. Gr.
 concinna, Hall, 1868, 20th Rep. N. Y. St. Mus. Nat. Hist., p. 319, Niagara Gr.
 corallifera, Hall, 1852, (Atrypa corallifera,) Pal. N. Y., vol. 2, p. 281, Niagara Gr.
 Prof. Davidson

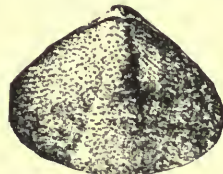


FIG. 564.—Elchwaldia reticulata.

regarded this shell as identical with E. capewelli, which was described in 1848, in Bull. Soc. Geol. France, vol. 3.

gibbosa, Hall, 1868, 20th Rep. N. Y. St. Mus. Nat. Hist., p. 319, Niagara Gr.
reticulata, Hall, 1863, (Rhynchonella?) reticulata, Trans. Alb. Inst., vol. 4, p. 217, Niagara Gr.



FIG. 565.—Echwaldia subtrigonalis. Dorsal, ventral, side, front, and apex views.

Davidson said a syn. for E. capewelli.
 subtrigonalis, Billings, 1858, Rep. of Progr. Geo. Sur. Can., p. 192, Black Riv. Gr.

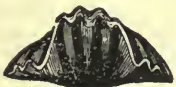


FIG. 562.—Eatonia medialis. Anterior view.

peculiaris, Conrad, 1841, (Atrypa peculiaris,) Ann. Rep. N. Y., p. 56, and

ELKANIA, Ford, 1886, Am. Jour. Sci. and Arts, 3d ser., vol. 32, p. 325. [Ety. proper name.] Shell thin, calcareous, articulate, longitudinally ovate or subcircular, convex; ventral valve, with solid beak and minute-grooved area; muscular scars, six in each valve; beneath the rostrum a spoon-shaped pit separates the scars. Type E. desiderata.

desiderata, Billings, 1862, (Obolella desiderata,) Pal. Foss., vol. 1, p. 69, Up. Taconic.

EUMETRIA, Hall, 1864, 16th Rep. N. Y. St. Mus. Nat. Hist., p. 59. Shell longitudinally suboval; striated, without mesial fold and sinus; structure punctate; beak of the ventral valve incurved; hinge area contracted; foramen large; internal spires as in *Athyris*; dorsal valve in the form of a pectinoid shell, with diverging lamellæ, which extend beneath the cardinal area of the ventral valve on either side of the center; processes extending into the cavity of the dorsal valve, gradually converge, and are united by a transverse concave septum. Type E. vera.

prima, White, 1862, (Acambona prima,) Proc. Bost. Soc. Nat. Hist., vol. 9, p. 27, Burlington Gr.

vera, Hall, 1858, (Retzia vera,) Geo. Sur. Iowa, p. 704, Kaskaskia Gr.

vera var. costata, Hall, 1858, (Retzia vera var. costata,) Geo. Sur. Iowa, p. 704, Kaskaskia Gr.

verneuilana, Hall, 1858, (Retzia verneuilana,) Trans. Alb. Inst., vol. 4, p. 19, and Geo. Sur. Iowa, p. 657, Warsaw Gr.



FIG. 566.—*Eumetria verneuilana*.

GLASSIA, Davidson, 1881, Lond. Geo. Mag., vol. 3, p. 11. [Ety. proper name.] Shell ovate; spiral coils in the dorsal valve for the support of the brachial appendages connected by a loop as in *Atrypa*; lamellæ converge downward like the letter V, with the extremities turned slightly upward before uniting; principal coils face the lateral margins; ends of the spirals meet in the center of the shell; spirals consist of four or five compressed coils. Type G. obovata.

headi, Meek, 1873, (*Zygospira headi*,) Ohio Pal., vol. 1, p. 127, Hud. Riv. Gr.

Goniocelia, Hall, syn. for *Pentagonia*.

GYPIDULA, Hall, 1867, Pal. N. Y., vol. 4, p. 373. [Ety. *gyps*, vulture; in allusion to the strongly incurved beak.] Short, gibbous or ventricose, ventral valve much the larger, with or without mesial fold; a large fissure, and elongate, much incurved, trough-shaped pit; dorsal valve depressed in front; area on both valves, that of the ventral striated as in *Spirifera*; lamellæ of dorsal valve separate and diverging. Type G. occidentalis.

læviuscula, Hall, 1867, Pal. N. Y., vol. 4, p. 381, Devonian.

munda, Calvin, 1878, Bull. U. S. Geo. Sur., vol. 4, No. 3, p. 730, Low. Devonian.

obsolescens, see *Pentamerella obsolescens occidentalis*, Hall, 1858, (*Pentamerus occidentalis*,) Geo. Rep. Iowa, vol. 1, pt. 2, p. 514, Ham. Gr.

unguiformis, Ulrich, 1886, Cont. to Am. Pal., p. 28, Niagara Gr.

Hemipronites, Pander, 1830. This name, not having been defined, has been superseded by *Streptorhynchus*, if the two names refer to the same form.

americanus, see *Streptorhynchus americanum*.

HINDELLA, Davidson, 1882, Monogr. Brit. Foss., Brachiozoa, vol. 5, p. 130. [Ety. proper name.] Shell elongate, ovate; about six coils in each spiral; apices directed laterally; stems attached to the hinge plate, and extending into the interior, they are abruptly bent backward, and then form a broad, rounded curve, facing the bottom of the dorsal valve; when they reach the front they give off a semicircular loop, having a spike-like process at the top, directed toward the beak. Type H. umbonata.

umbonata, Billings, 1865, (*Athyris umbonata*,) Pal. Foss., vol. 1, p. 144, Mid. Sil., Anticosti Div. 1.

Hippariomyx, Vanuxem, 1842, Geo. 3d Dist. N. Y., p. 124, syn. for *Orthis*. The genus was founded on a cast.

consimilis, syn. for *Atrypa reticularis*.

proximus, see *Orthis proximus*.

similaris, Vanuxem, 1842, Geo. Rep. 3d Dist. N. Y., Oriskany sandstone. Not defined.

IPIIDEA, Billings, 1874, Pal. Foss., vol. 2, p. 76. [Ety. proper name.] Ventral valve conical, elevated at the beak, hinge-line nearly straight, posterior angles rounded, sides and front nearly uniformly rounded; posterior side with a large false area and a convex pseudodeltidium; dorsal valve semicircular, moderately convex, most elevated at the beak; surface concentrically marked. Type I. bella.

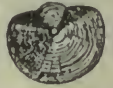


FIG. 567.—*Ipiidea bella*.

bella, Billings, 1872, Can. Nat., vol. 6, p. 477, and Pal. Foss., vol. 2, p. 76, Up. Taconic.

sculptilis, see *Kutorgina sculptilis*.

KONINCKIA, Suess, 1853. MS. published by Woodward, 1854, in Manual of Mollusca, p. 231. [Ety. proper name.]

Shell circular, inequivalve, compressed; ventral valve convex, with a slight longitudinal depression; beak incurved, with auricular expansions; dorsal valve concave; surface smooth; no area or deltidium; valves inarticulated; mesial ridge in dorsal valve; oral appendages supported by a

spiral, calcified lamella. Type *K. leonhardi*.

americana, Swallow, 1863, Trans. St. Louis Acad. Sci., vol. 2, p. 94, Kaskaskia Gr.

KUTORGINA, Billings, 1861, Pal. Foss., vol. 1, p. 8. [Ety. proper name.] Shell more



FIG. 568.—Kutorgina pannula. Enlarged 6 diam.

or less subquadrate in outline; hinge-line straight; sides slightly convex, anterior angles rounded, front slightly convex; surface with concentric ridges terminating on the cardinal edges, and the course conforming to the margin of the shell, and sometimes

with lines radiating from the beak to the margin; ventral valve tumid, most convex about the middle, beak slightly depressed; cardinal edges straight or slightly concave and diverging from the beak at an obtuse angle; dorsal valve less convex, most elevated at the beak, and along the middle there is a shallow concavity extending to the front margin. Type *K. cingulata*.

cingulata, Billings, 1861, Pal. Foss., vol. 1, p. 8, Up. Taconic.

labradorica, Billings, 1861, (Obolus labradoricus,) Pal. Foss., vol. 1, p. 6, Up. Taconic.

latourensii, Matthew, 1885, Trans. Roy. Soc. Can., p. 42, St. John Gr.

minutissima, Hall & Whitfield, 1877, U. S. Geo. Expl. 40th parallel, syn. for *K. sculptilis*.

pannula, White, 1874, (Trematis pannulus,) Rep. Invert. Foss., p. 6, and Geo. Sur. W. 100th Mer., vol. 4, p. 36, Up. Taconic.

prospectensis, Walcott, 1885, Monogr. U. S. Geo. Sur. Terr., vol. 8, p. 19, Up. Taconic.

pterineoides, Matthew, 1885, Trans. Roy. Soc. Can., p. 43, St. John Gr.

sculptilis, Meek, 1873, (Iphideasculptilis,) 6th Ann. Rep. U. S. Geo. Sur. Terr., p. 479, and Monogr. U. S. Geo. Sur. Terr., vol. 8, p. 20, Potsdam Gr.

stissingensis, Dwight, 1889, Am. Jour. Sci. and Arts, 3d ser., vol. 38, p. 145, Up. Taconic.

whitfieldi, Walcott, 1885, Monogr. U. S. Geo. Sur. Terr., vol. 8, p. 18, Up. Taconic.

LEIORHYNCHUS, Hall, 1860, 13th Rep. N. Y. St. Mus. Nat. Hist., p. 75. [Ety. *leios*, smooth; *rhynchos*, beak.] Ovate, circular or transverse, valves unequally convex; mesial fold and sinus, which are plicated; articulating by teeth and sockets; apex of ventral valve perforate, two diverging lamellæ extend into and join the sides or bottom of the rostral cavity; muscular impressions occupy a narrow triangular cavity below the dental lamellæ; median septum in the dorsal valve extending half the length of the shell; hinge plates, narrow, strong processes, embraced by the

curving teeth of the opposite valve; substance fibrous. Type *L. quadricostatum*. dubium, Hall, 1867, Pal. N. Y., vol. 4, p. 364, Marcellus Shale.

globuliforme, Vanuxem, 1842, (Atrypa globuliformis,) Geo. 3d Dist. N. Y., p. 182, and Pal. N. Y., vol. 4, p. 364, Chemung Gr.

hecate, Clarke, 1885, Bull. U. S. Geo. Sur. No. 16, p. 31, Genesee Shales.

huronense, Nicholson, 1874, Geo. Mag. Lond., n. s., vol. 1, p. 120, Ham. Gr.

iris, Hall, 1867, Pal. N. Y., vol. 4, p. 360, Chemung Gr.

kelloggi, Hall, 1867, Pal. N. Y., vol. 4, p. 361, Chemung Gr.

laura, Billings, May, 1860, (Rhynchonella laura,) Can. Jour., vol. 5, p. 273, Ham. Gr.

limitare, Vanuxem, 1842, (Orthis limitaris,) Geo.

3d Dist. N. Y., p. 146,

and Pal. N. Y., vol. 4, p. 356, (Atrypa limitaris),

4th Dist. N. Y., Marcellus Shale.

mesacostale, Hall, 1843, (Atrypa mesacostalis,) Geo. 4th Dist. N. Y., pl.

64, and Pal. N. Y., vol. 4, p. 362, Chemung Gr.

multicosta, Hall, 1860, 13th Rep. N. Y. St. Mus. Nat. Hist., p. 85, and Pal. N. Y.,

vol. 4, p. 358, Ham. Gr.

mysia, Hall, 1867, Pal. N. Y., vol. 4, p. 357, Marcellus Shale.

nevadense, Walcott, 1885, Monogr. U. S. Geo. Sur., vol. 8, p. 157, Devonian.

newberryi, Hall & Whitfield, 1873, 23d Rep. N. Y. St. Mus. Nat. Hist., p. 240, Waverly Gr.

quadricostatum, Vanuxem, 1842, (Orthis quadricostata,) Geo. 3d Dist. N. Y., p.

168, and Pal. N. Y., vol. 4, p. 357, Genesee Slate.

sesquiplicatum, Winchell, 1866, Rep. Low. Penin. Mich., p. 95, Ham. Gr.

sinuatum, Hall, 1867, Pal. N. Y., vol. 4, p. 362, Chemung Gr.

LEPTENA, Dalman, 1827, Kongl. Vet. Acad. Handl., p. 93. [Ety. *leptos*, thin.] Shell

thin, semicircular, transversely elongated, smooth or finely striated; hinge-

line straight, ventral valve convex, fissure partly covered by a deltidium;

beak inconspicuous, sometimes perforated; cardinal area narrow; muscular

scars small, not marginal; adductor scars close to a mesial ridge, while the

cardinal scars are on either side; vascular impressions radiating; dorsal

valve concave; socket ridges large, cardinal process small, multifid, connate

with their bases; adductor impressions large, produced, elongated, and bordered

by ridges; area on both valves. Type *L. transversalis*.

alternata, see *Strophomena alternata*.

alternistriata, see *Strophomena alternistriata*.

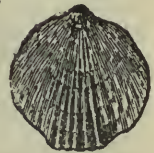


FIG. 569.—Leiorhynchus quadricostatus.

- analoga*, see *Strophomena analoga*.
aspera, James, syn. for *L. sericea*.
barabuensis, Winchell, 1864, (*Orthis barabuensis*.) *Am. Jour. Sci. and Arts*, 2d ser., vol. 37, p. 229, and *Geo. Wis.*, vol. 4, p. 171, Potsdam Gr.
bipartita, see *Strophomena bipartita*.
camerata, see *Strophomena camerata*.
concava, Hall, 1857, 10th Rep. N. Y. St. Mus. Nat. Hist., p. 47, and *Pal. N. Y.*, vol. 3, p. 197, Low. Held. Gr.
decipiens, Billings, 1862, *Pal. Foss.*, vol. 1, p. 74, Quebec Gr.
deflecta, see *Streptorhynchus deflectum*.
deltoida, see *Strophomena deltoida*.
depressa, see *Strophomena depressa*.
fasciata, see *Strophomena fasciata*.
filitexta, see *Streptorhynchus filitextum*.
fragaria, syn. for *Productella subaculeata*.
incrassata, see *Strophomena incrassata*.
indenta, see *Strophodonta indenta*.
laticosta, syn. for *Tropidoleptus carinatus*.
melita, Hall & Whitfield, 1877, *U. S. Geo. Expl. 40th parallel*, vol. 4, p. 208, Potsdam Gr.
membranacea, see *Productella hirsuta*.
mesacosta, Shumard, 1855, *Geo. Rep. Mo.*, p. 205, Trenton Gr.
nasuta, see *Strophomena nasuta*.
nucleata, Hall, 1857, 10th Rep. N. Y. St. Mus. Nat. Hist., p. 47, and *Pal. N. Y.*, vol. 3, p. 419, Oriskany sandstone.
obscura, see *Strophomena obscura*.
orthididea, see *Strophomena orthididea*.
planoconvexa, see *Streptorhynchus planoconvexum*.
planumbona, see *Streptorhynchus planumbonum*.
plicatella, Ulrich, 1879, *Jour. Cin. Soc. Nat. Hist.*, vol. 2, p. 15, Utica Slate Gr.
plicifera, see *Strophomena plicifera*.
profunda, see *Strophodonta profunda*.
prolongata, Foerste, 1885, *Bull. Sci. Lab. Denison Univ.*, p. 79, Niagara Gr.
punctulifera, see *Strophonella punctulifera*.
quadrilatera, syn. for *Strophomena rhomboidalis*.
recta, see *Streptorhynchus rectum*.
rugosa, see *Strophomena rugosa*.
semiovalis, syn. for *L. sericea*.
sericea, Sowerby, 1839, *Murch. Sil. Syst.*, p. 636, and *Pal. N. Y.*, vol. 1, p. 110, Trenton to Clinton Gr.

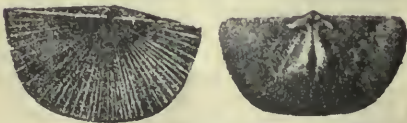


FIG. 570.—*Leptæna sericea*. Dorsal view, and interior of dorsal valve.

- sordida*, Billings, 1862, *Pal. Foss.*, vol. 1, p. 73, Quebec Gr.
subquadrata, Hall, 1883, *Rep. St. Geol.*, pl. 46, fig. 32, 33, Low. Held. Gr.
subtenta, see *Streptorhynchus subtentum*.
tenuilineata, see *Strophomena tenuilineata*.
tenuistriata, see *Strophomena tenuistriata*.

- transversalis*, Wahlenberg, 1821, (*Anomites transversalis*.) *Act. Soc. Upsal.*, vol. 8, p. 64, and *Pal. N. Y.*, vol. 2, p. p. 256, Anticosti and Clinton Gr.
trilobata, see *Strophomena trilobata*.
vicina, Castelnau, 1843, *Syst. Sil.*, p. 39. Not recognized.

- LEPTONOLUS, Hall, 1871, 24th Rep. N. Y. St. Mus. Nat. Hist., p. 226. [Ety. *leptos*, minute; *Obolus*, a genus.] Shell small, ovate, fragile, semiphosphatic, concentrically lined; ventral valve with an area and pedicel groove, muscular scar elevated, subquadrate; dorsal valve with trifid muscular impressions. Type *L. lepis*.
insignis, Hall, 1871, 24th Rep. N. Y. St. Mus. Nat. Hist., p. 227, Utica Slate.
lepis, Hall, 1871, 24th Rep. N. Y. St. Mus. Nat. Hist., p. 226, Utica Slate.
occidentalis, Hall, 1871, 24th Rep. N. Y. St. Mus. Nat. Hist., p. 227, Utica Slate.
LEPTOCÆLIA, Hall, 1857, 10th Rep. N. Y. St. Mus. Nat. Hist., p. 107, and 12th Rep., p. 32. [Ety. *leptos*, minute; *koilia*, belly; in allusion to the shallow visceral cavity.] Shell inequivalve, variable in form, plicated, usually mesial fold and sinus, substance lamellose or fibrous; ventral valve convex, beak extended, and more or less incurved; foramen terminal, the lower side formed by two deltoid pieces; two strong teeth, denticulated; muscular impressions marking a flabelliform area with a thin median septum, adductor imprints small; dorsal valve flat, concave, or depressed convex; on each side of a strong cardinal process are the deep, oblique, dental fossets, from the inner margins of which the crural processes proceed, supported below by thickened plates, extending obliquely on the border of the muscular impression toward the middle of the shell; muscular impression divided by a low median septum; the crura, in their extension, are united, in a flattened disk, which terminates in an acute point; on the center of the cardinal side a slender process extends downward, and near the junction of the crura two slender processes extend into the cavity of the ventral valve. Type *L. flabellites*.

- acutiplicata*, Conrad, 1841, (*Atrypa acutiplicata*.) *Ann. Rep. N. Y.*, p. 54, and *Pal. N. Y.*, vol. 4, p. 365, Up. Held. Gr.

- concava*, see *Cœlospira concava*.
dichotoma, see *Cœlospira dichotoma*.
disparilis, see *Cœlospira disparilis*.

- fimbriata*, Hall, 1859, *Pal. N. Y.*, vol. 3, p. 451, Oriskany sandstone.

- flabellites*, Conrad, 1841, (*Atrypa flabellites*.) *Ann. Rep. N. Y.*, p. 55, and *Pal. N. Y.*, vol. 3, p. 449, Oriskany sandstone.



FIG. 571.—*Leptocœlia flabellites*.

hemispherica, Sowerby, 1839, (*Atrypa hemispherica*.) Murch. Sil. Syst., p. 639, and Pal. N. Y., vol. 2, p. 74, Clinton Gr.

imbricata, see *Trematospira imbricata*.

intermedia, Hall, 1860, Can. Nat. and Geo., vol. 5, p. 144, Up. Sil.

planoconvexa, Hall, 1852, (*Atrypa planoconvexa*.) Pal. N. Y., vol. 2, p. 75, Clinton Gr.

propria, Hall, syn. for *L. flabellites*.

LINGULA, Bruguiere, 1792, Encyc. Meth., tab. 250. [Ety. *lingula*, a little tongue.]

Shell oblong or ovoid, depressed, thin, gaping at each end, rounded or subtruncate in front, pointed at the beaks, consisting of alternate fibrous, corneous, and tubular testaceous, phosphatic laminae; valves convex, held together by the action of muscles, beak of ventral valve more pointed and prominent than the other; surface smooth or concentrically lined; peduncle long, thick, cylindrical, fleshy, and flexible; there are twelve muscular impressions in the dorsal, and thirteen in the ventral valve. Type *L. anatina*. No Palaeozoic shell is positively known to agree with this genus in its muscular impressions, and probably none belong to it. Many referred to it belong to *Lingulella*, others to *Lingulepis*, and others, may be, to undefined genera. The external appearance, however, resembles *Lingula*, and for want of material to distinguish internal characters, they are left, provisionally, where the authors of the species left them.

acuminata, Conrad, 1839, Ann. Rep. N. Y., p. 64, Calcif. Gr.

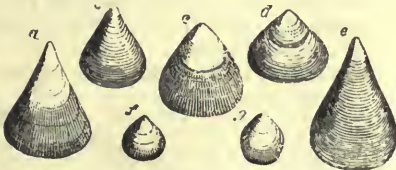


FIG. 572.—*Lingula acuminata*. Various forms; a, b, c, and e are ventral valves; d, dorsal; and f and g are young shells.

acutangula, Roemer, 1852, Kreid. von Texas, p. 90, Silurian.

acutirostra, Hall, 1843, Geo. Rep. 4th Dist. N. Y., p. 77, and Pal. N. Y., vol. 2, p. 56, Clinton Gr.

æqualis, Hall, 1847, Pal. N. Y., vol. 1, p. 95, Trenton Gr.

albapinensis, Walcott, 1885, Monogr. U. S. Geo. Sur., vol. 8, p. 108, Devonian.

alveata, Hall, 1863, 16th Rep. N. Y. St. Mus. Nat. Hist., p. 23, and Pal. N. Y., vol. 4, p. 12, Ham. Gr.

ampla, Owen, 1852, Geo. Sur. Wis., Iowa, and Minn., p. 583, Potsdam Gr.

antiqua, Emmons, 1842, Geo. Rep. N. Y., p. 268, and Pal. N. Y., vol. 1, p. 3, Potsdam Gr.

antiquata, Emmons, 1856, Am. Geol., p. 202, Potsdam Gr.

artemis, Billings, 1874, Pal. Foss., vol. 2, p. 14, passage beds between Up. Sil. and Devonian.

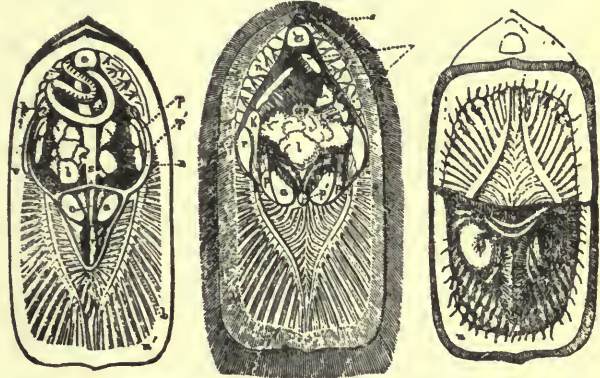


FIG. 573.—*Lingula anatina*. aa, Anterior adductors; a, posterior adductor; pp, external protractors; pp, central protractors; rr, anterior retractors; r, posterior retractors; c, capsule of pedicel; n, visceral sheath; o, oesophagus; s, stomach; l, liver; v, vent; h, auricles, etc.

attenuata, Sowerby. The fossil referred by Hall to this species is described by Billings under the name of *L. daphne*. *aurora*, see *Lingulella aurora*.

belli, Billings, 1859, Can. Nat. Geo., vol. 4, p. 431, Chazy Gr.

bicarinata, Ringueberg, 1884, Proc. Acad. Nat. Sci., p. 149, Niagara Gr. Not defined so as to be recognized.

billingsana, Whiteaves, 1878, Am. Jour. Sci. and Arts, 3d ser., vol. 16, p. 226, St. John's Gr.

bisulcata, Ulrich, 1889, Am. Geol., vol. 3, p. 380, Utica Slate.

briseis, Billings, 1862, Pal. Foss., vol. 1, p. 48, Trenton Gr.

calumet, N. H. Winchell, 1885, 13th Ann. Rep. Geo. Sur. Minn., p. 65, Taconic. Probably an *Obolella*.


canadensis, Billings, 1862, Pal. Foss., vol. 1, p. 114, Hud. Riv. Gr.

carbonaria, Shumard, 1858, Trans. St. Louis Acad. Sci., vol. 1, p. 215, Coal Meas. *centrilineata*, Hall, 1859, Pal. N. Y., vol. 3, p. 155, Low. Held. Gr.

ceryx, Hall, 1863, 16th Rep. N. Y. St. Mus. Nat. Hist., p. 19, and Pal. N. Y., vol. 4, p. 5, Schoharie grit.

clintoni, Vanuxem, 1842, Geo. Rep. N. Y., p. 79, and Pal. N. Y., vol. 2, p. 54, Clinton Gr.

cobourgensis, Billings, 1862, Pal. Foss., vol. 1, p. 50, Trenton Gr.

- complanata*, Williams, 1882, Proc. A. A. A. S., vol. 30, p. 188, Chemung Gr.
concentrica, Conrad, 1839, Ann. Rep. N. Y., p. 64, and Geo. Rep. 3d Dist. N. Y., p. 168, Genesee Slate.
covingtonensis, Hall & Whitfield, 1875, Ohio Pal., vol. 2, p. 67, Utica Slate.
crassa, Hall, 1847, Pal. N. Y., vol. 1, p. 98, Trenton Gr.
crawfordsvillensis, Gurlay, 1883, New Carb. Foss., p. 2, Keokuk Gr. The publication is not such as to entitle it to recognition.
cuneata, see *Lingulella cuneata*.
curta, Conrad, 1842, Jour. Acad. Nat. Sci., vol. 8, p. 266, and Pal. N. Y., vol. 1, p. 97, Utica Slate.
cuyahoga, Hall, 1863, 16th Rep. N. Y. St. Mus. Nat. Hist., p. 24, and Pal. N. Y., vol. 4, p. 15, Waverly Gr.
cyane, Billings, 1865, Pal. Foss., vol. 1, p. 216, Quebec Gr.
daphne, Billings, 1862, Pal. Foss., vol. 1, p. 50, Trenton Gr. See *L. attenuata*.
dawsoni, Mathew, 1884, Bull. U. S. Geo. Sur., vol. 2, p. 283, St. John Gr.
delia, Hall, 1863, 16th Rep. N. Y. St. Mus. Nat. Hist., p. 22, and Pal. N. Y., vol. 4, p. 12, Ham. Gr.
densa, Hall, 1863, 16th Rep. N. Y. St. Mus. Nat. Hist., p. 22, and Pal. N. Y., vol. 4, p. 11, Ham. Gr.
desiderata, Hall, 1863, 16th Rep. N. Y. St. Mus. Nat. Hist., p. 19, and Pal. N. Y., vol. 1, p. 6, Up. Held. Gr.
elderi, Whitfield, 1880, Am. Jour. Sci. and Arts, 3d ser., vol. 19, p. 472, and Geo. Wis., vol. 4, p. 345, Trenton Gr.
elegantula, syn. for *Lingula quadrata*.
elliptica, Hall, 1843, Geo. Rep. 4th Dist. N. Y. The name was preoccupied by Phillips in 1836. See *L. subelliptica*.
elliptica, Emmons, 1856, Am. Geol. The name was preoccupied.
elongata, Hall, 1847, Pal. N. Y., vol. 1, p. 97, Trenton Gr.
exilis, Hall, 1860, 13th Rep. N. Y. St. Mus. Nat. Hist., p. 77, and Pal. N. Y., vol. 4, p. 7, Marcellus Shale.
eva, Billings, 1861, Can. Nat. Geo., vol. 6, p. 150, Black Riv. Gr.
forbesi, Billings, 1862, Pal. Foss., vol. 1, p. 115, Hud. Riv. and Mid. Sil. Grs.
gibbosa, Hall, 1879, Desc. New Spec. Foss., p. 13, and 11th Rep. Geo. and Nat. Hist. Ind., p. 284, Niagara Gr.
halli, White, 1862, Proc. Bost. Soc. Nat. Hist., vol. 9, p. 8, Burlington Gr.
hurlbuti, Winchell, 1880, Geo. Sur. Minn., 8th Rep., p. 62, Galena Gr.
huronicensis, Billings, 1859, Can. Nat. Geo., vol. 4, p. 433, Chazy and Black Riv. Grs.
ingens, Spencer, 1884, Bull. No. 1, Mus. Univ. St. Mo., p. 56, Niagara Gr.
insularis, Billings, 1866, Catal. Sil. Foss. Antic., p. 40, Anticosti Gr.
iole, Billings, 1865, Pal. Foss., vol. 1, p. 215, Quebec Gr.
iowensis, see *Lingulella iowensis*.
irene, Billings, 1862, Pal. Foss., vol. 1, p. 71, Quebec Gr.
iris, Billings, 1865, Pal. Foss., vol. 1, p. 301, Quebec Gr.
kingstonensis, Billings, 1862, Pal. Foss., vol. 1, p. 48, Black Riv. Gr.
lamellata, Hall, 1843, Geo. Rep. 4th Dist. N. Y., p. 108, and Pal. N. Y., vol. 2, p. 249, Clinton and Niagara Grs.
leana, Hall, 1863, 16th Rep. N. Y. St. Mus. Nat. Hist., p. 20, and Pal. N. Y., vol. 4, p. 9, Ham. Gr.
ligea, Hall, 1860, 13th Rep. N. Y. St. Mus. Nat. Hist., p. 76, and Pal. N. Y., vol. 4, p. 7, Ham. Gr.
ligea var. Hall, 1867, Pal. N. Y., vol. 4, p. 8, Portage Gr.
ligea var. nevadensis, Walcott, 1885, Monogr. U. S. Geo. Sur., vol. 8, p. 107, Devonian.
lonensis, Walcott, 1885, Monogr. U. S. Geo. Sur., vol. 8, p. 108, Devonian.
lucretia, Billings, 1874, Pal. Foss., vol. 2, p. 14, passage beds between Up. Sil. and Devonian.
lyelli, Billings, 1859, Can. Nat. Geo., vol. 4, p. 348, Calcif. and Chazy Grs.
maida, Hall, 1863, 16th Rep. N. Y. St. Mus. Nat. Hist., p. 20, and Pal. N. Y., vol. 4, p. 9, Ham. Gr.
manni, Hall, 1863, 16th Rep. N. Y. St. Mus. Nat. Hist., p. 20, and Pal. N. Y., vol. 4, p. 6, Up. Held. Gr.
mantelli, Billings, 1859, Can. Nat. Geo., vol. 4, p. 349, Calcif. Gr.
manticula, White, 1864, Rep. Invert. Foss., p. 9, and Geo. Sur. W. 100th Mer., vol. 4, p. 52, Up. Taconic.
matthewi, see *Acrothele matthewi*.
melie, Hall, 1863, 16th Rep. N. Y. St. Mus. Nat. Hist., p. 24, and Pal. N. Y., vol. 4, p. 14, Waverly Gr.
membranacea, Winchell, 1863, Proc. Acad. Nat. Sci. Phil., vol. 15, p. 3, Marshall Gr.
minuta, Meek, 1868, Trans. Chi. Acad. Sci., p. 87, Devonian.
mosia, Hall, 1863, 16th Rep. N. Y. St. Mus. Nat. Hist., p. 126, Potsdam Gr.
murrayi, Billings, 1874, Pal. Foss., vol. 2, p. 66, Up. Taconic.
mytiloides, Sowerby, 1812, Min. Conch., p. 55, tab. 19, Coal Meas.
nebraskensis, Meek, 1872, (*L. scotica* var. *nebraskensis*.) Pal. E. Neb., p. 158, Coal Meas.
norwoodi, James, 1875, Cin. Quar. Jour. Sci., vol. 2, p. 10, Utica Slate Gr.
nuda, Hall, 1863, 16th Rep. N. Y. St. Mus. Nat. Hist., p. 22, Ham. Gr.  FIG. 574.—*Lingulella norwoodi*.
nympha, Billings, 1865, Pal. Foss., vol. 1, p. 214, Quebec Gr.
oblata, Hall, 1843, Geo. Rep. 4th Dist. N. Y., p. 77, and Pal. N. Y., vol. 2, p. 54, Clinton Gr.

oblonga, Conrad, 1839, Ann. Rep. N. Y.
The name was preoccupied, and afterward it was called *L. clintoni*.

obtusa, Hall, 1847, Pal. N. Y., vol. 1, p. 98, Trenton Gr.

ovata, McCoy, 1844, Syn. Sil. Foss. Ireland, p. 24. Not clearly identified in America.

palliformis, Hall, 1860, 13th Rep. N. Y. St. Mus. Nat. Hist., p. 76, and Pal. N. Y., vol. 4, p. 8, Ham. Gr.

papillosa, Emmons, 1856, Am. Geol., p. 202, Trenton Gr.

perlata, Hall, 1859, Pal. N. Y., vol. 3, p. 156, Low. Held. Gr.

perovata, Hall, 1852, Pal. N. Y., vol. 2, p. 55, Clinton Gr.

perplexa, Hall, 1877, 1st ed. Am. Pal. Foss., p. 244. Proposed instead of *L. elliptica*, which was preoccupied, but D'Orbigny had previously proposed *L. subelliptica*.

perryi, Billings, 1861, Pal. Foss., vol. 1, p. 20, Black Riv. Gr.

philomela, Billings, 1862, Pal. Foss., vol. 1, p. 49, Trenton Gr.

pinniformis, see *Lingulepis pinniformis*.

polita, see *Obolella polita*.

prima, see *Lingulepis prima*.

prima, Emmons, 1856, Am. Geol. This name was preoccupied.

proctori, Ulrich, 1889, Am. Geol., vol. 3, p. 377, Trenton Gr.

progne, Billings, 1862, Pal. Foss., vol. 1, p. 47, Utica Slate and Trenton Grs.

punctata, Hall, 1863, 16th Rep. N. Y. St. Mus. Nat. Hist., p. 21, and Pal. N. Y., vol. 4, p. 10, Ham. Gr.

quadrata, Eichwald, 1829, (Crania quadrata,) Zool. Specialis, vol. 1, p. 273, and Pal. N. Y., vol. 1, p. 96, Trenton Gr.

quebecensis, Billings, 1862, Pal. Foss., vol. 1, p. 72, Quebec Gr.

rectulatera, Hall, 1859, Pal. N. Y., vol. 3, p. 156, Low. Held. Gr.

rectilateralis, Emmons, 1842, Geo. Rep. N. Y., p. 399, Utica Slate.

riciniformis, Hall, 1847, Pal. N. Y., vol. 1, p. 95, Trenton Gr.

scotica, Davidson, 1860, Monogr. Scot. Carb. Brach., p. 62, Waverly Gr.

scotica var. nebraskensis, see *L. nebraskensis*.

spathata, Hall, 1859, Pal. N. Y., vol. 3, p. 157, Low. Held. Gr.

spatiosa, Hall, 1859, Pal. N. Y., vol. 3, p. 158, Low. Held. Gr.

spatulata, Vanuxem, 1842, Geo. Rep. 3d Dist. N. Y., p. 168, and Pal. N. Y., vol. 4, p. 13, Genesee slate.

stoneana, Whitfield, 1882, Geo. Wis., vol. 4, p. 344, Potsdam Gr.

striata, Emmons, 1856, Am. Geol., p. 112, Up. Taconic.

subelliptica, D'Orbigny, 1850, Prodr. d. Paleont., t. 1, p. 34, Clinton Gr. Proposed instead of *L. elliptica*, Hall, in 1843, Geo. Rep. 4th Dist. N. Y., p. 77.

suboblonga, D'Orbigny, syn. for *L. clintoni*.

subspatulata, Meek & Worthen, 1868, Geo. Sur. Ill., vol. 3, p. 437, Ham. Gr.

thedfordensis, Whiteaves, 1887, Cont. to Can. Pal., vol. 1, p. 111, Ham. Gr.

trentonensis, Conrad, 1842, Jour. Acad. Nat. Sci., vol. 8, p. 266, Trenton Gr.

triquetra, Clarke, 1835, Bull. U. S. Geo. Sur., vol. 16, p. 62, Portage Gr.

umbonata, Cox, 1857, Geo. Sur. Ky., vol. 3, p. 576, Coal Meas.

vanhorni, S. A. Miller, 1875, Cin. Quar. Jour. Sci., vol. 2, p. 9, Hud. Riv. Gr.

varsoviensis, Worthen, 1884, Bull. No. 2 Ill. St. Mus. Nat. Hist., p. 24, and Geo. Sur. Ill., vol. 8, p. 104, Warsaw Gr.

whitii, Walcott, 1885, Monogr. U. S. Geo. Sur., vol. 8, p. 109, Devonian.

whitfieldi, Ulrich, 1889, Am. Geol., vol. 3, p. 381, Utica Slate.

winona, Hall, 1863, 16th Rep. N. Y. St. Mus. Nat. Hist., p. 126, Potsdam Gr.

LINGULELASMA, Ulrich, 1889, Am. Geol., vol. 3, p. 383. [Ety. *Lingula*, a genus; *clasma*, plate.] Form and composition like *Lingula*; pedicle valve with slightly projecting beak, faintly arched deltidium, no area, small socket on each side of the deltidial borders, and subtriangular scar opposite their anterior ends subtriangular, trilobed platform from base of deltidium to middle of valve, with central part produced below in a low median ridge; two muscular scars on the lower lateral sides of the platform; brachial valve, with transverse ridge and swollen ends for sockets on the opposite valve; platform concave, elevated in front, and prolonged in a median plate, subcardinal, umbolateral and postmedian scars. Type *L. schucherti*.



FIG. 575.—*Lingula vanhorni*.

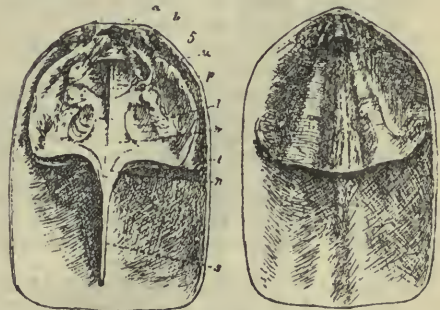


FIG. 576.—*Lingulelasma schucherti*. *a*, Posterior transverse ridge; *b*, subcardinal scars; *u*, umbolateral scars; *p*, postmedian scars; *l*, lateral scars; *m*, median scars; *n*, anterior scars; *z*, transverse scars; *s*, septum; *5a*, ventral valve.

schucherti, Ulrich, 1889, Am. Geol., vol. 3, p. 389, Hud. Riv. Gr.

LINGULELLA, Salter, 1861, Mem. Geo. North Wales, and Geo. Sur. Gt. Brit., vol. 3, p. 333. [Ety. diminutive of Lingula.]



Fig. 577.—*Lingulella cincinnatiensis*.

General form like *Lingula*; nearly equivalve, ventral valve pointed with a pedicle groove; muscular scars as in *obolus*, but anterior retractors more linear, and sliding muscles small and not quite as much external. Type *L. davisii*.

?affinis, Billings, 1874, Pal. Foss., vol. 2, p. 67, Up. Taconic.

aurora, Hall, 1861, (*Lingula aurora*), Geo. Rep. Wis., p. 24, Potsdam Gr.

cœlata, Hall, 1847, (*Orbicula cœlata*), Pal. N. Y., vol. 1, p. 290, Georgia Gr.

cincinnatiensis, Hall & Whitfield, 1875, Ohio Pal., vol. 2, p. 67, Hud. Riv. Gr.

cuneata, Conrad, 1839, (*lingula cuneata*), Geo. Rep. N. Y., p. 64, and Pal. N. Y., vol. 2, p. 8, Clinton Gr.

dawsoni, Matthew, 1885, Trans. Roy. Soc. Can., p. 33, St. John Gr.

ella, Hall & Whitfield, 1877, (*Lingulepis ella*), Geo. Expl. 40th Parallel, vol. 4, p. 232, Up. Taconic.

granvillensis, Walcott, 1887, Am. Jour. Sci. and Arts., 3d ser., vol. 34, p. 187, Up. Taconic.

inflata, Matthew, 1885, Trans. Roy. Soc. Can., p. 33, St. John Gr.

iowensis, Owen, 1840, (*Lingula iowensis*), Rep. Min. Lands, p. 70, Galena Gr.

lamborni, Meek, 1871, Proc. Acad. Nat. Sci., p. 185, Calciferous or Potsdam Gr.

linguloides, Matthew, 1885, Trans. Roy. Soc. Can., p. 34, St. John Gr.

?spissa, Billings, 1874, Pal. Foss., vol. 2, p. 67, Up. Taconic.

LINGULEPIS, Hall, 1863, 16th Rep. N. Y. St. Mus. Nat. Hist., p. 126. [Ety. *lingula*, little tongue; *lepis*, scale.]

Linguloid, inequivalve, equilateral, ovate or spatulate, corneous, phosphatic; visceral impressions in dorsal valve flabelliform, in ventral valve tripartite, the lateral divisions the larger. Type *L. pinniformis*.

cuneolus, Whitfield, 1877, Prelim. Rep. Pal. Black Hills, p. 8, and Geol. Black Hills, p. 336, Potsdam Gr.

dakotensis, Meek & Hayden, 1864, Pal. Up. Mo., p. 3, and Geol. Black Hills, p. 337, Potsdam Gr.

ella, See *Lingulella ella*.

mæra, Hall & Whitfield, 1877, U. S. Expl. 40th Parallel, vol. 4, p. 206, Potsdam Gr.

minima, Whitfield, 1884, Bull. Am. Mus. Nat. Hist., vol. 1, p. 139, Up. Taconic.

minuta, Hall & Whitfield, 1877, U. S. Expl. 40th Parallel, vol. 4, p. 206, Potsdam Gr.

morsii, N. H. Winchell, 1876, (*Lingula morsensis*) Geol. Fillmore Co., Minn., p. 31, St. Peters sandstone.

perattenuata, Whitfield, 1877, Prelim. Rep. Pal. Black Hills, p. 9, and Geol. Black Hills, p. 337, Potsdam Gr.

pinniformis, Owen, 1852, (*Lingula pinniformis*), Geo. Rep. Iowa, Wis., and Minn., p. 583, Potsdam Gr.

prima, Conrad, 1847, (*Lingula prima*), Pal. N. Y., vol. 1, p. 3, Potsdam Gr.



Fig. 579.—*Lingulepis pinniformis*.

LINGULORS, Hall, 1871, 23d

Rep. N. Y. St. Mus. Nat. Hist., p. 245. [Ety. *Lingula*, a genus; *opsis*, appearance.]

In external appearance like *Lingula* or *Lingulella*: the ventral valve presents a small area, with a narrow pedicle groove and a large lobed muscular impression, which, in the cast, extends as a narrow groove toward the base of the shell; the ramifications of the vascular lines originate at nearly the same point as in existing *Lingula*, but do not extend so far backward toward the beak. Type *L. whitfieldi*.

whitfieldi, Hall, 1871, 23d Rep. N. Y. St. Mus. Nat. Hist., p. 245, Low. Sil.

LINNARSSONIA, Walcott, 1885, Am. Jour. Sci. and Arts, 3d ser., vol. 29, p. 114. [Ety. proper name.]

Ovate or subcircular; inarticulate; apex of ventral valve perforated by a minute foramen; no area; cardinal edge thin; two scars in the interior, on each side of the foramen, close to the posterior margin; dorsal valve, with no area; two scars in the interior, close to the posterior margin, separated by a ridge that extends forward between two small divaricator scars. Type *L. transversa*.

taconica, Walcott, 1887, Am. Jour. Sci. and Arts, 3d ser., vol. 34, p. 189, Up. Taconic.

transversa, Hartt, 1868, (*Obolella transversa*), Acad. Geol., p. 644, St. John Gr.

MARTINIA, McCoy, 1844, syn. Carb. Foss., Ireland, p. 128. • [Ety. proper name.]

General characters the same as *Spirifera*, for which it is usually regarded as a synonym. It is distinguished by its smooth surface without radiating ribs, and by having smaller spiral appendages. Type *M. decora*.

athyroides, Winchell, 1866, Rep. Low. Penin. Mich., p. 94, Ham. Gr.

planoconvexa, see *Spirifera planoconvexa*. subumbonata, Hall, 1867, (*Spirifera subumbonata*), Pal. N. Y., vol. 4, p. 234, Ham. Gr. and Tully sandstone.

MEEKELLA, White & St. John, 1868, Trans. Chi. Acad. Sci., vol. 1, p. 120. [Ety. proper name.] Globose, rather longer than wide, plications large, hinge-line shorter than greatest breadth of the valves; dorsal valve most prominent on the umbo, beak incurved, no mesial sinus; cardinal process long, curving backward in front of the pseudodeltidium, and having upon each side a wing-like expansion, which is curved up at its outer edge forming an elongated dental fossette; ventral valve more convex, cardinal area high, no median septum; two broad dental lamellæ, continuous from the cardinal teeth to the beak, pass directly in front of the sutures between the cardinal area and the pseudodeltidium, and thence, slightly diverging, extend forward along the bottom of the valve about half-way to the front, the anterior margins of the lamellæ arching backward and upward to the dental processes; a cross section shows three chambers opening anteriorly into the shell. Type *M. striato-costata*.

striato-costata, Cox, 1857, (*Plicatula striato-costata*.) Geo. Rep. Ky., vol. 3, p. 568, Coal Meas.



FIG. 580.—*Meekella striatocostata*. Dorsal and ventral view.

Meganteris æquiradiata, see *Rensselæria æquiradiata*.

cumberlandiæ, see *Rensselæria cumberlandiæ*.

elliptica, see *Rensselæria elliptica*.

elongata, see *Amphigenia elongata*.

lævis, see *Rensselæria lævis*.

mutabilis, see *Rensselæria mutabilis*.

ovalis, see *Rensselæria ovalis*.

ovoides, see *Rensselæria ovoides*.

subtrigonalis, see *Amphigenia elongata* var. *subtrigonalis*.

suessana, see *Rensselæria suessana*.

MERISTA, Suess, 1851, Jahrb. Geol. Reichs. Austalt, vol. 2, p. 150. [Ety. *meros*, a part.] General form like *Athyris*, usually mesial fold and sinus poorly defined; the principal stems forming the spirals attach to the hinge plate, incline forward toward the interior of the shell, then abruptly bend backward and make a curve facing the bottom of the dorsal valve, and, after converging to about half their length, again diverge toward the front and form the

first spiral coil; there are 10 or 12 whorls in each spiral; the genus is distinguished by a shoe-lifter process under the beak of the ventral valve, consisting of two roof-shaped plates, fixed by their lateral margins to the medio-longitudinal region of the valve, and with their narrow end fitting under the extremity of the beak. Type *M. herculea*.

arcuata, see *Meristella arcuata*.

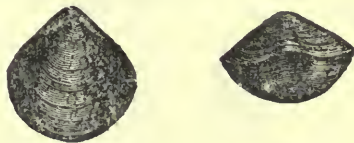


FIG. 581.—*Merista bella*. Dorsal and anterior view.

bella, Hall, 1857, 10th Rep. N. Y. St. Mus. Nat. Hist., p. 92, and Pal. N. Y., vol. 3, p. 248, Low. Held. Gr.

bisulcata, Vanuxem, 1843, (*Atrypa bisulcata*.) Geo. Rep. 3d Dist. N. Y., p. 112, and Pal. N. Y., vol. 3, p. 253, Low. Held. Gr.

elongata, Hall, 1859, (*Camarium elongatum*.) Pal. N. Y., vol. 3, p. 488, Low. Held. Gr.

houghtoni, Winchell, 1862, Proc. Acad. Nat. Sci., vol. 6, 2d ser., p. 407, Portage Gr.

lævis, see *Meristella lævis*.

lata, Hall, 1859, Pal. N. Y., vol. 3, p. 431, Oriskany sandstone.

lens, Winchell, 1866, Rep. Low. Penin. Mich., p. 94, Ham. Gr.

meekei, Hall, 1857, 10th Rep. N. Y. St. Mus. Nat. Hist., p. 97, and Pal. N. Y., vol. 3, p. 252, Low. Held. Gr.

princeps, see *Meristella princeps*.

subquadrata, Hall, 1857, 10th Rep. N. Y. St. Mus. Nat. Hist., p. 93, and Pal. N. Y., vol. 3, p. 249, Low. Held. Gr.

sulcata, Vanuxem, 1842, (*Atrypa sulcata*.) Geo. Rep. N. Y., p. 112, Waterlime Gr.

typus, Hall, 1859, (*Camarium typus*.) Pal. N. Y., vol. 3, p. 487, Low. Held. Gr.

MERISTELLA, Hall, 1860, 13th Rep. N. Y. St. Mus. Nat. Hist., p. 74. [Ety. diminutive of *Merista*.] Shells variable in form. ovoid or transverse; valves unequally convex, with or without a median fold and sinus; beak of ventral valve imperforate, incurved over the beak of the other valve; no area; valves articulating by teeth and sockets; surface smooth or with fine concentric striæ; interior of dorsal valve having a longitudinal septum and the upper part of the ventral valve a deep subtriangular muscular impression, which unites with the rostral cavity; spires are continued from their origin obliquely backward into the cavity of the ventral valve, and then,

recurring upon united laterally.



FIG. 582.—*Meristella circe*. Showing remnants of spiral appendages in the dorsal valve.

- themselves, are recurved upon united laterally. Type *M. lævis*.
- arcuata*, Hall, 1857, (*Merista arcuata*.) 10th Rep. N. Y. St. Mus. Nat. Hist., p. 95, and Pal. N. Y., vol. 3, p. 249, Low. Held. Gr.
- barrisi*, Hall, 1860, 13th Rep. N. Y. St. Mus. Nat. Hist., p. 84, and Pal. N. Y., vol. 4, p. 304, Marcellus shale and Ham. Gr.
- circe*, Billings, 1861, (*Charionella circe*.) Can. Jour., vol. 6, p. 273, Up. Held. Gr.
- cylindrica*, Hall, 1852, (*Atrypa cylindrica*.) Pal. N. Y., vol. 2, p. 76, Clinton and Niagara Gr.
- doris*, 1860, Hall, 13th Rep. N. Y. St. Mus. Nat. Hist., p. 84, and Pal. N. Y., vol. 4, p. 303, Schoharie grit and Corniferous Gr.
- elissa*, syn. for *Meristella nasuta*.
- haskinsi*, Hall, 1860, 13th Rep. N. Y. St. Mus. Nat. Hist., p. 84, and Pal. N. Y., vol. 4, p. 306, Ham. Gr.
- (?) *hyale*, Billings, 1862, (*Charionella* (?) *hyale*.) Pal. Foss., vol. 1, p. 166, Guelph Gr.
- julia*, Billings, 1862, (*Athyris julia*.) Pal. Foss., vol. 1, p. 146, Mid. Sil.
- lævis*, Vanuxem, 1843, (*Atrypa lævis*.) Geo. Rep. 3d Dist. N. Y., p. 120, and Pal. N. Y., vol. 3, p. 247, Low. Held. Gr.
- lenta*, Hall, 1867, Pal. N. Y., vol. 4, p. 420, Oriskany sandstone.
- maria*, see *Whitfieldia maria*.
- meta*, Hall, 1867, Pal. N. Y., vol. 4, p. 308, Ham. Gr.
- nasuta*, Conrad, 1840, (*Atrypa nasuta*.) Ann. Rep. N. Y., p. 18, and Pal. N. Y., vol. 4, p. 299, Schoharie grit, Up. Held. and Ham. Gr.
- princeps*, Hall, 1857, (*Merista princeps*.) 10th Rep. N. Y. St. Mus. Nat. Hist., p. 95, and Pal. N. Y., vol. 3, p. 252, Low. Held. Gr.
- prinstana*, Billings, 1862, (*Athyris prinstana*.) Pal. Foss., vol. 1, p. 145, Mid. Sil.
- rectirostra*, Hall, 1879, Desc. New Spec. Foss., p. 15, and 11th Rep. Geo. and Nat. Hist. Ind., p. 301, Niagara Gr.
- rostrata*, Hall, 1843, (*Atrypa rostrata*.) Geo. Rep. 4th Dist. N. Y., p. 202, and Pal. N. Y., vol. 4, p. 307, Ham. Gr. and Tully limestone.
- scitula*, Hall, 1843, (*Atrypa scitula*.) Geo. 4th Dist. N. Y., p. 171, and Pal. N. Y., vol. 4, p. 302, Corniferous Gr. Hall regards *M. circe* as a syn. for this species.



FIG. 583.—*Meristella rostrata*. Side view.

uniusulcata, Conrad, 1841, (*Atrypa uniusulcata*.) Ann. Rep. N. Y., p. 56, and Pal. N. Y., vol. 4, p. 309, Up. Held. and Ham. Gr.

- MERISTINA**, Hall, 1867, 20th Rep. N. Y. St. Mus. Nat. Hist., p. 186, and Pal. N. Y., vol. 4, p. 299. [Ety. *Merista*, a genus; *inus*, implying resemblance.] General form like *Meristella*; apex perforated; lamellæ of the spires united by a simple loop; spirals oval, and each contains about nine convolutions; the two principal stems attach to the hinge plate and extend into the interior between the spirals, where they bend backward and give forth converging lamellæ, which cross between the spirals to the ventral side, where they unite in an angular point. Type *M. nitida*.
- nitida*, Hall, 1843, (*Atrypa nitida*.) Geo. Rep. 4th Dist. N. Y., pl. 14, and Pal. N. Y., vol. 2, p. 268, Niagara Gr.
- nitida* var. *oblata*, Hall, 1852, (*Atrypa nitida* var. *oblata*.) Pal. N. Y., vol. 2, p. 269, Niagara Gr.



FIG. 584.—*Meristina nitida*. Dorsal view.

- MONOMERELLA**, Billings, 1871, Can. Nat. and Geo., vol. 6, p. 220. [Ety. *monos*, one; *meros*, a part; *ella*, diminutive termination.] Shell thick, circular or transversely oval in its marginal outline; umbo of the pedicle, valve large, projecting, double-chambered; area and deltidium large; hinge thick, elevated, ledge-shaped, concave in the middle portion; cardinal facet a wall-like space behind the ledge or flat of the hinge; cardinal buttress strong, lamelliform; platform flat, slightly elevated, widest, highest, and obtusely angulated in front; umbo of the brachial valve rounded; hinge moderately thick; platform trilobed; usually with a thin margin. Type *M. prisca*.
- newberryi*, Hall & Whitfield, 1875, Ohio, Pal., vol. 2, p. 131, Niagara Gr.
- orbicularis*, Billings, 1871, Can. Nat., vol. 6, p. 220, Guelph Gr.
- ovata*, Whiteaves, 1884, Pal. Foss., vol. 3, p. 5, Guelph Gr.
- ovata* var. *lata*, Whiteaves, 1884, Pal. Foss., vol. 3, p. 6, Guelph Gr.
- prisca*, Billings, 1871, Can. Nat. and Geol., vol. 6, p. 220, Guelph Gr.



FIG. 585.—*Monomerella prisca*.

NUCLEOSPIRA, Hall, 1859, Pal. N. Y., vol. 3, p. 219. [Ety. *nucleus*, kernel; *spira*, spire.] Shell spheroidal, or transversely elliptical, more or less gibbous, and furnished with spires as in *Spirifera*; hinge-line short, cardinal extremities rounded, valves subequal, articulating by teeth and sockets; surface smooth, structure punctate and covered with minute hair-like spines; ventral valve having the beak extended, with a triangular depression beneath, on each side of which at the base is a strong tooth, a narrow septum from beak to base; dorsal valve with spatulate cardinal process, which bends upward into the cavity of the opposite beak; from the sides of this process the brachial processes originate, which support the spires; muscular imprints confined to a narrow oval space. Type *N. ventricosa*.

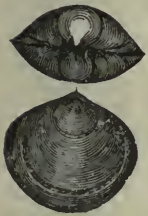


FIG. 586. — Nucleospira concinna.

barrisi, White, 1860, Bost. Jour. Nat. Hist., vol. 7, p. 227, Kinderhook Gr.
concentrica, Hall, 1859, Pal. N. Y., vol. 3, p. 223, Low. Held. Gr.
concinna, Hall, 1843, (*Atrypa concinna*.) Geo. 4th Dist. N. Y., p. 200, and Pal. N. Y., vol. 4, p. 279, Hamilton Gr.
elegans, Hall, 1859, Pal. N. Y., vol. 3, p. 222, Low. Held. Gr.

pisiformis, Hall, 1859, (Orthis pisum, 1852, Pal. N. Y., vol. 2,) Pal. N. Y., vol. 3, p. 218, Niagara Gr.
rotundata, Whitfield, 1882, Desc. New Spec. Foss. from Ohio, p. 194, Low. Held. Gr.

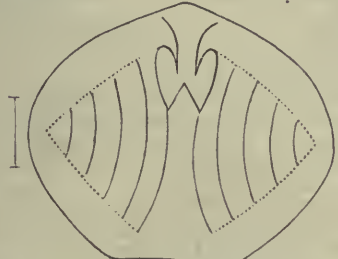


FIG. 587.—Spiral coils of Nucleospira pisiformis.

ventricosa, Hall, 1859, Pal. N. Y., vol. 3, p. 220, Low. Held. Gr. This species was first described in 1856, in 9th Reg. Rep., as *Spirifera ventricosa*.

OBOLELLA, Billings, 1861, Pal. Foss., vol. 1, p. 7. [Ety. diminutive of *obolus*, a small Greek coin.] Shell ovate, circular or subquadrate, convex or plano-convex; ventral valve with a false area, which is sometimes minute and usually grooved for the passage of the peduncle; dorsal valve with or without

an area; muscular impressions in the ventral valve four, one pair in front of the beak near the middle or in the upper half of the shell, and the others situated one on each side near the cardinal edge; shell calcareous; surface concentrically striated. Type *O. chromatica*.

ambigua, Walcott, 1885, Monogr. U. S. Geo. Sur., vol. 8, p. 67, Chazy Gr.
chromatica, Billings, 1861, Pal. Foss., vol. 1, p. 7, Up. Taconic.
cingulata, Billings, 1861, Pal. Foss., vol. 1, p. 8, Up. Taconic.
circe, Billings, 1871, Can. Nat. and Geol., vol. 6, p. 219, Up. Taconic.
crassa, Hall, 1847, (*Orbicula crassa*.) Pal. N. Y., vol. 1, p. 290, Up. Taconic Gr.
desiderata, see *Elkania desiderata*.
discoidea, Hall & Whitfield, 1877, U. S. Geo. Expl. 40th parallel, vol. 4, p. 205, Potsdam Gr.

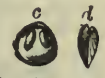


FIG. 588.—Obolella chromatella c, Showing muscular impressions; d, side view.

gemma, Billings, 1871, Can. Nat. and Geol., vol. 6, p. 218, Up. Taconic.
ida, Billings, 1862, Pal. Foss., vol. 1, p. 71, Quebec Gr.
misera, Billings, 1874, Pal. Foss., vol. 2, p. 69, Up. Taconic.
nana, Meek & Hayden, 1861, Proc. Acad. Nat. Sci. Phil., p. 435, and Pal. Up. Mo., p. 4, Potsdam Gr.
nitida, Ford, 1873, Am. Jour. Sci. and Arts, 3d ser., vol. 5, p. 213, Up. Taconic.
polita, Hall, 1861, Geo. Rep. Wis., p. 24, and Geol. Black Hills, p. 339, (*Lingula polita*.) Potsdam Gr.
pretiosa, Billings, 1862, Pal. Foss., vol. 1, p. 68, Quebec Gr.
transversa, see *Linnarssonia transversa*.
Obolellina, Billings, Dec., 1871, Can. Nat., vol. 6, p. 220, syn. for *Dinobolus*.
canadensis, see *Dinobolus canadensis*.
gallensis, see *Dinobolus gallensis*.
magnifica, see *Dinobolus magnificus*.

OBOLOUS, Eichwald, 1829, Zoologia Specialis, vol. 1, p. 274. [Ety. *obolus*, a small coin.] Shell orbicular, equilateral, transverse or elongated, depressed; valves not articulated; larger valve most convex, beak obtuse or pointed, wide flattened cardinal edge or false area, over which the concentric lines of surface growth pass uninterruptedly; cardinal edge grooved longitudinally by a semicylindrical furrow; smaller valve shorter, slightly convex, without prominent beak; hinge-line an arch; cardinal edge flattened, horizontally striated; surface smooth or having minute undulating wrinkles; interior of larger valve with a mesial ridge, on each side of which are two oval muscular scars, one pair near the cardinal angles, the other toward the center of the valve beyond the mesial ridge; structure calcareo-carneous. Type *O. apollinis*.

canadensis, see *Dinobolus canadensis*.

conradi, see *Dinobolus conradi*.



FIG. 589.—*Obolus apollinis*. *b*, Dorsal valve; *a*, interior of ventral valve.

galtensis, see *Trimerella galtensis*.

labradoricus, see *Kutorgina labradorica*.

(?) *murrayi*, Billings, 1865, *Pal. Foss.*, vol. 1, p.

362, Quebec Gr. or Up. Taconic.

pectinoides, Whitfield, 1875, Ludlow's Rep. Black Hills of Dakota, p. 103, Up. Taconic.

Orbicula, Cuvier, 1808, *Tab. Elem. d'Hist. Nat.*, p. 435, syn. for *Crania*.

cælata, see *Lingulella cælata*.

cancellata, see *Trematis cancellata*.

corrugata, see *Crania corrugata*.

crassa, see *Obolella crassa*.

deformata, see *Crania deformata*.

eccentrica, see *Crania eccentrica*.

filosa, see *Schizocrania filosa*.

grandis, see *Discina grandis*.

lamellosa, see *Discina lamellosa*.

lodensis, see *Discina lodensis*.

minuta, see *Discina minuta*.

nitida, see *Discina nitida*.

prima, see *Crania prima*.

squamiformis, see *Pholidops squamiformis*.

subtruncata, see *Pholidops subtruncatus*.

tenuilamellata, see *Discina tenuilamellata*.

terminalis, see *Trematis terminalis*.

truncata, see *Crania truncata*.

ORBICULOIDEA, D'Orbigny, 1847, *Comptes rendus de l'Académie des Sciences*, and *Prod. de Paléont.*, t. 1, p. 44. [Ety. *Orbicula*, a genus; *oides*, like.] Suborbicular, patelliform, longitudinally or transversely oval, upper valve convex, with vertex near the posterior margin; lower valve conical or concave; no pedicle disk; a narrow oval or circular aperture, more or less confined in its shape, is situated in a furrow or depression. Type *O. elliptica*.

conica, Dwight, 1880, *Am. Jour. Sci. and Arts*, 3d ser., vol. 19, p. 452, Trenton Gr.

ORTHUS, Dalman, 1827, *Kongl. Vet. Acad. Handl.*, p. 93. [Ety. *orthos*, straight, in allusion to the straight hinge-line.] Shell variable in form, hinge-line straight; valves convex or plano-convex, plicated, with or without mesial fold and sinus; cardinal area notched in the center; ventral valve with two prominent diverging teeth, muscular impression saucer-shaped, divided by a median septum on which the central adductor attached; divaricator and pedicle impressions, lateral, fan-like; dorsal valve with a tooth-like, cardinal process between two curved brachial processes; adductor impression quadruple; vascular impressions numerous, spreading; no coiled spiral arms. Type *O. zonata* and *O. callactis*.

acuminata, Billings, 1859, *Can. Nat. Geo.*, vol. 4, p. 440, Chazy Gr.

acutilirata, Conrad, 1842, (*Delthyris acutilirata*.) *Jour. Acad. Nat. Sci.*, vol. 8, p. 260, Hud. Riv. Gr.

acutiloba, Ringeberg, 1888, *Proc. Acad. Nat. Sci. Phil.*, p. 134, Niagara Gr.

æquivalvis, Hall, 1847, *Pal. N. Y.*, vol. 1, p. 120, Trenton Gr.

æquivalva, Shaler. The name was preoccupied.

æquivalvis, Hall, see *Orthis eryna*.

alata, Shaler. The name was preoccupied.

alsus, Hall, 1863, 16th Rep. N. Y. St. Mus. Nat. Hist., p. 33, Schoharie grit.

alternans, Castelnau, 1843, *Syst. Sil.*, p. 38. Not recognized.

amœna, Winchell, 1880, *Geo. Sur. Minn. 8th Rep.*, p. 65, Hud. Riv. Gr.

anticostiensis, syn. for *Orthis poreata*.

apicalis, Billings, 1865, *Pal. Foss.*, vol. 1, p. 301, Quebec Gr.

aramanda, Billings, 1865, *Pal. Foss.*, vol. 1, p. 303, Quebec Gr.

assimilis, Hall, 1859, *Pal. N. Y.*, vol. 3, p. 175, Low. Held. Gr.

aurelia, Billings, 1874, *Pal. Foss.*, vol. 2, p. 34, Gaspe limestone No. 8, Devonian.

barabuensis, see *Leptana barabuensis*.

battis, Billings, 1865, *Pal. Foss.*, vol. 1, p. 185, Quebec Gr.

bellargosa, Conrad, 1843, *Proc. Acad. Nat. Sci. Phil.*, vol. 1, p. 333, and *Pal. N. Y.*, vol. 1, p. 118, Trenton Gr.

bellula, Meek, 1873, *Ohio Pal.*, vol. 1, p. 103, Hud. Riv. Gr.

biforata, Schlothheim, 1820, (*Terebratulites biforatus*.) *Petrefact.*, p. 265, Trenton and Hud. Riv. Grs.

billingsi, Hartt, 1868, *Acad. Geol.*, p. 644, St. John Gr.

biloba, Linnæus, 1767, (*Anomia biloba*.) *Linne. Syst.*, ed. 12, p. 1154, Niagara Gr.

bilobata, Conrad, 1838, (*Delthyris bilobata*.) *Ann. Rep. N. Y.* The name was preoccupied by Sowerby.

bisulcata, see *Camarella bisulcata*.

borealis, Billings, 1859, *Can. Nat. Geo.*, vol. 4, p. 436, Chazy and Trenton Grs.

carbonaria, Swallow, 1858, syn. for *Orthis pecosi*.

carinata, Hall, 1843, *Geo. Rep. 4th Dist. N. Y.*, p. 267, and *Pal. N. Y.*, vol. 4, p. 58, Portage and Chemung Grs.

carleyi, Hall, syn. for *Orthis retrorsa*.

centrilineata, Hall, 1847, *Pal. N. Y.*, vol. 1, p. 289, Hud. Riv. Gr.

centrosa, n. sp., Hud. Riv. Gr. Proposed instead of *O. crassa*, in *Cin. Quar. Jour. Sci.*, vol. 1, p. 20, and *Ohio Pal.*, vol. 1, p. 117, pl. 10, fig. 3.

charlottæ, Winchell, 1880, *Geo. Sur. Minn., 8th Rep.*, p. 67, Hud. Riv. Gr.

cincinnatiensis, S. A. Miller, 1883, 2d Ed. *Am. Pal. Foss.*, p. 296, Hud. Riv. Gr., Cincinnati, Ohio. Proposed instead of *Orthis costata*, Hall, 1845, *Am. Jour. Sci. and Arts*, vol. 48, p. 294.

circularis, Winchell, 1880, Geo. Sur. Min. 8th Rep., p. 66, Hud. Riv. Gr.
circulus, Hall, 1843, Geo. Rep. 4th Dist. N. Y., p. 71, and Pal. N. Y., vol. 2, p. 86, Clinton Gr.
clarkensis, Swallow, 1863, Trans. St. Louis Acad. Sci., vol. 2, p. 81, Keokuk Gr.
cleobis, Hall, 1863, 16th Rep. N. Y. St. Mus. Nat. Hist., p. 35, Onondaga limestone, and Up. Held. Gr.
clytie, Hall, 1861, 14th Rep. N. Y. St. Mus. Nat. Hist., p. 90, Trenton Gr.
coloradoensis, Shumard, 1860, Trans. St. Louis Acad. Sci., vol. 1, p. 627, Potsdam Gr.
coloradoensis, Meek, 1870, see *O. desmopleura*.
concinna, Hall, 1859, Pal. N. Y., vol. 3, p. 172, Low. Held. Gr.
conradi, Castelnau, 1843, Syst. Sil. p. 37. Not recognized.
conradi, Winchell, 1880, Geo. Sur. Minn. 8th Rep., p. 68, Hud. River. Gr.
cooperensis, Swallow, 1863, Trans. St. Louis Acad. Sci., vol. 2, p. 82, Warsaw Gr.
corinna, Billings, 1865, Pal. Foss., vol. 1, p. 302, Quebec Gr.
costalis, Hall, 1847, Pal. N. Y., vol. 1, p. 20, Chazy Gr.
costata, Hall, 1845. This name was preoccupied by Sowerby in 1839. See *O. cincinnatiensis*.
crassa, James, 1874, Cin. Quar. Jour. Sci., vol. 1, p. 20. The name was preoccupied by Lindstrom in 1860. See *O. centrosa*.
crispata, Emmons, 1842, Geo. Rep. N. Y., p. 404, Trenton Gr.
cumberlandia, Hall, 1859, Pal. N. Y., vol. 3, p. 481, Oriskany sandstone.
cuneata, Owen, 1852, Geo. Sur. Wis., Iowa, and Minn., p. 585, Devonian.
cyclas, Hall, 1860, 13th Rep. N. Y. St. Mus. Nat. Hist., p. 78, and Pal. N. Y., vol. 4, p. 52, Ham. Gr.
cyclus, James, syn. for *Orthis multisepta*.
cypha, James. Not characterized so as to establish a species.
dalyana, S. A. Miller, 1881, Jour. Cin. Soc. Nat. Hist., vol. 4, p. 313, Burlington Gr.
davidsoni, Verneuil, 1840, Bull. Geol. Soc. France, vol. 5, p. 341, Up. Sil.
daytonensis, Foerste, 1885, Bull. Sci., Lab. Denison Univ., p. 87, Niagara Gr.
deflecta, see *Streptorhynchus deflectum*.
deformis, Hall, 1857, 10th Rep. N. Y. St. Mus. Nat. Hist., p. 44, Pal. N. Y., vol. 3, p. 174, Low. Held. Gr.
delicatula, Billings, 1865, Pal. Foss., vol. 1, p. 217, Quebec Gr.
dentata, Pander, 1830, (Porambonites dentatus,) Bietr. Geogn. Russl., p. 100, Trent and Hud. Riv. Gr.
desmopleura, Meek, 1872, Hayden's Geo. Rep. of Wyoming, p. 295, Silurian. Proposed instead of *O. coloradoensis*.
dichotoma, syn. for *Orthis fissicosta*.
discus, Hall, 1859, Pal. N. Y., vol. 3, p. 165, Low. Held. Gr.

disparilis, Conrad, 1843, Proc. Acad. Nat. Sci., vol. 1, p. 333, and Pal. N. Y., vol. 1, p. 119, Black Riv. and Trenton Gr.
dubia, Hall, 1858, Trans. Alb. Inst., vol. 4, p. 12, and Bull. Am. Mus. Nat. Hist., p. 45, Warsaw Gr.
eboracensis, n. sp., Up. Held. Gr. Proposed instead of *O. lenticularis* of Vanuxem in Rep. 3d Dist. N. Y., p. 147, which was preoccupied. It was re-described by Hall in Pal. N. Y., vol. 4, p. 35.
electra, Billings, 1862, Pal. Foss. vol. 1, p. 79, Quebec Gr.
elegantula, Dalman, 1827, Kongl. Vet. Acad. Handl., p. 117, and Pal. N. Y., vol. 2, p. 57, and 252, Clinton and Niagara Gr.



FIG. 590.—*Orthis elegantula*. Dorsal and ventral views.

ella, Hall, 1861, 13th Rep. N. Y. St. Mus. Nat. Hist., p. 121, Hud. Riv. Gr.
emacerata, Hall, 1860, 13th Rep. N. Y. St. Mus. Nat. Hist., p. 121, Hud. Riv. Gr.
emarginata, see *Orthis oblata* var. *emarginata*.
eminens, Hall, 1857, 10th Rep. N. Y. St. Mus. Nat. Hist., p. 42, and Pal. N. Y., vol. 3, p. 167, Low. Held. Gr.
erratica, Hall, 1847, Pal. N. Y., vol. 1, p. 288, Hud. Riv. Gr.
eryna, Hall, 1863, (Corrigenda *eryna*.) 16th Rep. N. Y. St. Mus. Nat. Hist., p. 35, and Pal. N. Y., vol. 4, p. 42, Cornif. Gr. Named instead of *O. æquivalvis* in 10th Rep., p. 102.
eudocia, Billings, 1862, Pal. Foss., vol. 1, p. 83, Quebec Gr.
eurekaensis, Walcott, 1885, Monogr. U. S. Geo. Sur., vol. 8, p. 22, Up. Taconic.
euryone, Billings, 1862, Pal. Foss., vol. 1, p. 78, Quebec Gr.
evadne, Billings, 1862, Pal. Foss., vol. 1, p. 81, Quebec Gr.
fasciata, Hall, 1852, Pal. N. Y., vol. 2, p. 255, Niagara Gr.
fausta, Foerste, 1885, Bull. Sci. Lab. Denison Univ., p. 85, Niagara Gr.
fissicosta, Hall, 1847, Pal. N. Y., vol. 1, p. 121, Hud. Riv. Gr.
fissiplica, Roemer, 1860, Sil. Fauna West Tenn., p. 64, Niagara Gr.
flabellum, Sowerby, 1839, in Murch. Sil. Syst., p. 639, and Pal. N. Y., vol. 2, p. 254, Niagara Gr.
flava, Winchell, 1865, Proc. Acad. Nat. Sci., p. 117, Marshall Gr.
gemmicula, Billings, 1862, Pal. Foss., vol. 1, p. 75, Quebec Gr.
gibbosa, Billings, 1857, Rep. of Progr. Geo. Sur. Can., p. 296, Black Riv. Gr.
hamburgensis, Walcott, 1885, Monogr. U. S. Geo. Sur., vol. 8, p. 73, Chazy Gr.

- highlandensis, Walcott, 1886, Bull. U. S. Geo. Sur., No. 30, p. 119, Upper Taconic.
- hipparionyx*, syn. for *O. proximus*.
- hippolyte*, Billings, 1862, Pal. Foss., vol. 1, p. 81, Quebec Gr.
- huronensis*, Castelnau, 1843, Syst. Sil., p. 37. Not recognized.
- hybrida*, Sowerby, 1839, Murch. Sil. Syst., p. 630, Niagara Gr.
- idonea*, Hall, 1867, Pal. N. Y., vol. 4, p. 52, Ham. Gr.
- imperator*, Billings, 1859, Can. Nat. Geo., vol. 4, p. 435, Chazy Gr.
- impressa*, Hall, 1843, Geo. Rep. 4th Dist., N. Y., p. 268, and Pal. N. Y., vol. 4, p. 60, Chemung Gr.
- inæqualis*, Hall, 1858, Geo. of Iowa, p. 490, Ham. Gr.
- infera*, Calvin, 1878, Bull. U. S. Geo. Sur. Terr., vol. 4, No. 3, p. 728, Low. Devonian.
- insculpta*, Hall, 1847, Pal. N. Y., vol. 1, p. 125, Hud. Riv. Gr.
- insignis*, see *Skenidium insigne*.
- interlineata*, Sowerby, see *Orthis tioga*.
- interstitialis*, Phillips, 1841, Pal. Foss., Devonian. This species is probably foreign to America.
- iowensis*, Hall, 1858, Geo. of Iowa, p. 488, Ham. Gr.
- iowensis* var. *furnarius*, Hall, 1858, p. 489, Geo. of Iowa, Ham. Gr.
- iphigenia*, Billings, 1862, Pal. Foss., vol. 1, p. 133, Trenton Gr.
- jamesi*, Hall, 1861, 14th Rep. N. Y. St. Mus. Nat. Hist., p. 89, Hud. Riv. Gr.
- kankakensis*, McChesney, 1860, Desc. New Pal. Foss., p. 77, Hud. Riv. Gr.
- kassubæ*, Winchell, 1880, Geo. Sur. Minn. 8th Rep., p. 65, Hud. Riv. Gr.
- kennicotti*, McChesney, syn. for *O. retrorsa*.
- keokuk*, Hall, 1858, Geo. Rep. Iowa, p. 640, Keokuk Gr. This species was referred to *Orthis umbraculum* of DeKoninck by Owen.
- lasallensis*, McChesney, 1860, New Pal. Foss., p. 32, syn. for *Streptorhynchus crassum*.
- laticosta*, Meek, 1873, Pal. Ohio, vol. 1, p. 116, Hud. Riv. Gr.
- laurentina*, Billings, 1857, Rep. of Geo. Sur. Can., p. 297, Mid. Sil., Anticosti Gr., Div. 1.
- lenticularis*, Vanuxem, 1842, Geo. Rep. 3d Dist. N. Y., p. 139. The name was preoccupied by Wahlenberg in 1821. See *O. eboracensis*.
- leonensis*, Hall, 1867, Pal. N. Y., vol. 4, p. 62, Chemung Gr.
- lepida*, Hall, 1860, 13th Rep. N. Y. St. Mus. Nat. Hist., p. 78, and Pal. N. Y., vol. 4, p. 46, Ham. Gr.
- lepis*, as identified by d'Archiac & Verneuil. Not American.
- leptænoides*, Emmons, 1842, Geo. Rep. N. Y., p. 396, Trenton Gr.
- leucosia*, Hall, 1860, 13th Rep. N. Y. St. Mus. Nat. Hist., p. 80, and Pal. N. Y., vol. 4, p. 48, Ham. Gr.
- limitaris*, see *Leiorhynchus limitare*.
- livia*, Billings, 1860, Can. Jour. Ind., Sci. and Art, vol. 5, p. 267, Up. Held. Gr.
- lonensis*, Walcott, 1885, Monogr. U. S. Geo. Sur., vol. 8, p. 74, Trenton Gr.
- lucia*, Billings, 1874, Pal. Foss., vol. 2, p. 35, Gaspe Limestone No. 8, Devonian.
- lynx*, Eichwald, 1830, (Terebratula lynx,) Nat. Skizze von Podol., p. 202, and Pal. N. Y., vol. 1, p. 133, Trenton and Hud. Riv. Grs.
- maria*, Billings, 1862, Pal. Foss., vol. 1, p. 137, Anticosti Gr., Div. 1, Mid. Sil.
- macfarlanii*, Meek, 1868, Trans. Chi. Acad. Sci., vol. 1, p. 88, Ham. Gr.
- macleodi*, Whitfield, 1889, Bull. Am. Mus. Nat. Hist., vol. 2, p. 43, Calciferous Gr.
- media*, Shaler, 1865, Bull. No. 4, M. C. Z., p. 65, Anticosti Gr. This is probably only a variety of *O. elegantula*.
- media*, Winchell, 1880, Geo. Sur. Minn. 8th Rep., p. 64, Hud. Riv. Gr. The name was preoccupied.
- meeki*, S. A. Miller, 1875, Cin. Quar. Jour. Sci., vol. 2, p. 20, Hud. Riv. Gr. A variety of *O. testudinaria*.
- merope*, Billings, 1862, Pal. Foss., vol. 1, p. 139, Trenton Gr.
- melchioni*, (Terebratula melchioni,) L'Eveille, 1835, Mem. Soc. Geol. France, vol. 2, p. 39, Subcarboniferous.
- melchioni* var. *burlingtonensis*, Hall, 1858, Geo. Rep. Iowa, p. 596, Burlington Gr.
- minna*, Billings, 1865, Pal. Foss., vol. 1, p. 303, Quebec Gr.
- minneapolis*, Winchell, 1880, Geo. Sur. Minn., 8th Rep., p. 63, Hud. Riv. Gr.
- missouriensis*, Shumard, 1855, Geo. Rep. Mo., p. 205, Up. Sil.
- missouriensis*, Swallow, 1860, Trans. St. Louis Acad. Sci. This name was preoccupied.
- mitis*, Hall, 1863, 16th Rep. N. Y. St. Mus. Nat. Hist., p. 34, Schoharie grit.
- morrowensis*, James, not defined so as to be recognized.
- multisepta*, Meek, 1873, Ohio Pal., vol. 1, p. 112, Hud. Riv. Gr.
- multistriata*, Hall, 1857, 10th Rep. N. Y. St. Mus. Nat. Hist., p. 45, and Pal. N. Y., vol. 3, p. 176, Low. Held. Gr.
- musculosa*, Hall, 1857, 10th Rep. N. Y. St. Mus. Nat. Hist., p. 43, Oriskany sandstone.
- mycale*, Billings, 1862, Pal. Foss., vol. 1, p. 82, Quebec Gr.
- nisis*, Hall & Whitfield, 1872, 24th Rep. N. Y. St. Mus. Nat. Hist., p. 181, Niagara Gr.
- nucleus*, Hall, syn. for *Ambocelia umbonata*.
- oblata*, Hall, 1857, 10th Rep. N. Y. St. Mus. Nat. Hist., p. 41, and Pal. N. Y., vol. 3, p. 162, Low. Held. Gr.



FIG. 591.—Orthis lynx. Small Trenton specimen.

- oblata var. emarginata, Hall, 1859, Pal. N. Y., vol. 3, p. 164, Low. Held. Gr.
- occusus, Hall, 1860, 13th Rep. N. Y. St. Mus. Nat. Hist., p. 111, Waverly Gr.
- occidentalis, Hall, 1847, Pal. N. Y., vol. 1, p. 127, Trenton to Hud. Riv. Gr.
- orbicularis, Sowerby, 1839, Murch. Sil. Sys., p. 611, Up. Sil.
- orthambonites, Eichwald, 1840, Sil. Syst. in Esthl., p. 150, Quebec Gr.
- pecosi, Marcou, 1858, Geo. N. America, p. 48, Coal Meas. This species was subsequently described by Swallow under the name of *Orthis carbonaria*.
- pecten, as identified by d'Archiac & Verneuil. Not American.
- pectinella, Emmons, 1842, Geo. Sur. 2d Dist. N. Y., p. 394, and Pal. N. Y., vol. 1, p. 123, Trenton Gr.
- pectinella var. *semiovalis*, Hall, 1847, Pal. N. Y., vol. 1, p. 124, Trenton Gr. Not distinguishable from the type species.
- peduncularis, Hall, 1859, Pal. N. Y., vol. 3, p. 174, Low. Held. Gr.
- peloris, Hall, 1863, 16th Rep. N. Y. St. Mus. Nat. Hist., p. 32, Schoharie grit.
- penelope, Hall, 1860, 13th Rep. N. Y. St. Mus. Nat. Hist., p. 79, and Pal. N. Y., vol. 4, p. 50, Ham. Gr.
- pepina, Hall, 1863, 16th Rep. N. Y. St. Mus. Nat. Hist., p. 135, Potsdam Gr.
- perelegans, Hall, 1857, 10th Rep. N. Y. St. Mus. Nat. Hist., p. 44, and Pal. N. Y., vol. 3, p. 171, Low. Held. Gr.
- perversa*, see *Streptorhynchus perversum*.
- perveta, Conrad, 1843, Proc. Acad. Nat. Sci., vol. 1, p. 333, and Pal. N. Y., vol. 1, p. 120, Black Riv. and Trenton Grs.
- pigra, Billings, 1859, Can. Nat. Geo., vol. 4, p. 442, Chazy Gr.
- pisum*, as identified by Hall, see *Nucleospira pisiformis*.
- planoconvexa, Hall, 1859, Pal. N. Y., vol. 3, p. 168, Low. Held. Gr.
- platys, Billings, 1859, Can. Nat. Geo., vol. 4, p. 438, Chazy Gr.
- plicata*, Vanuxem, see *Spirifera vanuxemi*.
- plicatella, Hall, 1847, Pal. N. Y., vol. 1, p. 122, Trenton and Hud. Riv. Grs.
- pogonipensis, Hall & Whitfield, 1877, U. S. Geo. Expl. 40th parallel, vol. 4, p. 232, Chazy Gr.
- porcata, McCoy, 1844, Sil. Foss. of Ireland, p. 32, Trenton, [Hud. Riv., and Mid. Sil.
- porcia, Billings, 1859, Can. Nat. Geo., vol. 4, p. 439, Chazy Gr.
- præumbona*, see *Ambocoelia præumbona*.
- pratzeni*, McChesney, 1860, New Pal. Foss., Coal Meas. Not recognized.
- prava, Hall, 1858, Geo. of Iowa, p. 490, Ham. Gr.
- propinqua, Hall, 1857, 10th Rep. N. Y. St. Mus. Nat. Hist., p. 110, and Pal. N. Y., vol. 4, p. 43, Up. Held. Gr.
- proximus, Vanuxem, 1842, (*Hipparionyx proximus*.) Geo. Rep. 3d Dist. N. Y., p. 124, and Pal. N. Y., vol. 3, p. 407, Oriskany sandstone.
- punctostriata, Hall, 1852, Pal. N. Y., vol. 2, p. 254, Niagara Gr.
- pyramidalis*, see *Skenidium pyramidale*.
- quacoensis, Matthew, 1885, Trans. Roy. Soc. Can., p. 43, St. John Gr.
- quadrucostata*, see *Leiorhynchus quadrucostatum*.
- remnicha, Winchell, 1886, 14th Ann. Rep. Geo. Minn., p. 317, Potsdam Gr.
- resupinata, Martin, 1809, Petref. Derb., tab. 49, figs. 13 and 14, Subcarb.
- resupinoides, Cox, 1857, Geo. Sur. Ky., vol. 3, p. 570, Coal Meas.
- retrorsa, Salter, 1858, Mem. Geo. Sur. of Gt. Brit., vol. 2, p. 373, Trenton and Hud. Riv. Grs.
- rhynchonelliformis, Shaler, 1865, Bull. No. 4, M. C. Z., p. 66, Anticosti Gr.
- richmondii*, McChesney, 1860, New Pal. Foss., p. 32, syn. for *Streptorhynchus crassum*.
- robusta*, Hall, 1858, Geo. Rep. Iowa, p. 713, syn. for *Streptorhynchus crassum*.
- rugiplicata, Hall & Whitfield, 1872, 24th Rep. N. Y. St. Mus. Nat. Hist., p. 182, Niagara Gr.
- ruida, Billings, 1866, Catal. Sil. Foss. Antic., p. 42, Anticosti Gr.
- salemensis, Walcott, 1887, Am. Jour. Sci. and Arts, 3d ser., vol. 34, p. 190, Up. Taconic.
- sandbergi, Winchell, 1886, 14th Ann. Rep. Geo. Minn., p. 318, Potsdam Gr.
- schohariensis*, Castelnau, 1843, Syst. Sil., p. 36. Not recognized.
- scovillii, S. A. Miller, 1882, Jour. Cin. Soc. Nat. Hist., vol. 5, p. 40, Hud. Riv. Gr.
- sectostriata*, Ulrich, Jour. Cin. Soc. Nat. Hist., vol. 2, p. 15, syn. for *O. ella*.
- semele, Hall, 1863, 16th Rep. N. Y. St. Mus. Nat. Hist., p. 34, Onondaga and Up. Held. Grs.
- sinuata, Hall, 1847, Pal. N. Y., vol. 1, p. 128, Hud. Riv. Gr.
- sola, Billings, 1866, Catal. Sil. Foss. Antic., p. 12, Hud. Riv. Gr.
- solitaria, Hall, 1860, 13th Rep. N. Y. St. Mus. Nat. Hist., p. 80, and Pal. N. Y., vol. 4, p. 45, Ham. Gr.
- stonensis, Safford, 1869, Geo. of Tenn., p. 286, Trenton and Nashville Grs.
- striatella*, see *Chonetes striatellus*.
- striatula*, Emmons, 1842, Geo. Rep. N. Y. This name was preoccupied by Schlottheim.
- strophomenoides, Hall, 1857, 10th Rep. N. Y. St. Mus. Nat. Hist., p. 46, and Pal. N. Y., vol. 3, p. 177, Low. Held. Gr.
- subcarinata, Hall, 1857, 10th Rep. N. Y. St. Mus. Nat. Hist., p. 42, and Pal. N. Y., vol. 3, p. 169, Low. Held. Gr.
- subæquata, Conrad, 1843, Proc. Acad. Nat. Sci., vol. 1, p. 333, and Pal. N. Y., vol. 1, p. 118, Chazy to Trenton Gr.
- subelliptica, White & Whitfield, 1862, Proc. Bost. Soc. Nat. Hist., vol. 8, p. 292, Waverly or Kinderhook Gr.
- subjugata*, syn. for *Orthis occidentalis*.

subnodosa, Hall, 1879, Desc. New Spec. Foss., p. 14, and 11th Rep. Geo. and Nat. Hist. Ind., p. 286, Niagara Gr.
 suborbicularis, Hall, 1858, Geo. of Iowa, p. 486, Ham. Gr.
 subquadrata, Hall, 1847, Pal. N. Y., vol. 1, p. 126, Trenton to Hud. Riv. Gr.
 subumbona, see *Martinia subumbonata*.
 swallowi, Hall, 1858, Geo. Rep. Iowa, p. 597, Burlington Gr.
 tenuidens, Hall, 1852, Pal. N. Y., vol. 2, p. 58, Clinton Gr.

tenuistriata, Hall, 1843, Geo. Rep. 4th Dist. N. Y., p. 244, Portage Gr. The name was preoccupied by Sowerby.

testudinaria, Dalman, 1827, Vet. Acad. Hand., p. 115, and Pal. N. Y., vol. 1, p. 117, Trenton and Hud. Riv. Grs.

thiemii, White, 1860, Jour. Bost. Soc. Nat. Hist., vol. 7, p. 231, and Cont. to Pal. No. 8, p. 164, Kinderhook Gr.

tioga, Hall, 1867, Pal. N. Y., vol. 4, p. 59, (O. interlineata, Sow.,) Geo. Rep. 4th Dist. N. Y., Portage and Chemung Grs.

tricenaria, Conrad, 1843, Proc. Acad. Nat. Sci., vol. 1, p. 333, and Pal. N. Y., vol. 1, p. 121, Trenton Gr.

trinucleus, Hall, 1852, Pal. N. Y., vol. 2, p. 58, Clinton Gr.
triplicatella, Meek, 1873, Ohio Pal., vol. 1, p. 109, Hud. Riv. Gr.

tritionia, Billings, 1862, Pal. Foss., vol. 1, p. 76, Quebec Gr.

tubulostriata, Hall, 1857, 10th Rep. N. Y. St. Mus. Nat. Hist., p. 42, and Pal. N. Y., vol. 3, p. 166, Low. Held. Gr.

tulliensis, Vanuxem, 1843, Geo. Rep. 3d Dist. N. Y., p. 163, and Pal. N. Y., vol. 4, p. 55, Tully limestone.

uberis, Billings, 1866, Catal. Sil. Foss. Antic., p. 42, Anticosti Gr.

umbonata, see *Ambocelia umbonata*.

umbraculum, DeKoninck, see *Orthis keokuk* and *Streptorhynchus umbraculum*.
unguiculus, Phillips, as identified by Hall in 1843, see *Ambocelia gregaria*.

unguiformis, Castlenau, 1843, Syst. Sil., p. 37, syn. for *Orthis hipparionyx*.

vanuxemi, Hall, 1857, 10 Rep. N. Y. St. Mus. Nat. Hist., p. 135, and Pal. N. Y., vol. 4, p. 47, Ham. Gr.

vanuxemi, Winchell, 1862, Proc. Acad. Nat. Sci., vol. 6, 2d ser., p. 409, Portage Gr. The name was preoccupied.

varica, Conrad, 1842, (*Delthyris varica*,) Jour. Acad. Nat. Sci., vol. 8, p. 262, and Pal. N. Y., vol. 3, p. 179, Low. Held. Gr.

ORTHISINA, D'Orbigny, 1850, Prodr. d. Pal., vol. 1, p. 16. [Ety. *Orthis*, a genus; *inus*, implying resemblance to.] External characters of *Orthis*, but the triangular pit in the cardinal area of the ventral valve is closed by a cicatrix with an oval perforation near the apex; interior

of ventral valve with two broad, dental lamellæ bordering the cardinal pit, and converging to a mesial line at the surface of the shell; interior of dorsal valve with a small mesial septum extends toward the margin; lateral cardinal teeth as in *Orthis*. Type *O. verneuili*.

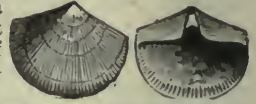


FIG. 503.—*Orthisina granditrifid* rostral æva. Dorsal and ventral valves.

alternata, see *Streptorhynchus perversum*.
arctostriata, see *Streptorhynchus arctostriatum*.

crassa, see *Streptorhynchus crassum*.
diversa, Shaler, syn. for *Orthisina verneuili*.

festinata, Billings, 1861, Pal. Foss., vol. 1, p. 10, Georgia Gr.

grandæva, Billings, 1859, Can. Nat. Geo., vol. 4, p. 349, Calif. Gr.

missouriensis, Swallow, 1858, syn. for *Meekella striatocostata*.

occidentalis, Swallow, 1863, Trans. St. Louis Acad. Sci., vol. 2, p. 82, Up. Coal Meas.

orientalis, Whitfield, 1884, Bull. Am. Mus. Nat. Hist., vol. 1, p. 139, Georgia Gr.

shumardana, Swallow, 1858, Trans. St. Louis Acad. Sci., p. 183, Permian Gr.
transversa, Walcott, 1886, Bull. U. S. Geo. Sur., No. 30, p. 121, Up. Taconic.

verneuili Eichwald, 1842, (*Orthis verneuili*,) *Urwelt Russie*, vol. 2, p. 51, Trenton and Anticosti Gr.

Pentagonia, Cozzens, 1846, Ann. N. Y. Lyceum, vol. 4, p. 158. [Ety. *pente*, five; *gonia*, an angle.] This genus seems to have been founded upon Conrad's *Atrypa unisulcata*, which is now referred to *Meristella*. The genus is not recognized by authors.

peersi, Cozzens, 1846, Ann. N. Y. Lyceum, vol. 4, p. 158, syn. for *Meristella unisulcata*.



FIG. 504.—*Pentamerella arata*. Dorsal view.

PENTAMERELLA, Hall, 1867, Pal. N. Y., vol. 4, p. 375. [Ety. diminutive of *Penta-*

merus.] Ventral valve gibbous, beak incurved, fissure triangular, area narrow, mesial sinus; in the interior an elongate, spoon-shaped pit, the upper part supported on a central septum; dorsal valve convex, mesial fold; crura conjoined at their bases, making a V-shaped pit, which is attached to the valve in its upper part, and continues sessile for about half the length of the shell; surface plicated. Type *P. arata*.



FIG. 595.—*Pentamerella arata*. Side view.

arata, Conrad, 1841, (*Atrypa arata* and *Atrypa octo-costata*.) Ann. Rep. N. Y., p. 55, and Pal. N. Y., vol. 4, p. 375, Schoharie grit and Up. Held. Gr.
compressa, Ringueberg, 1886, Bull. Buf. Soc. Nat. Sci., vol. 5, p. 15, Niagara Gr.
dubia, Hall, 1860, (*Spirifer dubius*.) 13th Rep. N. Y. St. Mus. Nat. Hist., p. 90, Ham. Gr.
micula, Hall, 1867, Pal. N. Y., vol. 4, p. 378, Ham. Gr.
obsolescens, Hall, 1867, Pal. N. Y., vol. 4, p. 379, Devonian.
papilionensis, Hall, 1858, (*Pentamerus papilionensis*.) Geo. Rep. Iowa, vol. 1, pt. 2, p. 514, Ham. Gr.
PENTAMERUS, Sowerby, 1812, Min. Conch., vol. 1, p. 73. [Ety. *penta*, five; *meros*, apartments.] Shell globose, ovate, receiving valve largest; generally destitute of mesial fold and sinus, but when present, the fold is in the receiving, and the sinus in the entering valve; no hinge-line; area large, undefined, and having a deep, triangular pit in the center, under the beak of the dorsal valve, and into which the beak of the entering valve is strongly incurved; internally the receiving valve has one large bipartite central septum, the walls of which suddenly divaricate as they approach the entering valve, forming the walls of the external triangular opening, and inclosing between them a triangular chamber much smaller than the two lateral ones; in the entering valve the two corresponding plates are subparallel, and separate from their origin, being so curved that internal casts show one of their edges, like the diverging cardinal teeth of *Orthis*, and the inner edges form the long, subparallel slits, the middle one of the three resulting chambers being much the narrower. Type *P. knighti*.

aratus, see *Pentamerella arata*.
arcuosus, McChesney, 1861, New Pal. Foss., p. 87, Niagara Gr. Not recognized.
barrandi, Billings, 1857, Rep. of Progr., Geo. Sur. Can., p. 296, Mid Sil.
beaumonti, Castelneau, 1843, Syst. Sil., p. 38. Not recognized.
bisinuatus, McChesney, 1859, New Pal. Foss., p. 85, and Trans. Chi. Acad. Sci., vol. 1, p. 30, Niagara Gr.
borealis, Meek, 1868, Trans. Chi. Acad. Sci., p. 95, Ham. Gr. This name was preoccupied by Eichwald in 1840.
brevirostris, Sowerby, 1839, (*Terebratula brevirostris*.) Murch. Sil. Syst., p. 631, and Pal. N. Y., vol. 2, p. 278, Niagara Gr.
chicagoensis, Winchell & Marcy, 1865, Mem. Bost. Soc. Nat. Hist., p. 94, Niagara Gr.
comis, Owen, 1852, (*Atrypa comis*.) Geo. Sur. Wis., Iowa and Minn., p. 583, Ham. Gr.
coppingeri, Etheridge, 1878, Quar. Jour. Geo. Soc., vol. 34, p. 593, Up. Silurian.
crassiradiatus, McChesney, 1861, New Pal. Foss., p. 87, Niagara Gr. Not recognized.
deshayesi, Castelneau, 1843, Syst. Sil., p. 38. Not recognized. Probably syn. for *Amphigenia elongata*.
elongatus, see *Amphigenia elongata*.
fornicatus, Hall, 1852, Pal. N. Y., vol. 2, p. 81, Clinton Gr.
galeatiformis, Meek & Worthen, syn. for *P. galeatus*.
galeatus, Dalman, 1827, (*Atrypa galeatus*.) Vet. Acad. Handl., p. 130, and Pal. N. Y., vol. 3, p. 257, Low. Held Gr.
intralineatus, Winchell, 1866, Rep. Low. Penin. Mich., p. 94, Ham. Gr.
knappi, Hall & Whitfield, 1872, 24th Rep. N. Y. St. Mus. Nat. Hist., p. 184, Niagara Gr.
knighti, Sowerby, 1812, Min. Conch., vol. 1, p. 73, Devonian.
laqueatus, Conrad, 1855, Proc. Acad. Nat. Sci., p. 441, Niagara Gr.
lenticularis, White & Whitfield, 1862, Proc. Bost. Soc. Nat. Hist., vol. 8, p. 295, Kinderhook Gr.
littoni, Hall, 1859, Pal. N. Y., vol. 3, p. 262, Low. Held. and Niagara Gr.
lotis, Walcott, 1885, Monogr. U. S. Geo. Sur., vol. 8, p. 161, Devonian.
multicostatus, Hall, 1861, Rep. of Progr. Wis. Sur., p. 1, Niagara Gr.
nucleus, Hall & Whitfield, 1872, 24th Rep. N. Y. St. Mus. Nat. Hist., p. 200, Niagara Gr.



FIG. 596.—*Pentamerus knighti*.

- nysius, Hall & Whitfield, 1872, 24th Rep. N. Y. St. Mus. Nat. Hist., p. 184, Niagara Gr. There are two varieties, one having coarse and the other finer radii. These are designated *P. nysius* var. *crassicosus* and *P. nysius* var. *tenuicostus*.
- oblongus, Sowerby, 1839, Murch. Sil. Syst., p. 641, and Pal. N. Y., vol. 2, p. 79, Clinton and Niagara Gr.
- oblongus var. *cylindricus*, Hall & Whitfield, 1872, 24th Rep. N. Y. St. Mus. Nat. Hist., p. 183, Niagara Gr.
- occidentalis, Hall, 1852, Pal. N. Y., vol. 2, p. 341, Guelph Gr.
- occidentalis, see *Gypidula occidentalis*.
- ovalis, Hall, 1852, Pal. N. Y., vol. 2, p. 103, Clinton Gr.
- papilionensis*, see *Pentamerella papilionensis*.
- pergibbosus, Hall & Whitfield, 1875, Ohio Pal., vol. 2, p. 139, Niagara Gr.
- pesovis, Whitfield, 1882, Desc. New Spec. Foss., from Ohio, p. 195, Low. Held. Gr.
- pseudogaleatus, Hall, 1857, 10th. Rep. N. Y. St. Mus. Nat. Hist., p. 106, and Pal. N. Y., vol. 3, p. 259, Low. Held. Gr.
- reversus, see *Anastrophia reversa*.
- salinensis, Swallow, 1860, Trans. St. Louis Acad. Sci., vol. 1, p. 652, Devonian.
- similior, Winchell & Marcy, 1865, (*Spirifer* aff. *similior*.) Mem. Bost. Soc. Nat. Hist., p. 93, Niagara Gr.
- subglobosus, Meek & Worthen, 1868, Geo. Sur. Ill., vol. 3, p. 429, Ham. Gr.
- trisinuatus, McChesney, 1861, Desc. New Pal. Foss., p. 86, Niagara Gr.
- ventricosus, Hall, 1861, Rep. Progr. Wis. Sur., p. 2, and 20th Rep. N. Y. St. Mus. Nat. Hist., p. 374, Niagara Gr.
- verneuili, see *Anastrophia verneuili*.
- PHOLIDOPS, Hall, 1859, Pal. N. Y., vol. 3, p. 489. [Ety. *pholis*, *pholidos*, a scale.] Small, thin, subelliptical, inequivalve; apex excentric, foramen in front of the apex of the ventral valve; surface marked by concentric lamellæ of growth; dorsal valve marked with bilobed muscular impressions. Type *P. squamiformis*.
- arenaria, Hall, 1867, Pal. N. Y., vol. 4, p. 413, Oriskany sandstone.
- areolata, Hall, 1863, 16th Rep. N. Y. Mus. Nat. Hist., p. 31, Schoharie grit.
- bellula, Walcott, 1885, Monogr. U. S. Geo. Sur., vol. 8, p. 113, Devonian.
- cincinnatiensis, Hall, 1872, 24th Rep. N. Y. St. Mus. Nat. Hist., pl. 7, fig. 10, Hud. Riv. Gr.
- hamiltoniæ, Hall, 1860, 13th Rep. N. Y. St. Mus. Nat. Hist., p. 92, and Pal. N. Y., vol. 4, p. 32, Ham. Gr.
- linguloides, Hall, 1867, Pal. N. Y., vol. 4, p. 414, Ham. Gr.
- oblata, Hall, 1867, Pal. N. Y., vol. 4, p. 414, Ham. Gr.
- ovalis, Hall, 1863, Trans. Alb. Inst., vol. 4, p. 209, Niagara Gr.
- ovata, Hall, 1859, Pal. N. Y., vol. 3, p. 490, Low. Held. Gr.
- quadrangularis, Walcott, 1885, Monogr. U. S. Geo. Sur., vol. 8, p. 114, Devonian.
- squamiformis, Hall, 1843, (*Orbicula squamiformis*.) Geo. Rep. 4th Dist. N. Y., p. 108, and Pal. N. Y., vol. 2, p. 250, Niagara Gr.
- subtruncata, Hall, 1847, (*Orbicula subtruncata*.) Pal. N. Y., vol. 1, p. 290, Hud. Riv. Gr.
- terminalis, Hall, 1859, Pal. N. Y., vol. 3, p. 490, Oriskany sandstone.
- trentonensis, Hall, 1866, 24th Rep. N. Y. St. Mus. Nat. Hist., p. 221, Trenton Gr.
- Platystrophia*, King, syn. for *Orthis*.
- regularis*, syn. for *Orthis lynx*.
- Plectambonites arca*, syn. for *Leptaena transversalis*.
- glabra*, syn. for *Leptaena sericea*.
- tenera*, syn. for *Leptaena transversalis*.
- Plicatula*, Lamarck, 1809. Not Palæozoic.
- striatocostata*, see *Meekella striatocostata*.
- PORAMBONITES, Pander, 1830, Beitrage zur Geog. des Russischen Reiches, p. 99.



FIG. 598.—*Porambonites ottawensis*. a, b, c, d, Different views; e, interior of ventral valve; f, interior of dorsal valve; g, showing oral arms.

- [Ety. *poros*, opening; *ambon*, umbone.] Subglobose, depressed, dorsal valve the larger, beaks obtuse, subequal, separated by a small cardinal area in each valve; foramen in each valve small, triangular, reaching the hinge-line; two long, slightly diverging dental lamellæ in each valve, those of the ventral valve closer together; surface coarsely punctured in lines. Type *P. æquiostrius*.
- dentatus*, see *Orthis dentata*.
- obscurus, Hall & Whitfield, 1877, U. S. Geo. Expl. 40th parallel, vol. 4, p. 234, Quebec Gr.
- ottawensis, Billings, 1862, Pal. Foss., vol. 1, p. 140, Black Riv. Gr.
- PRODUCTELLA, Hall, 1867, Pal. N. Y., vol. 4, p. 153. [Sig. diminutive of *Productus*.] Shells having the general form of *Productus*, but with a narrow area on each valve, a foramen or callosity on the ventral area, small teeth, and more or less distinct teeth sockets. Type *P. subaculeata*.
- arctirostrata, Hall, 1857, (*Productus arctirostratus*.) 10th Rep. N. Y. St. Mus.



FIG. 597.—*Pholidops cincinnatiensis*.

Nat. Hist., p. 177, and Pal. N. Y., vol. 4, p. 182, Chemung Gr.
 bialveata, Hall, 1867, Pal. N. Y., vol. 4, p. 183, Chemung Gr.
 boydi, Hall, 1857, (Productus boydii,) 10th Rep. N. Y. St. Mus. Nat. Hist., p. 179, and Pal. N. Y., vol. 4, p. 169, Chemung Gr.
 concentrica, Hall, 1857, (Productus concentricus,) 10th Rep. N. Y. St. Mus. Nat. Hist., p. 180, Kinderhook Gr.
 costatula, Hall, 1867, Pal. N. Y., vol. 4, p. 180, Chemung Gr.
 costatula var. strigata, Hall, 1867, Pal. N. Y., vol. 4, p. 181, Chemung Gr.
 dissimilis, see P. hallana.
 dumosa, Hall, 1861, (Productus dumosus,) 14th Rep. N. Y. St. Mus. Nat. Hist., p. 99, and Pal. N. Y., vol. 4, p. 162, Ham. Gr.
 eriensis, Nicholson, 1874, Geo. Mag., n. s., vol. 1, p. 118, Cornif. Gr.
 exanthemata, Hall, 1857, (Productus exanthematus,) 10th Rep. N. Y. St. Mus. Nat. Hist., p. 174, and Pal. N. Y., vol. 4, p. 163, Ham. Gr.
 hallana, Walcott, 1885, Monogr. U. S. Geo. Sur., vol. 8, p. 130, Ham. Gr. Proposed instead of P. dissimilis of Hall, which was preoccupied by DeKoninck.

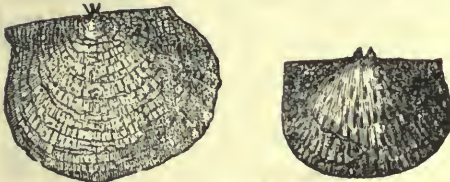


FIG. 599.—Productella hirsuta.

hirsuta, Hall, 1857, (Productus hirsutus,) 10th Rep. N. Y. St. Mus. Nat. Hist., p. 175, Chemung Gr.
 hirsuta var. rectispina, Hall, 1867, Pal. N. Y., vol. 4, p. 168, Chemung Gr.
 hystricula, Hall, 1867, Pal. N. Y., vol. 4, p. 178, Chemung Gr.
 lachrymosa, Conrad, 1842, (Strophomena lachrymosa,) Jour. Acad. Nat. Sci., vol. 8, p. 256, and Pal. N. Y., vol. 4, p. 174, Chemung Gr.
 lachrymosa var. lima, Conrad, 1842, (Strophomena lima,) Jour. Acad. Nat. Sci., vol. 8, p. 256, and Pal. N. Y., vol. 4, p. 174, Chemung Gr.
 lachrymosa var. stigmata, Hall, 1867, Pal. N. Y., vol. 4, p. 174, Chemung Gr.
 navicella, Hall, 1857, (Productus navicella,) 10th Rep. N. Y. St. Mus. Nat. Hist., p. 172, and Pal. N. Y., vol. 4, p. 156, Cornif. and Ham. Grs.
 newberryi, Hall, 1857, (Productus newberryi,) 10th Rep. N. Y. St. Mus. Nat. Hist., p. 180, Chemung Gr.
 onusta, Hall, 1867, Pal. N. Y., vol. 4, p. 184, Chemung Gr.
 pyxidata, Hall, 1858, (Productus pyxidatus,) Geo. of Iowa, p. 498, Ham. Gr.

rarispinga, Hall, 1857, (Productus rarispinus,) 10th Rep. N. Y. St. Mus. Nat. Hist., p. 178, and Pal. N. Y., vol. 4, p. 170, Chemung Gr.
 shumardana, Hall, 1858, (Productus shumardana,) Geo. Rep. of Iowa, vol. 1, pt. 2, p. 499, and Pal. N. Y., vol. 4, p. 157, Up. Held. Gr., Marcellus shale, Ham. and Chemung Grs.
 speciosa, Hall, 1857, (Productus speciosus,) 10th Rep. N. Y. St. Mus. Nat. Hist., p. 176, and Pal. N. Y., vol. 4, p. 175, Chemung Gr.
 spinulicosta, Hall, 1857, (Productus spinulicostus,) 10th Rep. N. Y. St. Mus. Nat. Hist., p. 173, and Pal. N. Y., vol. 4, p. 160, Marcellus shales and Ham. Gr.
 striatula, Hall, 1867, Pal. N. Y., vol. 4, p. 177, Chemung Gr.
 subaculeata, Murchison, 1840, (Productus subaculeatus,) Bul. Soc. Geo. de France, vol. 11, p. 255, and Pal. N. Y., vol. 4, p. 154, Waverly Gr.
 subalata, Hall, 1857, (Productus subalatus,) 10th Rep. N. Y. St. Mus. Nat. Hist., p. 174, and Pal. N. Y., vol. 4, p. 165, Ham. Gr.
 truncata, Hall, 1857, (Productus truncatus,) 10th Rep. N. Y. St. Mus. Nat. Hist., p. 171, and Pal. N. Y., vol. 4, p. 160, Marcellus shales and Ham Gr.
 tullia, Hall, 1867, Pal. N. Y., vol. 4, p. 164, Ham. Gr.

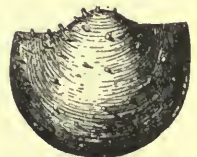


FIG. 600.—Productella subalata. Ventral valve.

PRODUCTUS, Sowerby, 1812, Min. Conch., vol. 1, p. 153. [Ety. productus, produced—so named from one valve of the shell being prolonged beyond the other, and often to a great extent.] Shell inequivalve, transverse, or elongated with auricular expansions; ventral valve convex, geniculated, or perpendicularly incurved; hinge-line straight; area narrow, or the cardinal edge thickened; beak incurved; in the interior a narrow mesial ridge separates two elongated, ramified, muscular adductor scars; under and outside these are two deep, longitudinally subquadrated impressions for cardinal muscles, widely separated by a crest, and lower down toward the center of the shell two deep concave subspiral depressions for spiral or labial appendages; dorsal valve concave, following the other valve; cardinal process for the attachment of muscles prominent, trifid, and below it a mesial ridge, upon each side of which are the ramified adductor scars; outside and in front of these are two reniform impressions; a prominence on each side the mesial ridge indicates the origin of spiral arms; surface of shell striated, more or less concentrically

- wrinkled, and bearing tubular spines. Types *P. longispinus* and *P. semireticulatus*.
- æquicostatus*, Shumard, 1855, *Geo. Rep. Mo.*, p. 201, Coal Meas.
- alternatus*, Norwood & Pratten, 1854, *Jour. Acad. Nat. Sci.*, 2d series, vol. 3, p. 20, Keokuk Gr.
- altonensis*, Norwood & Pratten, 1854, *Jour. Acad. Nat. Sci.*, 2d series, vol. 3, p. 7, Kaskaskia Gr.
- americanus*, Swallow, 1863, *Trans. St. Louis Acad. Sci.*, vol. 2, p. 91, Up. Coal Meas.
- arctirostratus*, see *Productella arctirostrata*.
- arcuatus*, Hall, 1858, *Geo. Rep. Iowa*, p. 518, Kinderhook Gr.
- asper*, McChesney, syn. for *P. nebrascensis*.
- auriculatus*, Swallow, 1863, *Trans. St. Louis Acad. Sci.*, vol. 2, p. 92, Coal Meas.
- biseriatus*, Hall, 1858, *Trans. Alb. Inst.*, vol. 4, p. 12, and *Bull. Am. Mus. Nat. Hist.*, p. 46, Warsaw Gr.
- boonensis*, Swallow, 1858, *Trans. St. Louis Acad. Sci.*, vol. 1, p. 217, Coal Meas.
- boydi*, see *Productella boydi*.
- calhounanus*, Swallow, 1858, *Trans. St. Louis Acad. Sci.*, vol. 1, p. 215, Coal Meas. Prof. Meek regarded this name as a synonym for *P. semireticulatus*.
- callawayensis*, Swallow, 1860, *Trans. St. Louis Acad. Sci.*, vol. 1, p. 640, Ham. Gr.
- cancrini*, as identified by Geinitz, is *P. pertenuis* of Meek.
- capaci*, D'Orbigny, 1843, as identified by early authors, is referred to *P. longispinus*.
- cestriensis*, Worthen, 1860, *Trans. St. Louis Acad. Sci.*, vol. 1, p. 570, Kaskaskia Gr.
- clavus*, Norwood & Pratten, 1854, *Jour. Acad. Nat. Sci.*, 2d series, vol. 3, p. 10, Coal Meas.
- comoides*, as identified by d'Archiac & Verneuil. Not American.
- concentricus*, see *Productella concentrica*.
- confragosus*, Conrad, 1835, *Trans. Geo. Soc. Penn.*, vol. 1, p. 2, p. 267, Coal Meas. This species is not recognized.
- cooperensis*, Swallow, 1860, *Trans. St. Louis Acad. Sci.*, vol. 1, p. 640, Waverly or Choteau Gr.
- cora*, D'Orbigny, 1842, *Paléont. d. l'Am. Merid.*, p. 48, Coal Meas.
- cora* var. *mogoyoni*, Marcou, 1858, *Geo. N. Amer.*, p. 45, Subcarboniferous.
- coriformis*, Swallow, 1863, *Trans. St. Louis Acad. Sci.*, vol. 2, p. 94, Kaskaskia Gr.
- costatoides*, Swallow, 1858, *Trans. St. Louis Acad. Sci.*, vol. 1, p. 217, Up. Coal Meas.
- costatus*, Sowerby, 1827, *Min. Conch.*, vol. 6, p. 115, Coal Meas. It is doubtful whether this species has been identified in America.
- curtirostratus*, Winchell, 1865, *Proc. Acad. Nat. Sci.*, p. 114, Marshall Gr.
- delawari*, Marcou, 1858, *Geol. N. Amer.*, p. 45, Subcarb.
- depressus*, Sowerby, 1825, see *Strophomena depressa*.
- depressus*, Swallow, 1863, *Trans. St. Louis Acad. Sci.*, vol. 2, p. 93, Keokuk Gr.
- dissimilis*, see *Productella dissimilis*.
- dolorosus*, Winchell, 1865, *Proc. Acad. Nat. Sci.*, p. 114, Marshall Gr.
- dumosus*, see *Productella dumosa*.
- duplicostatus*, Winchell, 1865, *Proc. Acad. Nat. Sci.*, p. 113, Marshall Gr.
- elegans*, Norwood & Pratten, 1854. This name was preoccupied, and the fossil is now named *P. cestriensis*.
- exanthematus*, see *Productella exanthemata*.
- fasciculatus*, McChesney, 1860, *New Pal. Foss.*, Coal Meas. Not recognized.
- feintonensis*, Swallow, 1863, *Trans. St. Louis Acad. Sci.*, vol. 2, p. 93, Keokuk Gr.
- flemingi*, Sowerby, 1812, *Min. Conch.*, vol. 1, p. 155, Subcarb.
- flemingi* var. *burlingtonensis*, Hall, 1858, *Geo. Rep. Iowa*, p. 598, Burlington Gr.
- gracilis*, Winchell, 1865, *Proc. Acad. Nat. Sci.*, p. 112, Cuyahoga shale.
- gradatus*, Swallow, 1863, *Trans. St. Louis Acad. Sci.*, vol. 2, p. 93, Keokuk Gr.
- hepar*, Morton, 1836, *Am. Jour. Sci. and Arts*, vol. 29, p. 149, Coal Meas. Not recognized.
- hildrethanus*, Norwood & Pratten, 1854, *Jour. Acad. Nat. Sci.*, 2d ser., vol. 3, p. 18, Coal Meas.
- hirsutiformis*, Walcott, 1885, *Monogr. U. S. Geo. Sur.*, vol. 8, p. 133, Up. Devonian.
- hirsutus*, see *Productella hirsuta*.
- horridus*, as identified by Geinitz, 1866. Prof. Meek regarded the fossil as *P. longispinus*.
- incurvatus*, Shepard, 1838, *Am. Jour. Sci.*, vol. 34, p. 144. Not recognized. Probably a *Streptorhynchus* or *Strophodonta*.
- indianensis*, Hall, 1858, *Trans. Alb. Inst.*, vol. 4, p. 13, and *Bull. Am. Mus. Nat. Hist.*, vol. 4, p. 47, Warsaw Gr.
- inflatus*, syn. for *P. semireticulatus*.
- ivesi*, Newberry, 1861, *Ives's Col. Ex. Exped.*, p. 122, Mid. Carb.
- lasallensis*, Worthen, 1873, *Geo. Sur. Ill.*, vol. 5, p. 569, Up. Coal Meas.
- levicostus*, White, 1860, *Bost. Jour. Nat. Hist.*, vol. 7, p. 230, Kinderhook Gr.
- latissimus*, Sowerby, 1822, *Min. Conch.*, vol. 4, p. 32, Carb.



FIG. 601.—*Productus longispinus*. Dorsal and ventral views.

longispinus, Sowerby, 1812, *Min. Conch.*, vol. 1, p. 154, Coal Meas.

lobatus, as identified by d'Archiac & Verneuil. Not American.
magnicostatus, Swallow, 1860, Trans. St. Louis Acad. Sci., vol. 1, p. 641, Coal Meas.
magnus, Meek & Worthen, 1861, Proc. Acad. Nat. Sci. Phil., p. 142, and Geo. Sur. Ill., vol. 3, p. 528, Keokuk Gr.
marginicinctus, Prout, 1857, Trans. St. Louis Acad. Sci., vol. 1, p. 43, St. Louis Gr.
mesialis, Hall, 1858, Geo. Rep. Iowa, p. 636, Keokuk Gr.
mexicanus, Shumard, 1858, Trans. St. Louis Acad. Sci., vol. 1, p. 291, Permian Gr.
morbillianus, Winchell, 1865, Proc. Acad. Nat. Sci., p. 113, Burlington Gr.
multistriatus, Meek, 1860, Proc. Acad. Nat. Sci., vol. 12, p. 309, and Simpson's Rep. Gt. Basin of Utah, p. 350, Coal Meas.
muricatus, Norwood & Pratten, 1854, Jour. Acad. Nat. Sci. Phil., vol. 3, p. 14, Coal Meas. Prof. Meek regarded this as a syn. for *P. longispinus*.
nanus, Meek & Worthen, 1860, Proc. Acad. Nat. Sci., p. 450, and Geo. Sur. Ill., vol. 2, p. 320, Coal Meas.
navicella, see *Productella navicella*.
nebraskensis, Owen, 1852, Geo. Rep. Wis., Iowa, and Minn., p. 584, Coal Meas.
nevadensis, Meek, 1877, U. S. Geo. Sur. 40th parallel, p. 64, Carboniferous.
nodosus, Newberry, 1861, Ives' Col. Ex. Exped., p. 124, Carb.
norwoodi, Swallow, 1858, Trans. St. Louis Acad. Sci., p. 182, Permian Gr.
occidentalis, Newberry, 1861, Ives' Col. Ex. Exped., p. 122, Up. Carb.
orbignyanus, DeKoninck, 1847, Mon. du genre *Productus*, p. 152, Up. Coal Meas.
ovatus, Hall, 1858, Geo. Rep. Iowa, p. 674, St. Louis Gr.
parvulus, Winchell, 1863, Proc. Acad. Nat. Sci., p. 4, Marshall Gr.
parvus, Meek & Worthen, 1860, Proc. Acad. Nat. Sci. Phil., p. 450, and Geo. Sur. Ill., vol. 2, p. 297, Kaskaskia Gr.
pectenoides, Shepard, 1838, Am. Jour. Sci., vol. 34, p. 150. Not recognized. Probably a *Streptorhynchus*.
pertenuis, Meek, 1872, Pal. E. Neb., p. 164, Coal Meas.
phillipsi, Norwood & Pratten, 1854, Jour. Acad. Nat. Sci., vol. 3, 2d series, p. 8, Subcarb.
pileiformis, syn. for *Productus cora*.
pileolus, Shumard, 1858, Trans. St. Louis Acad. Sci., vol. 1, p. 291, Permian Gr.
picillum, Morton, 1836, Am. Jour. Sci. and Arts, vol. 29, p. 149, Coal Meas. Not recognized.
popii, Shumard, 1858, Trans. St. Louis Acad. Sci., vol. 1, p. 290, Permian Gr.

portlockanus, Norwood & Pratten, 1854, Jour. Acad. Nat. Sci., 2d series, vol. 3, p. 15, Coal Meas.
prattenanus, Norwood, 1854, Jour. Acad. Nat. Sci. Phil., 2d series, vol. 3, p. 17, Coal Meas.
punctatus, Martin, 1809, Petrif. Derb., pl. 37, fig. 6, Low. Carb. and Coal Meas.
pyxidatus, see *Productella pyxidata*.
pyxidiformis, DeKoninck, 1847, Monographie du genre *Productus*, p. 220, Subcarboniferous.
rarispinus, see *Productella rarispinata*.
rogersi, Norwood & Pratten, 1854, Jour. Acad. Nat. Sci., vol. 3, p. 9, Coal Meas. Prof. Meek regarded this as a synonym for *P. nebraskensis*.
scabriculus, (*Conchyliolithus Anomites scabriculus*), Martin, 1809, Petrif. Derb., p. 8, tab. 36, fig. 5, Carb.
scitulus, Meek & Worthen, 1860, Proc. Acad. Nat. Sci., p. 451, and Geo. Sur. Ill., vol. 2, p. 280, St. Louis Gr.
semipunctatus, Shepard, 1838, Am. Jour. Sci., vol. 34, p. 153, Coal Meas.
semipunctatus, Hildreth, 1838, syn. for *P. punctatus*.
semireticulatus, Martin, 1809, (*Conchyliolithus Anomites semireticulatus*), Petrif. Derb., p. 7, Keokuk Gr.
semistriatus, Meek, 1860, Proc. Acad. Nat. Sci., vol. 12, p. 309, and Simpson's Rep. Gt. Basin of Utah, p. 349, Coal Meas.

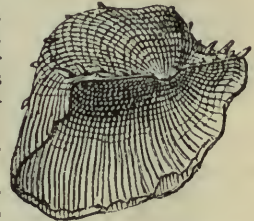


FIG. 602.—*Productus semireticulatus*.

setigerus, Hall, 1858, Geo. Rep. Iowa, p. 638, Keokuk Gr.
setigerus var. *Keokuk*, Hall, 1858, Geo. Rep. Iowa, p. 639, Keokuk Gr.
shumardanus, see *Productella shumardana*.
speciosus, see *Productella speciosa*.
spinulicostus, see *Productella spinulicosta*.
spinulosus, Sowerby, 1812, Min. Conch., vol. 1, p. 155, Carb.
splendens, Norwood & Pratten, 1854, Jour. Acad. Nat. Sci. Phil., vol. 3, p. 11, Coal Meas. Prof. Meek regarded this as a synonym for *P. longispinus*.
subaculeatus, see *Productella subaculeata*.
subalatus, see *Productella subalata*.
subhorridus, Meek, 1877, U. S. Geo. Sur., 40th parallel, p. 75, Carboniferous.
sulcatus, Castelnau, 1843, Syst. Sil., p. 39, Not recognized.
symmetricus, McChesney, 1860, Desc. New Pal. Foss., p. 35, and Pal. E. Neb. p. 167, Coal Meas.
tenuicostus, Hall, 1858, Geo. Rep. Iowa, p. 675, St. Louis Gr.
tenuistriatus, Verneuil, 1845, Geol. Russia and Ural Mountains, vol. 2, p. 260, Carb.

truncatus, see *Productella truncata*.
tubulospinus, McChesney. Syn. for. *P. semipunctatus*.
viminalis, White, 1862, Proc. Bost. Soc. Nat. Hist., vol. 9, p. 29, Burlington Gr.
vittatus, Hall, 1858, Geo. Rep. Iowa, p. 639, Keokuk Gr.
wabashensis, Norwood & Pratten, 1854, Jour. Acad. Nat. Sci., vol. 3, p. 13, Coal Meas.
wilberianus, McChesney, syn. for *P. nebraskensis*.
wortheni, Hall, 1858, Geo. Rep. Iowa, p. 635, Keokuk Gr.

PSEUDOCRANIA, McCoy, 1851, Ann. and Mag. Nat. Hist., 2d series, vol. 8, p. 387. [Ety. *pseudo*, false; *Crania*, a genus.] Shell slightly inequivalve, free; each valve depressed, subconical; dorsal valve with or without a small cardinal area; internally, margin broad, flat, smooth, or minutely striated concentrically; anterior pair of muscular impressions much larger than the posterior pair; pallial impressions numerous, linear, not interrupted along the middle. Type *P. divaricata*.
anomala, Winchell, 1866, Rep. Low. Pen. Mich., p. 92, Ham. Gr.

RENSELLERIA, Hall, 1859, Pal. N. Y., vol. 3, p. 454. [Ety. proper name.] Inequivalve, oval, ovoid, or suborbicular, elongated, rarely transverse, sometimes subtrigonal, gibbous or ventricose; no mesial fold or sinus; beak prominent, incurved, foramen terminal; articulation by two widely separated teeth and sockets; surface striated; structure punctate. Type *R. ovoides*.

aquiradiata, Conrad, 1842, (*Atrypa aquiradiata*), Jour. Acad. Nat. Sci., vol. 8, p. 266, and Pal. N. Y., vol. 3, p. 255, Low. Held. Gr.

coudoni, McChesney, 1861, New Pal. Foss., p. 85, Oriskany sandstone.

cumberlandia, Hall, 1857, (*Meganteris cumberlandia*), 10th Rep. N. Y. St. Mus. Nat. Hist., p. 101, and Pal. N. Y., vol. 3, p. 464, Oriskany sandstone.

elliptica, Hall, 1857, (*Meganteris elliptica*), 10th Rep. N. Y. St. Mus. Nat. Hist., p. 98, Low. Held. Gr.

elongata, see *Amphigenia elongata*.

intermedia, Hall, 1859, Pal. N. Y., vol. 3, p. 463, Oriskany sandstone.

johanni, Hall, 1867, Pal. N. Y., vol. 4, p. 385, Up. Held. Gr.

lævis, Hall, 1857, (*Meganteris lævis*), 10th Rep. N. Y. St. Mus. Nat. Hist., p. 99, Low. Held. Gr.

lævis, Meek, 1868, Trans. Chi. Acad. Sci., p. 108. This name was preoccupied.

marylandica, Hall, 1859, Pal. N. Y., vol. 3, p. 461, Oriskany sandstone.

mutabilis, Hall, 1857, (*Meganteris mutabilis*), 10th Rep. N. Y. St. Mus. Nat. Hist., p. 97, Low. Held. Gr.

ovalis, Hall, 1857, (*Meganteris ovalis*), 10th Rep. N. Y. St. Mus. Nat. Hist., p. 101, and Pal. N. Y., vol. 3, p. 458, Oriskany sandstone.

ovoides, Eaton, 1832, (*Terebratula ovoides*), Geo. Textbook, p. 45, and Pal. N. Y., vol. 3, p. 456, Oriskany sandstone.

suessana, Hall, 1857, (*Meganteris suessana*), 10th Rep. N. Y. St. Mus. Nat. Hist., p. 100, and Pal. N. Y., vol. 3, p. 459, Oriskany sandstone.

portlandica, Billings, 1863, Proc. Port. Soc. Nat. Hist., vol. 1, p. 115, Low. Held. Gr.

RETZIA, King, 1850, Monograph of Permian Foss., p. 137. [Ety. proper name.] Longitudinally oval, ribbed, with large punctures; foramen in ventral valve; area triangular; fissure closed. Type *R. adrieni*.



FIG. 604. *Retzia evax*.

altirostris, White, 1862, Proc. Bost. Soc. Nat. Hist., vol. 9, p. 28, Marshall Gr.

compressa, Meek, 1864, Pal. California, vol. 1, p. 14, Coal Meas.

deweyi, Hall, 1857, (*Waldheimia deweyi*), 10th Rep. N. Y. St. Mus. Nat. Hist., p. 89, Low. Held. Gr.

dubia, Billings, 1863, Proc. Port. Soc. Nat. Hist., vol. 1, p. 113, Low. Held. Gr.

electra, Billings, 1863, Proc. Port. Soc. Nat. Hist., vol. 1, p. 114, Low. Held. Gr.

eugenia, Billings, 1861, Can. Jour., vol. 6, p. 147, Ham. Gr.

evax, Hall, 1863, (*Rhynchospira evax*), Trans. Alb. Inst., vol. 4, p. 213, and Rep. Geol. and Nat. Hist. Ind., Niagara Gr.

formosa, Hall, 1857, (*Waldheimia formosa*), 10th Rep. N. Y. St. Mus. Nat. Hist., p. 88, Low. Held. Gr.

hippolyte, Billings, 1863, Proc. Port. Soc. Nat. Hist., vol. 1, p. 112, Low. Held. Gr.

lepida, Hall, 1860, (*Rhynchospira lepida*), 13th Rep. N. Y. St. Mus. Nat. Hist., p. 83, and Pal. N. Y., vol. 4, p. 275, Ham. Gr.

marcyi, Shumard, 1854, (*Terebratula marcyi*), Marcy's Exp. Red Riv., p. 177, Kaskaskia Gr.

maria, Billings, 1863, Proc. Port. Soc. Nat. Hist., vol. 1, p. 112, Low. Held. Gr.



FIG. 603.—*Rensseleria ovoides*.

meehana, Shumard, 1858, Trans. St. Louis Acad. Sci., vol. 1, p. 295, Permian Gr.

mormoni, Marcou, 1858, (Terebratula mormonii,) Geo. N. Amer., p. 51, Coal Meas. This species was subsequently, though in the same year, described by Shumard under the name *R. punctilifera*.



FIG. 605.—*Retzia mormoni*.

osagensis, Swallow, 1860, Trans. St. Louis Acad. Sci., vol. 1, p. 653, Waverly or Choteau Gr.

papillata, Shumard, 1858, Trans. St. Louis Acad. Sci., vol. 1, p. 294, Permian Gr.

popana, Swallow, 1860, Trans. St. Louis Acad. Sci., vol. 1, p. 654, Waverly or Choteau Gr.

punctilifera, Shumard, 1858, syn. for *Retzia mormoni*.

polypleura, Winchell, 1862, Proc. Acad. Nat. Sci., 2d ser., vol. 6, p. 406, Portage Gr.

sexplicata, White & Whitfield, 1862, Proc. Bost. Soc. Nat. Hist., vol. 8, p. 294, Kinderhook Gr.

sinuata, Hall, 1860, (Rhynchospira sinuata,) Can. Nat. and Geol., vol. 5, Up. Sil.

subglobosa, Hall, 1867, (Rhynchospira subglobosa,) Pal. N. Y., vol. 4, p. 421, Up. Held. Gr.

subglobosa, McChesney, syn. for *Retzia mormoni*.

vera, see *Eumetria vera*.

vera var. costata, see *Eumetria vera* var. costata.

verneuilana, see *Eumetria verneuilana*.

woosteri, White, 1879, Bull. U. S. Sur., vol. 5, No. 2, p. 215, and Cont. to Pal., No. 6, p. 134, Coal Meas.

RHYNCHONELLA, Fischer, 1809, Mem. Soc. Imp. Mosc., vol. 2, p. 35. [Ety. *rhynchos*, beak; *ella*, little.] Shell oval or trigonal, subglobose, with or without mesial fold and sinus; surface plicated; beak of ventral valve acute, entire, prominent, curved; foramen under the beak, by the incurving of which it is sometimes closed, partly surrounded by a deltidium, which is composed of two pieces; two teeth in the ventral valve, supported by dental plates, which extend to the bottom of the valve; two sockets in the dorsal valve; apophyses two, short, flattened, curved, attached to the hinge plate; adductor scars four, separated by a mesial ridge; pedicle scars on the cardinal plates; pedicle muscles of the ventral valve in a saucer-shaped cavity at the base of the dental plates; shell impunctate. Type *R. loxia*.

abrupta, Hall, 1857, 10th Rep. N. Y. St. Mus. Nat. Hist., p. 68, and Pal. N. Y., vol. 3, p. 228, Low. Held. Gr.

acadiensis, Davidson, 1863, Quar. Jour. Geo. Soc., vol. 19, p. 172, Low Carb.

acinus, Hall, 1863, Trans. Alb. Inst., vol. 4, p. 215, Niagara Gr.

acutiplicata, Hall, 1857, N. Y. St. Mus. Nat. Hist., p. 73, and Pal. N. Y., vol. 3, p. 232, Low Held. Gr.

acutirostris, Hall, 1847, (*Atrypa acutirostra*,) Pal. N. Y., vol. 1, p. 21, Chazy Gr.

æquivalvis, Hall, 1857, 10th Rep. N. Y. St. Mus. Nat. Hist., p. 66, and Pal. N. Y., vol. 3, p. 224, Low. Held. Gr.

æquiradiata, Hall, 1852, (*Atrypa æquiradiata*,) Pal. N. Y., vol. 2, p. 70, Clinton Gr.

ainslæi, Winchell, 1886, 14th Ann. Rep. Geo. Minn., p. 315, Trenton Gr.

algeri, McChesney, 1860, New Pal. Foss. Carb. Not recognized.

altilis, Hall, 1847, (*Atrypa altilis*,) Pal. N. Y., vol. 1, p. 23, Chazy Gr.

altiplicata, Hall, 1857, 10th Rep. N. Y. St. Mus. Nat. Hist., p. 72, and Pal. N. Y., vol. 3, p. 231, Low Held. Gr.

alveata, see *Centronella alveata*.

ambigua, Calvin, 1878, Bull. U. S. Geo. Sur., vol. 4, No. 3, p. 729, Low. Devonian.

angulata, Linnaeus, as identified by Geinitz, syn. for *Syntrielasma hemipliatum*.

anticostiensis, Billings, 1862, Pal. Foss., vol. 1, p. 142, Hud. Riv. Gr.

aprinis, DeVerneuil, 1845, (*Terebratula aprinis*,) Geo. Russia and Ural Mts., vol. 2, p. 90, and Pal. N. Y., vol. 2, p. 280, Niagara Gr.

arctirostrata, Swallow, 1863, Trans. St. Louis Acad. Sci., vol. 2, p. 84, Kaskaskia Gr.

argentea, Billings, 1866, Catal. Sil. Foss. Antic., p. 43, Anticosti Gr.

argenturbica, White, 1874, Rep. Invert. Foss., p. 14, and Geo. Sur. W. 100th Mer., vol. 4, p. 75, Hud. Riv. Gr.

aspasia, Billings, 1863, Proc. Port. Soc. Nat. Hist., vol. 1, p. 111, Low. Held. Gr.

barquensis, Winchell, 1862, Proc. Acad. Nat. Sci., p. 408, Marshall Gr.

barrandi, Hall, 1857, 10th Rep. N. Y. St. Mus. Nat. Hist., p. 82, and Pal. N. Y., vol. 3, p. 442, Oriskany sandstone.

bialveata, Hall, 1857, 10th Rep. N. Y. St. Mus. Nat. Hist., p. 73, and Pal. N. Y., vol. 3, p. 233, Low. Held. Gr.

bidens, Hall, 1852, (*Atrypa bidens*,) Pal. N. Y., vol. 2, p. 69, Clinton Gr.

bidentata, Hisinger, 1826, (*Terebratula bidentata*,) Vet. Acad. Handl., p. 343, and Pal. N. Y., vol. 2, p. 276, Niagara Gr.

billingsi, see *Stenoschisma billingsi*.

boonensis, Shumard, 1855, Geo. Rep. Mo., p. 205, Burlington Gr.

brevirostris, see *Pentamerus brevirostris*.

campbellana, Hall, 1857, 10th Rep. N. Y. St. Mus. Nat. Hist., p. 79, and Pal. N. Y., vol. 3, p. 239, Low. Held. Gr.

camerifera, Winchell, 1862, Proc. Acad. Nat. Sci., p. 408, Marshall Gr.
 capax, Conrad, 1842, (*Atrypa capax*.) Jour. Acad. Nat. Sci., vol. 8, p. 264, Hud. Riv. Gr.



FIG. 606.—*Rhynchonella capax*.

caput-testudinis, White, 1862, Proc. Bost. Soc. Nat. Hist., vol. 9, p. 23, Burlington Gr.

carica, see *Stenoschisma carica*.

carbonaria, McChesney, 1860, New Pal. Foss., Coal Meas. Not recognized.

carolina, see *Stenoschisma carolina*.

castanea, Meek, 1868, Trans. Chi. Acad. Sci., p. 93, Devonian.

congregata, see *Stenoschisma congregatum*.

contracta, see *Stenoschisma contractum*.

cooperensis, Shumard, 1855, Geo. Rep. Mo., p. 204, Waverly or Choteau Gr.

corinthia, Billings, 1865, Pal. Foss., vol. 1, p. 220, Quebec Gr.

cuboides, Sowerby, (*Atrypa cuboides*.) see *R. venustula*.

cuneata, see *Rhynchotretra cuneata* var. *Americana*.

dawsonana, Davidson, 1863, Quar. Jour. Geol. Soc., vol. 19, p. 172, Subcarboniferous.

dentata, Hall, 1847, (*Atrypa dentata*.) Pal. N. Y., vol. 1, p. 148, Hud. Riv. Gr.

dotis, see *Stenoschisma dotis*.

dryope, Billings, 1874, Pal. Foss., vol. 2, p. 37, Gaspé limestone No. 8, Devonian.

dubia, Hall, 1847, (*Atrypa dubia*.) Pal. N. Y., vol. 1, p. 21, Chazy Gr.

duplicata, syn. for *Stenoschisma contractum*.

eatoniiiformis, McChesney, 1860, New Pal. Foss., syn. for *R. rockymontana*.

emacerata, Hall, 1852, (*Atrypa emacerata*.) Pal. N. Y., vol. 2, p. 71, Clinton Gr.

eminens, Hall, 1857, 10th Rep. N. Y. St. Mus. Nat. Hist., p. 78, and Pal. N. Y., vol. 3, p. 237, Low. Held. Gr.

emmonsii, Hall & Whitfield, 1877, U. S. Geo. Expl. 40th Parallel, vol. 4, p. 247, Devonian.

endlichi, Meek, 1876, U. S. Geo. Sur. of Colorado, p. 47, and White's Cont. to Pal. No. 6, p. 133, Up. Devonian.

eurekaensis, Walcott, 1885, Monogr. U. S. Geo. Sur., vol. 8, p. 223, Subcarboniferous.

eva, Billings, 1866, Catal. Sil. Foss. Antic., p. 44, Anticosti Gr.

evangelina, Hartt, 1868, Acad. Geol., p. 299, Subcarboniferous.

excellens, Billings, 1874, Pal. Foss., vol. 2, p. 36, Gaspé limestone No. 8, Devonian.

eximia, see *Stenoschisma eximium*.

explanata, McChesney, 1860, Desc. New Pal. Foss., Kaskaskia Gr. Not recognized.

fitchiana, Hall, 1857, 10th Rep. N. Y. St. Mus. Nat. Hist., p. 85, and Pal. N. Y., vol. 3, p. 441, Oriskany sandstone.

formosa, see *Stenoschisma formosum*.

fringilla, Billings, 1862, Pal. Foss., vol. 1, p. 141, Anticosti Gr., Div. 1., Mid. Sil.

glacialis, Billings, 1862, Pal. Foss., vol. 1, p. 143, Anticosti Gr., Div. 1., Mid. Sil.

glaufsagea, see *Centronella glaufsagea*.

greenana, Ulrich, 1886, Cont. to Am. Pal., p. 26, Waverly Gr.

grosvenori, Hall, 1858, Trans. Alb. Inst., vol. 4, p. 10, and Bull. Am. Mus. Nat. Hist., p. 53, Warsaw Gr.

guadalupae, Shumard, 1858, Trans. St. Louis Acad. Sci., vol. 1, p. 295, Permian Gr.

heteropsis, Winchell, 1865, Proc. Acad. Nat. Sci., p. 121, Marshall Gr.

horsfordi, see *Stenoschisma horsfordi*.

hubbardi, Winchell, 1862, Proc. Acad. Nat. Sci., p. 407, Marshall Gr.

huronia, Winchell, 1862, Proc. Acad. Nat. Sci., 2d ser., vol. 6, p. 409, Portage Gr.

hydraulicia, Whitfield, 1882, Desc. New Spec. Foss. from Ohio, p. 194, Low. Held. Gr.

ida, Hartt, 1868, Acad. Geol., p. 298, Subcarboniferous.

illinoisensis, Worthen, 1884, Bull. No. 2, Ill. St. Mus. Nat. Hist., p. 24, and Geo. Sur. Ill., vol. 8, p. 104, Coal Meas.

increbescens, syn. for *Rhynchonella capax*.

indentata, Shumard, 1859, Trans. St. Louis Acad. Sci., vol. 1, p. 393, Permian Gr.

indianensis, Hall, 1863, Trans. Alb. Inst., vol. 4, p. 215, Niagara Gr.

inæquiplata, Hall, 1857, 10th Rep. N. Y. St. Mus. Nat. Hist., p. 126, Up. Held. Gr.

intermedia, Barris, 1879, Proc. Davenport Acad. Sci., vol. 2, p. 285, Up. Held. Gr.

inutilis, Hall, 1857, 10th Rep. N. Y. St. Mus. Nat. Hist., p. 74, and Pal. N. Y., vol. 3, p. 233, Low. Held. Gr.

janea, Billings, 1866, Catal. Sil. Foss. Antic., p. 43, Anticosti Gr.

lacunosa. Not an American species.

lamellata, Hall, 1852, (*Atrypa lamellata*.) Pal. N. Y., vol. 2, p. 329, Coralline Limestone.

laura, see *Leiorhynchus laura*.

macra, Hall, 1858, Trans. Alb. Inst., vol. 4, p. 11, and Bull. Am. Mus. Nat. Hist., p. 52, Warsaw Gr.

mainensis, Billings, 1863, Proc. Port. Soc. Nat. Hist., vol. 1, p. 110, Low. Held. Gr.

- marshallensis, Winchell, 1862, Proc. Acad. Nat. Sci., p. 408, Marshall Gr.
- medea, Billings, 1860, Can. Jour., vol. 5, p. 271, Corniferous Limestone.
- metallica, White, 1874, Rep. Invert. Foss., p. 20, and Geo. Sur. W. 100th Mer., vol. 4, p. 129, Carb.
- mica, Billings, 1866, Catal. Sil. Foss. Antic., p. 44, Anticosti Gr.
- micropleura, Winchell, 1865, Proc. Acad. Nat. Sci., p. 122, Marshall Gr.
- missouriensis, Shumard, 1855, Geo. of Mo., p. 204, Waverly or Choteau Gr.
- multistriata, Hall, 1857, 10th Rep. N. Y. St. Mus. Nat. Hist., p. 85, and Pal. N. Y., vol. 3, p. 440, Oriskany sandstone.
- mutabilis, Hall, 1857, 10th Rep. N. Y. St. Mus. Nat. Hist., p. 66, and Pal. N. Y., vol. 3, p. 225, Low. Held. Gr.
- mutata, Hall, 1858, Trans. Alb. Inst., vol. 4, p. 10, and Geo. Sur. Iowa, p. 658, Warsaw Gr.
- neenah, Whitfield, 1880, Ann. Rep. Geo. Sur. Wis., p. 62, and Geo. Wis., vol. 4, p. 265, Trenton Gr.
- neglecta, Hall, 1852, (*Atrypa neglecta*), Pal. N. Y., vol. 2, p. 274, Niagara Gr.
- neglecta var. scobina, Meek, 1872, Am. Jour. Sci. and Arts, 3d ser., vol. 4, p. 277, and Ohio Pal., vol. 1, p. 179, and vol. 2, p. 116, Niagara Gr.
- nobilis, Hall, 1857, 10th Rep. N. Y. St. Mus. Nat. Hist., p. 80, and Pal. N. Y., vol. 3, p. 240, Low. Held. Gr.
- nucleolata, Hall, 1857, 10th Rep. N. Y. St. Mus. Nat. Hist., p. 68, and Pal. N. Y., vol. 3, p. 227, Low. Held. Gr.
- nuclua, Sowerby, 1839, (*Terebratula nuclua*), Murch. Sil. Syst., p. 611, Up. Sil.
- nutrix, Billings, 1866, Catal. Sil. Foss. Antic., p. 43, Anticosti Gr.
- oblata, Hall, 1857, 10th Rep. N. Y. St. Mus. Nat. Hist., p. 86, and Pal. N. Y., vol. 3, p. 439, Oriskany sandstone.
- obsolescens, Hall, 1860, 13th Rep. N. Y. St. Mus. Nat. Hist., p. 111, Waverly Gr.
- obtusiplicata, Hall, 1852, (*Atrypa obtusiplicata*), Pal. N. Y., vol. 2, p. 279, Niagara Gr.
- occidens, Walcott, 1885, Monogr. U. S. Geo. Sur., vol. 8, p. 152, Devonian.
- opposita, White & Whitfield, 1862, Proc. Bost. Soc. Nat. Hist., vol. 8, p. 294, Kinderhook Gr.
- orbicularis, see *Stenoschisma orbiculare*.
- orientalis, Billings, 1859, Can. Nat. Geo., vol. 4, p. 443, Chazy Gr.
- osagensis, Swallow, 1858, syn. for *Rhynchonella uta*.
- ottumwa, White, 1862, Proc. Bost. Soc. Nat. Hist., vol. 9, p. 23, and Cont. to Pal., No. 8, p. 165, St. Louis Gr.
- parvini, McChesney, syn. for *Camero-phoria subtrigona*.
- perlamellosa, Whitfield, 1878, Ann. Rep. Geo. Sur. Wis., p. 73, and Geo. Sur. Wis., vol. 4, p. 265, Hud. Riv. Gr.
- perrostellata, Swallow, 1863, Trans. St. Louis Acad. Sci., vol. 2, p. 85, Kas-kaskia Gr.
- persinuata, Winchell, 1865, Proc. Acad. Nat. Sci., p. 121, Marshall Gr.
- phoca, see *Atrypa phoca*.
- pisum, Hall & Whitfield, 1875, Ohio Pal., vol. 2, p. 135, Niagara Gr.
- planoconvexa, Hall, 1857, 10th Rep. N. Y. St. Mus. Nat. Hist., p. 75, and Pal. N. Y., vol. 3, p. 235, Low. Held. Gr.
- pleioleura, Conrad, 1841, (*Atrypa pleioleura*), Ann. Rep. N. Y., p. 55, and Pal. N. Y., vol. 3, p. 440, Oriskany sandstone.
- plena, Hall, 1847, (*Atrypa plena*), Pal. N. Y., vol. 1, p. 21, Chazy Gr.
- plicata, Hall, 1852, (*Atrypa plicata*), Pal. N. Y., vol. 2, p. 10, Medina Gr.
- plicatula, Hall, 1843, (*Atrypa plicatula*), Geo. Rep. 4th Dist. N. Y., p. 71, and Pal. N. Y., vol. 2, p. 74, Clinton Gr.
- plicifera, Hall, 1847, (*Atrypa plicifera*), Pal. N. Y., vol. 1, p. 22, Chazy Gr.
- principalis, Hall, 1857, 10th Rep. N. Y. St. Mus. Nat. Hist., p. 84, and Pal. N. Y., vol. 3, p. 443, Oriskany sandstone.
- prolifera, see *Stenoschisma prolificum*.
- pugnus, Martin, 1809, (*Conchiliolithus Anomites pugnus*), Petrif. Derb., pl. 22, figs. 4 and 5, Subcarboniferous.
- pustulosa, White, 1860, Bost. Jour. Nat. Hist., vol. 7, p. 236, Burlington Gr.
- pyramidata, Hall, 1857, 10th Rep. N. Y. St. Mus. Nat. Hist., p. 70, and Pal. N. Y., vol. 3, p. 229, Low. Held. Gr.
- pyrrha, Billings, 1866, Catal. Sil. Foss. Antic., p. 44, Anticosti Gr.
- quadricostata, Hall, 1852, (*Atrypa quadricostata*), Pal. N. Y., vol. 2, p. 68, Clinton Gr.
- ramsayi, Hall, 1859, Pal. N. Y., vol. 3, p. 446, Oriskany sandstone.
- raricosta, Whitfield, 1882, Desc. New Spec. Foss., from Ohio, p. 201, Up. Held. Gr.
- recurvirostra, see *Anazyga recurvirostra*.
- reticulata, see *Eichwaldia reticulata*.
- ricinula, Hall, 1858, Trans. Alb. Inst., vol. 4, p. 9, and Bull. Am. Mus. Nat. Hist., p. 53, Warsaw Gr.
- ringens, Swallow, 1860, Trans. St. Louis Acad. Sci., vol. 1, p. 653, Burlington Gr.
- robusta, Hall, 1852, Pal. N. Y., vol. 2, p. 71, (*Atrypa robusta*), Clinton Gr.
- rockymontana, Marcou, 1858, (*Terebratula rockymontana*), Geo. North America, p. 50, Coal Meas.
- royana, see *Stenoschisma royanum*.
- ridleyana, Safford, 1869, Geo. of Tenn. Not defined.
- rudis, Hall, 1857, 10th Rep. N. Y. St. Mus. Nat. Hist., p. 75, and Pal. N. Y., vol. 3, p. 235, Low. Held. Gr.
- rugosa, Hall, 1852, (*Atrypa rugosa*), Pal. N. Y., vol. 2, p. 271, Niagara Gr.
- saffordi, Hall, 1860, Can. Nat. and Geo., vol. 5, p. 144, Low. Held. Gr.
- sagerana, Winchell, 1862, Proc. Acad. Nat. Sci., p. 407, Marshall Gr.

sappho, see *Stenoschisma sappho*.
semiplicata, Conrad, 1841, (*Atrypa semiplicata*.) Ann. Rep. N. Y., p. 56, and Pal. N. Y., vol. 3, p. 224, Low. Held. Gr.
septata, Hall, 1859, Pal. N. Y., vol. 3, p. 443, Oriskany sandstone.
sordida, Hall, 1847, (*Atrypa sordida*.) Pal. N. Y., vol. 1, p. 148, Trenton Gr.
speciosa, Hall, 1857, 10th Rep. N. Y. St. Mus. Nat. Hist., p. 81, and Pal. N. Y., vol. 3, p. 444, Oriskany sandstone.
stephani, see *Stenoschisma stephani*.
stricklandi, Sowerby, 1839, (*Terebratula stricklandi*.) Murch. Sil. Syst., p. 631, Niagara Gr.
subcircularis, Winchell, 1862, Proc. Acad. Nat. Sci., p. 408, Marshall Gr.
subcuboides. Not an American species.
subcuneata, Hall, 1856, Trans. Alb. Inst., vol. 4, p. 11, and Geo. Sur. Iowa, p. 658, Warsaw Gr.
subtrigona, see *Camarophoria subtrigona*.
subtrigonalis, Hall, 1847, (*Atrypa subtrigonalis*.) Pal. N. Y., vol. 1, p. 145, Trenton Gr.
sulcopicata, Hall, 1857, 10th Rep. N. Y. St. Mus. Nat. Hist., p. 76, and Pal. N. Y., vol. 3, p. 236, Low. Held. Gr.
tennesseensis, Roemer, 1860, Sil. Fauna West Tenn., p. 72, Niagara Gr.
tethys, see *Stenoschisma tethys*.
tetrptyx, Winchell, 1865, Proc. Acad. Nat. Sci., p. 120, Kinderhook Gr.
texana, Shumard, 1859, Trans. St. Louis Acad. Sci., vol. 1, p. 393, Permian Gr.
thalia, see *Stenoschisma billingsi*.
thera, Walcott, 1885, Monogr. U. S. Geo. Sur., vol. 8, p. 223, Subcarboniferous.
transversa, Hall, 1857, 10th Rep. N. Y. St. Mus. Nat. Hist., p. 74, and Pal. N. Y., vol. 3, p. 234, Low. Held. Gr.
tuta, S. A. Miller, 1881, Jour. Cin. Soc., Nat. Hist., vol. 4, p. 315, Burlington Gr.
unica, Winchell, 1865, Proc. Acad. Nat. Sci., p. 122, Marshall Gr.
unisulcata, see *Meristella unisulcata*.
uta, Marcou, 1858, (*Terebratula uta*.) Geo. N. Amer., p. 58, Coal Meas. This was subsequently described by Swallow as *R. osagensis*.
vellicata, Hall, 1857, 10th Rep. N. Y. St. Mus. Nat. Hist., p. 71, and Pal. N. Y., vol. 3, p. 230, Low. Held. Gr.
ventricosa, Hall, 1857, 10th Rep. N. Y. St. Mus. Nat. Hist., p. 78, and Pal. N. Y., vol. 3, p. 238, Low. Held. Gr.
venustula, Hall, 1867, Pal. N. Y., vol. 4, p. 346, Tully limestone. This was identified by Vanuxem, 1842, Geo. 3d Dist. N. Y., as *Atrypa cuboides* of Sowerby.
vicina, Billings, 1866, Catal. Sil. Foss. Antic., p. 44, Anticosti Gr.
warrenensis, Swallow, 1860, Trans. St. Louis Acad. Sci., vol. 1, p. 653, Ham. Gr.
wasatchensis, White, 1874, Rep. Invert. Foss., p. 19, and Geo. Sur. W. 100th Mer., vol. 4. p. 130, Carb. ;

whitiana, S. A. Miller, 1883, 2d Ed. Am. Pal. Foss., p. 297, Niagara Gr., from Waldron, Indiana. Proposed instead of *R. whitii*, Hall, 1863, Trans. Alb. Inst., vol. 4, p. 216, and also in 28th Rep. N. Y. St. Mus. Nat. Hist., p. 164, pl. 26, figs. 23-33, and again in the 11th Ann. Rep. Geol. and Nat. Hist. of Indiana, p. 307, pl. 26, figs. 23-33.
whitii, Winchell, 1862, Proc. Acad. Nat. Sci., p. 407, Marshall Gr.
whitii, Hall, see *R. whitiana*.
wilsoni, Sowerby, 1816, (*Terebratula wilsoni*.) Min. Conch., vol. 2. p. 38, Niagara Gr.
wortheni, see *Camarophoria wortheni*.
Rhynchospira, Hall, 1859, Pal. N. Y., vol. 3, syn. for *Retzia*.
deweyi, see *Retzia deweyi*.
evax, see *Retzia evax*.
formosa, see *Retzia formosa*.
lepida, see *Retzia lepida*.
nobilis, see *Trematospira nobilis*.
rectirostra, see *Trematospira rectirostra*.
subglobosa, see *Retzia subglobosa*.
sinuata, see *Retzia sinuata*.

RHYNCHOTRETA, Hall, 1879, 28th, Rep. N. Y. St. Mus. Nat. Hist., p. 166. [Ety. *rhynchos*, beak; *retros*, with a hole in it.] Distinguished from *Rhynchonella* by the straight, produced, perforated beak of the ventral valve and divided deltidium, and by the crura which rise near the dorsal beak, curve into the ventral cavity, and re-



FIG. 607.—
Rhynchotreta cuneata var. *americana*

curve to the dorsal side. Type *R. cuneata*.

cuneata var. *americana*, Hall, 1879, 28th Rep. N. Y. St. Mus. Nat. Hist., p. 167, Niagara Gr.

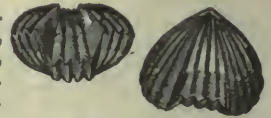


FIG. 608.—*Rhynchotreta quadruplicata*.

quadruplicata, S. A. Miller, 1875, (*Trematospira quadruplicata*.) Cin. Quar. Jour. Sci., vol. 2, p. 60, Trenton Gr.
Rhynobolus, Hall, 1871, 23d Rep. N. Y. St. Mus. Nat. Hist., p. 247, syn. for *Trimerella*.
galtensis, Hall, see *Trimerella galtensis*.
SCHIZAMBON, Walcott, 1885, Monogr. U. S. Geo. Sur., vol. 8, p. 69. [Ety. *schiza*, a cleft; *ambon*, the boss of a shield.] Inequivalve, ovate; valves inarticulate; no area or deltidium; foramen oblong; structure calcareo-corneous; two scars in each valve. Type *S. typicalis*.
typicalis, Walcott, 1885, Monogr. U. S. Geo. Sur., vol. 8, p. 70, Chazy Gr.
SCHIZOBOLUS, Ulrich, 1886, Cont. to Am. Pal., p. 25. [Ety. *schiza*, a cleft; *Obolus*, a genus.] Ventral valve with apex at the terminus of a notch in the posterior margin; two pair of adductor

scars separated by a ridge; dorsal valve with truncated posterior margin; two pairs of muscular scars separated by a septum. Type *S. truncatus*.

truncatus, Hall, 1862, (*Discina truncata*), 16th Rep. N. Y. St. Mus. Nat. Hist., p. 28, and Pal. N. Y., vol. 4, p. 23, Genesee slate to Chemung Gr.

SCHIZOCRANIA, Hall & Whitfield, 1875, Ohio Pal., vol. 2, p. 73. [Ety. *schiza*, a cleft;



FIG. 609. — Schizocrania filosa.

Crania, a genus.] Shell parasitic inequivalve, articulated, surface of the upper valve finely striated; interior with six muscular scars. Type *S. filosa*.

filosa, Hall, 1847, (*Orbicula* (?) *filosa*), Pal. N. Y., vol. 1, p. 99, Hud. Riv. and Utica Slate.

SIPHONOTRETA, DeVerneuil, 1845, Russia and Ural Mountains, vol. 2, p. 286. [Ety. *siphon*, siphon; *treto*, with a hole in it.]

Shell oblong oval, unarticulated; ventral valve most convex with a straight, thick, perforated, conical beak near the hinge-line; foramen opening on the back of the beak, and communicating with the interior of the shell by a cylindrical tube or siphon for the passage of the muscle of attachment; dorsal valve slightly convex, the hinge-line forming an arch which merges imperceptibly into the lateral margins; each valve has a wide, crescent-shaped cardinal edge, covered by horizontal lines



FIG. 610. — Siphonotreta unguiculata. a, Ventral valve; b, interior of same.

of growth; structure calcareo-corneous, with a distinctly punctured structure arranged in tubular layers; surface smooth, with numerous lines of growth and

slender hollow spines dilated at the base. Type *S. unguiculata*.

scotica, Davidson, 1877, Geol. Mag., new ser., vol. 4, p. 13, Utica slate.

SKENIDIUM, Hall, 1860, 13th Rep. N. Y. St. Mus. Nat. Hist., p. 70. [Ety. *skenidium*, a little tent.] Distinguished from *Orthis* by its large triangular area; the cardinal process extends as a median septum through the length of the shell, and may be simple or divided at the extremity. Type *S. insigne*.

devonicum, Walcott, 1885, Monogr. U. S. Geol. Sur., vol. 8, p. 116, Devonian.

halli, Safford, 1869, Geo. of Tenn. Not defined.

insigne, Hall, 1859, (*Orthis insignis*), Pal. N. Y., vol. 3, p. 173, Low. Held. Gr.

pyramidale, Hall, 1852, (*Orthis pyramidalis*), Pal. N. Y., vol. 2, p. 251, Niagara Gr.

SPIRIFERA, Sowerby, 1815, Min. Conch., vol. 2, p. 42, and Linnæan Trans., vol. 12, p. 514. [Ety. *spira*, spire; *fero*, to bear.]

Triangular semicircular, transversely elongate, subglobose or otherwise variable in form, with or without mesial fold and sinus; structure impunctate; surface smooth, striated or plicated; cardinal line straight, area in each valve; hinge articulated by short teeth and sockets; area of the ventral valve larger than the other, and divided by a triangular foramen more or less closed by a false deltidium; area of the dorsal valve divided in the middle by a fissure occupied by the cardinal muscular process; beak of ventral valve more prominent than that of the other; in the interior of the dorsal valve the spiral supports of the labial arms are attached by their crura to the hinge plates, some distance from which they are nearly or quite connected by a small process extending inward from each; the cardinal muscles seem to have been attached to the cardinal process, under and in front of which four scars of the adductor muscles occur; on each side of a mesial ridge in the ventral valve occur the scars of the adductors, and outside of these the scars of the cardinal muscles. Type *S. striata*.

acanthoptera, Conrad, 1842, (*Delthyris acanthoptera*), Jour. Acad. Nat. Sci., vol. 8, p. 264, Chemung Gr.

acuminata, Conrad, 1839, (*Delthyris acuminata*), Ann. Rep. N. Y., p. 65, and Pal. N. Y., vol. 4, p. 198, Up. Held. and Ham. Grs.

acuticostata, DeKoninck, 1843, Desc. Ann. Foss. Terr. Carb. Belg., p. 265, Subcarboniferous.

agelaia, Meek, 1873, Hayden's Geo. Sur. Terr., p. 470, and White's Cont. to Pal. No. 6, p. 135, Subcarboniferous.

alata, Castelnau, 1843, Syst. Sil., p. 42. Not recognized.

albapinensis, Hall & Whitfield, 1877, U. S. Geol. Expl. 40th parallel, vol. 4, p. 255, Waverly Gr.

aldrichi, Etheridge, 1878, Quar. Jour. Geo. Soc., vol. 34, p. 634, Devonian.

alta, Hall, 1867, Pal. N. Y., vol. 4, p. 248, Chemung Gr.

amara, Swallow, 1860, Trans. St. Louis Acad. Sci., vol. 1, p. 642, Waverly or Choteau Gr.

angusta, Hall, 1857, 10th Rep. N. Y. St. Mus. Nat. Hist., p. 164, and Pal. N. Y., vol. 4, p. 230, Ham. Gr.

annæ, Swallow, 1860, Trans. St. Louis Acad. Sci., vol. 1, p. 641, Ham. Gr.

annectans, Walcott, 1885, Monogr. U. S. Geol. Sur., vol. 8, p. 216, Subcarboniferous.

arata, syn. for *S. granulifera*.

archiaci, see *S. disjuncta*.

arctica, Haughton, 1857, Jour. Roy. Soc. Dub., vol. 1, p. 183, Devonian.

arctisegmenta, Hall, 1857, 10th Rep. N. Y. St. Mus. Nat. Hist., p. 131, and Pal. N. Y., vol. 4, p. 208, Up. Held. Gr.

- arenosa, Conrad, 1839, (Delthyris arenosa,) Ann. Rep. N. Y., p. 65, and Pal. N. Y., vol. 3, p. 425, Oriskany sandstone.
- argentaria, Meek, 1877, U. S. Geo. Sur. 40th Parallel, p. 42, Devonian.
- arrecta, Hall, 1859, Pal. N. Y., vol. 3, p. 422, Oriskany sandstone.
- aspera, Hall, 1858, Geo. Rep. Iowa, p. 508, Ham. Gr.
- asperata, Ringueberg, 1886, Bull. Buf. Soc. Nat. Sci., vol. 5, p. 16, Niagara Gr.
- atwaterana, S. A. Miller, 1878, Proc. Davenport Acad. Sci., vol. 2, p. 221, Ham. Gr. Proposed instead of *S. pennata*, Owen, which was preoccupied.
- audacula, Conrad, (Delthyris audacula,) 1842, Jour. Acad. Nat. Sci., vol. 8, p. 262, Ham. Gr.
- belphegor, Clarke, 1885, Bull. U. S. Geo. Sur., No. 16, p. 30, Genesee shales.
- bialveata, Conrad, (Delthyris bialveata,) 1842, Jour. Acad. Nat. Sci., vol. 8, p. 261, Niagara Gr. Probably a syn. for *S. radiata*.
- bicostata, Vanuxem, 1842, (Orthis bicostatus,) Geol. Rep. 3d Dist. N. Y., p. 91, and Pal. N. Y., vol. 2, p. 263, Niagara Gr.
- bicostata var. petila, Hall, 1879, Desc. New Spec. Foss., p. 15, and 11th Rep. Geo. and Nat. Hist. Ind., p. 297, Niagara Gr.
- bidosalis, Winchell, 1866, Rep. Low. Penin. Mich., p. 93, Ham. Gr.
- bifurcata, Hall, 1858, Trans. Alb. Inst., vol. 4, p. 8, and Bull. Am. Mus. Nat. Hist., p. 47, Warsaw Gr.
- billingsana, n. sp., Upper Devonian Gaspe limestone, No. 8. Proposed instead of *S. superba*, Billings, 1874, Pal. Foss., vol. 2, p. 45, which name was preoccupied.
- biloba, Linnæus, 1768, (Anomia biloba,) Syst. Nat., p. 115, and Pal. N. Y., vol. 2, p. 260, Niagara Gr.
- bimesialis, Hall, 1858, Geo. Rep. Iowa, vol. 1, pt. 2, p. 507, Ham. Gr.
- biplicata, Hall, 1858, Geo. Rep. Iowa, vol. 1, pt. 2, p. 519, Kinderhook Gr.
- boonensis, Swallow, 1860, Trans. St. Louis Acad. Sci., vol. 1, p. 646, Low Coal Meas.
- brachynota, Hall, 1843, (Delthyris brachynota,) Geo. 4th Dist. N. Y., p. 71, Clinton Gr. Not well defined.
- calcarata, syn. for *S. disjuncta*.
- camerata, Morton, 1836, Am. Jour. Sci., vol. 29, p. 150, Coal Meas.
- camerata var. kansasensis, Swallow, 1866, Trans. St. Louis Acad. Sci., vol. 2, p. 409, Coal Meas.
- camerata var. percrassa, Swallow, 1866, Trans. St. Louis Acad. Sci., vol. 2, p. 409, Coal Meas. This name was preoccupied as a species.
- capax, Hall, 1858, Geo. Rep. Iowa, vol. 1, pt. 2, p. 520, syn. for *S. parryana*.
- carteri, Hall, 1857, 10th Rep. N. Y. St. Mus. Nat. Hist., p. 170, Waverly Gr.
- cedarensis, Owen, 1852, Geo. Sur. Wis., Iowa, and Minn., p. 585, Ham. Gr.
- centronota, Winchell, 1865, Proc. Acad. Nat. Sci., p. 118, and Geo. Sur. W. 100th Mer., vol. 4, p. 87, Cuyahoga Shale.
- clara, Swallow, 1853, Trans. St. Louis Acad. Sci., vol. 2, p. 86, Kaskaskia Gr.
- clavatula, McChesney, 1861, Desc. New Pal. Foss., p. 84, Burlington Gr. Not recognized.
- clintoni, syn. for *S. granulifera*.
- clio, syn. for *S. ziczac*.
- compacta, Meek, 1868, Trans. Chi. Acad. Sci., p. 102, Ham. Gr.
- concinna, Hall, 1857, 10th Rep. N. Y. St. Mus. Nat. Hist., p. 60, Low. Held. Gr.
- congesta, syn. for *S. granulifera*.
- conradana, S. A. Miller, 1883, 2d Ed. Am. Pal. Foss., p. 298, Oriskany, Up. Held. and Ham. Grs. Proposed instead of *S. fimbriata* of Conrad in Jour. Acad. Nat. Sci., vol. 8, p. 263, and Pal. N. Y., vol. 4, p. 214, which was preoccupied.
- consobrina, D'Orbigny, 1850, Prodr. d. Paléont., t. 1, p. 98, Ham. Gr. Proposed instead of *S. ziczac*, Hall, 1843, Geo. Rep. 4th Dist. N. Y., p. 200, which was preoccupied by Roemer.
- consors, Winchell, 1866, Rep. Low. Peninsula Mich., p. 93, Ham. Gr.
- cooperensis, Swallow, 1860, Trans. St. Louis Acad. Sci., vol. 1, p. 643, Waverly or Choteau Gr.
- corticoza, Hall, 1857, 10th Rep. N. Y. St. Mus. Nat. Hist., p. 160, Ham. Gr.
- costalis, Castelnau, 1843, Syst. Sil., p. 41. Not recognized.
- crenistriata, see *Streptorhynchus crenistriatum*.
- crispa, Hisinger, 1826, (Terebratula crispa,) Act. Acad. Sci., Holm., t. 7, fig. 4, and Pal. N. Y., vol. 2, p. 262, Niagara Gr.
- crispa var. simplex, Hall, 1879, 28th Rep. N. Y. St. Mus. Nat. Hist., p. 157, Niagara Gr.
- cumberlandiæ, Hall, 1857, 10th Rep. N. Y. St. Mus. Nat. Hist., p. 63, and Pal. N. Y., vol. 3, p. 421, Oriskany sandstone.
- cuspidatiformis, n. sp., Keokuk Gr. Proposed instead of *S. subcuspidata*, Hall, 1858, Geo. Sur. Iowa, p. 646, p. 20, fig. 5 a, b, which name was preoccupied.
- cycloptera, Hall, 1857, 10th Rep. N. Y. St. Mus. Nat. Hist., p. 58, and Pal. N. Y., vol. 3, p. 199, Low. Held. Gr.
- cyrtiniformis, Hall & Whitfield, 1873, 23d Rep. N. Y. St. Mus. Nat. Hist., p. 238, Chemung Gr.
- decemplicata, Hall, 1843, (Delthyris decemplicata,) Geo. Rep. 4th Dist. N. Y., p. 106, Niagara Gr.
- desiderata, Walcott, 1885, Monogr. U. S. Geo. Sur., vol. 8, p. 217, Subcarb.
- disjuncta, Sowerby, 1840, Trans. Geo. Soc., 2d ser., vol. 5, p. 704, and Pal. N. Y., vol. 4, p. 243, Chemung Gr.
- disparilis, Hall, 1857, 10th Rep. N. Y. St. Mus. Nat. Hist., p. 134, and Pal. N. Y., vol. 4, p. 204, Up. Held Gr.

distans, syn. for *S. disjuncta*.
divaricata, Hall, 1857, 10th Rep. N. Y. St. Mus. Nat. Hist., p. 133, and Pal. N. Y., vol. 4, p. 213, Cornif. and Ham. Grs.
dubia, see *Pentamerella dubia*.
duodenaria, Hall, 1843, (*Delthyris duodenaria*.) Geol. 4th Dist. N. Y., p. 171, and Pal. N. Y., vol. 4, p. 189, Schoharie grit and Cornif. Gr.
duplicata, Conrad, 1842, (*Delthyris duplicata*.) Jour. Acad. Nat. Sci., vol. 8, p. 261, Ham. Gr.
eatoni, see *S. medialis* var. *eatoni*.
engelmanni, Meek, 1860, Proc. Acad. Nat. Sci., p. 308, and Geo. Sur. Ill., vol. 3, p. 398, Oriskany sandstone.
eudora, Hall, 1861, Rep. of Progr. Wis. Sur., p. 25, Niagara Gr.
euruteines, Owen, 1844, (*Delthyris euruteines*, Report on Min. Lands, p. 74, and Pal. N. Y., vol. 4, p. 209, Up. Held. Gr.
euruteines var. *fornacula* see *S. fornacula*.
exporrecta, see *Cyrtia exporrecta*.
exporrecta var. *arrecta*, see *Cyrtia exporrecta* var. *arrecta*.
extensa, syn. for *S. disjuncta*.
extenuata, Hall, 1858, Geo. Rep. Iowa, p. 520, Kinderhook Gr.
fasciger, Keyserling in Owen's report, see *Spirifera camerata*.
fastigata, Morton, 1836, Am. Jour. Sci. and Arts, vol. 29, p. 149, Coal Meas.
fastigata, Meek & Worthen, 1870, Proc. Acad. Nat. Sci., p. 36. The name was preoccupied by Morton. See *S. mortonana*.
filicosta, Winchell, 1866, Rep. Low. Peninsula Mich., p. 94, Ham. Gr.
fimbriata, Morton, 1836, Am. Jour. Sci. and Arts, vol. 29, p. 149, Coal Meas.
fimbriata, Conrad. The name was preoccupied. See *S. conradana*.
fischeri, Castelnau, 1843, Syst. Sil., p. 42. Not recognized.
forbesi, Norwood & Pratten, 1854, Jour. Acad. Nat. Sci., vol. 3, p. 73, Burlington Gr.
formosa, Hall, 1857, 10th Rep. N. Y. Mus. Nat. Hist., p. 154, and Pal. N. Y., vol. 4, p. 220, Ham. Gr.
fornacula, Hall, 1857, 10th Rep. N. Y. Mus. Nat. Hist., p. 154, Ham. Gr.
fornax, Hall, 1857, 10th Rep. N. Y. Mus. Nat. Hist., p. 155, Ham. Gr.
franklini, Meek, 1868, Trans. Chi. Acad. Sci., p. 107, Ham. Gr.
fultonensis, Worthen, 1873, Geol. Rep. Ill., vol. 5, p. 572, Low. Coal Meas.
gaspensis, Billings, 1874, Pal. Foss., vol. 2, p. 74, Devonian.
gibbosa, Hall, 1861, Rep. of Progr. Wis. Sur., p. 25, Niagara Gr.
gigantea, syn. for *S. disjuncta*.
glabra, Martin, 1809, (*Anomites glabra*.) Petrif. Derb., tab. 28, figs. 9 and 10, Subcarboniferous.
glabra var. *contracta*, Meek & Worthen, 1861, Proc. Acad. Nat. Sci., p. 143, and Geo. Sur. Ill., vol. 2, p. 298, Kaskaskia Gr.

glabra var. *nevadensis*, Walcott, 1885, Monog. U. S. Geo. Sur., vol. 8, p. 139, Up. Devonian.
glanscerasi, White, 1862, Proc. Bost. Soc. Nat. Hist., vol. 9, p. 8, Ham. Gr.
grandeva, syn. for *S. disjuncta*.
granulifera, Hall, 1843, (*Delthyris granulifera*.) Geol. 4th Dist. N. Y. p. 207, and Pal. N. Y., vol. 4, p. 223, Ham. Gr.
granulosa, Conrad, 1839, (*Delthyris granulosa*.) Ann. Rep. N. Y., p. 65, Low. Held. Gr.

FIG. 611.—*Spirifera gregaria*.

gregaria, Clapp, 1857, 10th Rep. N. Y. Mus. Nat. Hist., p. 127, and Pal. N. Y., vol. 4, p. 195, Up. Held. Gr.
grieri, Hall, 1857, 10th Rep. N. Y. Mus. Nat. Hist., p. 127, and Pal. N. Y., vol. 4, p. 194, Schoharie grit and Up. Held. Gr.
grimesi, Hall, 1858, Geo. Rep. of Iowa, p. 604, Burlington Gr.
guadalupensis, Shumard, 1859, Trans. St. Louis Acad. Sci., vol. 1, p. 391, Permian Gr.
hannibalensis, Swallow, 1860, Trans. St. Louis Acad. Sci., vol. 1, p. 647, Waverly or Choteau Gr.
hemicycla, Meek & Worthen, 1868, Geo. Sur. Ill., vol. 3, p. 399, Oriskany sandstone.
hemiplicata, see *Syntrielasma hemiplicatum*.
heteroclitus, syn. for *S. granulifera*.
hirtus, White & Whitfield, 1862, Proc. Bost. Soc. Nat. Hist., vol. 8, p. 293, Kinderhook Gr.
hungerfordi, Hall, 1858, Geo. Rep. Iowa, vol. 1, pt. 2, p. 501, Ham. Gr.
huronensis, Winchell, 1862, Proc. Acad. Nat. Sci., p. 405, Portage Gr.
huronensis, Castelnau, 1843, Syst. Sil., p. 41. Not recognized.
imbrex, Hall, 1858, Geo. Rep. Iowa, p. 601, Burlington Gr.
inaequivalvis, Castelnau, 1843, Syst. Sil., p. 40. Not recognized.
incerta, Hall, 1858, Geo. Rep. Iowa, p. 602, Burlington Gr.
inconstans, syn. for *Spirifera racinensis*.
increbescens, Hall, 1858, Geo. Rep. Iowa, p. 706, Kaskaskia Gr.
increbescens var. *americana*, Swallow, 1866, Trans. St. Louis Acad. Sci., vol. 2, p. 410, Kaskaskia Gr.
increbescens var. *transversalis*, Hall, 1858, Geol. Rep. Iowa, p. 708, Kaskaskia Gr.
inaequicostata, Owen, 1852, Geo. Rep. Wis., Iowa, and Min., p. 586, Carb.
inornata, syn. for *S. disjuncta*.
insolita, Winchell, 1862, Proc. Acad. Nat. Sci., p. 405, Portage Gr.

- intermedia*, Hall, 1859, Pal. N. Y., vol. 3, p. 424, Oriskany sandstone. This name was preoccupied by Brongniart in 1829.
- inutilis*, Hall, 1858, Geo. Rep. Iowa, vol. 1, pt. 2, p. 505, Ham. Gr.
- iowensis*, Owen, 1852, Geo. Sur. Wis., Iowa, and Min., p. 585, Ham. Gr.
- kelloggi*, Swallow, 1863, Trans. St. Louis Acad. Sci., vol. 2, p. 86, Keokuk Gr.
- kennicotti*, Meek, 1868, Trans. Chi. Acad. Sci., p. 101, Ham. Gr.
- kentuckensis*, see *Spiriferina kentuckiensis*.
- kentuckensis* var. *propatula*, see *Spiriferina kentuckiensis* var. *propatula*.
- keokuk*, Hall, 1858, Geo. Rep. Iowa, p. 642, Keokuk Gr.
- keokuk* var. *shelbyensis*, Swallow, 1866, Trans. St. Louis Acad. Sci., vol. 2, p. 410, Keokuk Gr.
- laevigata*, Swallow, 1853, Trans. St. Louis Acad. Sci., vol. 2, p. 86, Keokuk Gr.
- laevis*, Hall, 1843, (*Delthyris laevis*.) Geol. 4th Dist. N. Y., p. 345, and Pal. N. Y., vol. 4, p. 239, Portage Gr.
- lamellosa*, see *Athyris lamellosa*.
- laminosus*, McCoy, as identified by Geinitz, is *Spiriferina kentuckiensis*.
- lateralis*, Hall, 1858, Geo. Rep. Iowa, p. 661, Warsaw Gr.
- laticus*, Swallow, 1863, Trans. St. Louis Acad. Sci., vol. 2, p. 86, Waverly or Choteau Gr.
- leidy*, Norwood & Pratten, 1855, Jour. Acad. Nat. Sci., 2d series, vol. 3, p. 72, Kaskaskia Gr.
- leidy* var. *chesterensis*, Swallow, 1866, Trans. St. Louis Acad. Sci., vol. 2, p. 409, Kaskaskia Gr.
- leidy* var. *merrimacensis*, Swallow, 1866, Trans. St. Louis Acad. Sci., vol. 2, p. 410, Warsaw Gr.
- ligus*, Owen, 1852, Rep. Geo. Sur. Wis., Iowa, and Minn., p. 585, Ham. Gr.
- lineatoides*, Swallow, 1860, Trans. St. Louis Acad. Sci., vol. 1, p. 645, Burlington Gr.
- lineata*, Martin, 1809, (*Conchiliolithus Anomites lineatus*.) Petrif. Derb., tab. 36, fig. 3, and 13th Rep. Geo. Sur. Ind., p. 133, Coal Meas.
- lineata* var. *striato-lineata*, Swallow, 1866, Trans. St. Louis Acad. Sci., vol. 2, p. 408, Coal Meas.
- littoni*, Swallow, 1860, Trans. St. Louis Acad. Sci., vol. 1, p. 646, St. Louis Gr.
- logani*, Hall, 1858, Geo. Rep. Iowa, p. 647, Keokuk Gr.
- lonsdalei*, syn. for *S. disjuncta*.
- macra*, Hall, 1857, 10th Rep. N. Y. Mus. Nat. Hist., p. 134, and Pal. N. Y., vol. 4, p. 190, Schoharie grit and Up. Held. Gr.
- macra*, Meek, 1868. This name was preoccupied. See *S. strigosa*.
- macronota*, Hall, 1843, (*Delthyris macronota*.) Geo. 4th Dist. N. Y., p. 206, and Pal. N. Y., vol. 4, p. 231, Ham. Gr.
- macropleura*, Conrad, 1840, (*Delthyris macropleura*.) Ann. Rep. N. Y., p. 217, and Pal. N. Y., vol. 3, p. 202, Low. Held. Gr.
- macropleura*, Castelnau, 1843, Syst. Sil., p. 41. The name was preoccupied.
- macroptera*, as identified by d'Archiac & Verneuil, is *S. pennata*.
- macrothyris*, Hall, 1857, 10th Rep. N. Y. Mus. Nat. Hist., p. 132, and Pal. N. Y., vol. 4, p. 202, Up. Held. Gr.
- maia*, Billings, 1860, (*Athyris maia*.) Can. Jour. Ind. Sci. and Arts, vol. 5, p. 276, Up. Held. Gr.
- manni*, Hall, 1857, 10th Rep. N. Y. Mus. Nat. Hist., p. 128, and Pal. N. Y., vol. 4, p. 211, Up. Held. Gr.
- marcyi*, Hall, 1857, 10th Rep. N. Y. Mus. Nat. Hist., p. 158, and Pal., N. Y., vol. 4, p. 226, Ham. Gr.
- marionensis*, Shumard, 1855, Geo. Rep. Mo., p. 203, Waverly or Choteau Gr.
- medialis*, Hall, 1843, (*Delthyris medialis*.) Geo. 4th Dist. N. Y., p. 208, and Pal. N. Y., vol. 4, p. 207, Ham. Gr.
- medialis* var. *eatoni*, Hall, 1857, (*Spirifer eatoni*.) 10th Rep. N. Y. Mus. Nat. Hist., p. 157, and Pal. N. Y., vol. 4, p. 229, Ham. Gr.
- meeki*, Swallow, 1860, Trans., St. Louis Acad. Sci., vol. 1, p. 645, Burlington Gr.
- meristoidea*, Meek, 1868, Trans. Chi. Acad. Sci., p. 106, Ham. Gr.
- mesacostalis*, Hall, 1843, (*Delthyris mesacostalis* and *D. acuminata*.) Geo. 4th Dist. N. Y., p. 269, and Pal. N. Y., vol. 4, p. 240, Chemung Gr.
- mesastrialis*, Hall, 1843, (*Delthyris mesastrialis*.) Geo. 4th Dist. N. Y., p. 269, and Pal. N. Y., vol. 4, p. 242, Ham. and Chemung Gr.
- meta*, Hall, 1867, 20th Rep. N. Y. Mus. Nat. Hist., p. 380, Niagara Gr.
- meusebachianus*, syn. for *Spirifera camerata*.
- mexicana*, Shumard, 1858, Trans. St. Louis Acad. Sci., vol. 1, p. 292, Permian Gr.
- missouriensis*, Swallow, 1860, Trans. St. Louis Acad. Sci., vol. 1, p. 643, Waverly or Choteau Gr.
- modesta*, Hall, 1857, 10th Rep. N. Y. Mus. Nat. Hist., p. 61, and Pal. N. Y., vol. 3, p. 203, Low Held. Gr.
- mortonana*, S. A. Miller, 1883, 2d Ed., Am. p. 298, Pal. Foss. Keokuk Gr. Proposed instead of *S. fastigata* of Meek and Worthen, 1870, in Proc. Acad. Nat. Sci., p. 36, and afterward in Geo. Sur. Ill., vol. 6, p. 521, pl. 30, fig. 3, from Crawfordsville, Indiana.
- mucronata*, Conrad, syn. for *S. pennata*.
- multicostata*, Castelnau, 1843, Syst. Sil., p. 42. Not recognized.
- multigranosa*, Worthen, (in press,) Geo. Sur. Ill., vol. 8, p. 105, Coal Meas.
- multistriata*, see *Trematospira multistriata*.
- murchisoni*, Castelnau, 1843, Syst. Sil., p. 41. Not recognized.
- mysticensis*, Meek, 1873, Hayden's Geo. Sur. Terr. 6th Rep., p. 466. Not satisfactorily defined.
- neglecta*, Hall, 1858, Geo. Rep. Iowa, p. 642, Keokuk Gr.

newberryi, Hall, 1883, Rep. St. Geol. pl. 56, fig. 9, 10, Waverly Gr.
 niagarensis, Conrad, 1842, Jour. Acad. Nat. Sci., vol. 8, p. 261, and Pal. N. Y., vol. 2, p. 264, Niagara Gr.
 niagarensis var. oligoptycha, Roemer, 1860, Sil. Fauna West Tenn., p. 68, Niagara Gr.
 nictavensis, Dawson, 1868, Acad. Geol., p. 499, Devonian.
 norwoodana, Hall, 1858, Trans. Alb. Inst., vol. 4, p. 7, and Bull. Am. Mus. Nat. Hist., p. 48, Warsaw Gr.
 norwoodi, Meek, 1860, Proc. Acad. Nat. Sci., vol. 12, p. 308, Devonian.
 novamexicana, S. A. Miller, 1881, Jour. Cin. Soc. Nat. Hist., vol. 4, p. 314, Burlington Gr.
 nympha, Billings, 1863, Proc. Port. Soc. Nat. Hist., vol. 1, p. 116, Low. Held. Gr.
 octocostata, Hall, 1857, 10th Rep. N. Y. Mus. Nat. Hist., p. 62, and Pal. N. Y., vol. 3, p. 205, Low. Held. Gr.
 optima, Hall, 1858, Geo. Rep. Iowa, p. 711, syn. for *S. rockymontana*.
 orestes, Hall & Whitfield, 1873, 23d Rep. N. Y. Mus. Nat. Hist., p. 237, Chemung Gr.
 oregonensis, Shumard, 1863, Trans. St. Louis Acad. Sci., vol. 2, p. 108, Coal Meas.
 osagensis, Swallow, 1860, Trans. St. Louis Acad. Sci., vol. 1, p. 641, Waverly or Choteau Gr.
 oweni, Hall, 1857, 10th Rep. N. Y. Mus. Nat. Hist., p. 129, Up. Held. Gr.
 pachyptera, Goldfuss, as identified by Conrad in 1839, (*Delthyris pachyptera*). Not American.
 parryana, Hall, 1858, Geo. Rep. Iowa, vol. 1, pt. 2, p. 509, Ham. Gr.
 peculiaris, Shumard, 1855, Geo. Rep. Mo., p. 202, Waverly or Choteau Gr.
 pennata, Atwater, 1820, (*Terebratula pennata*) Am. Jour. Sci. and Arts, vol. 2, p. 242, Ham. Gr.



FIG. 612.—*Spirifera pennata*.

pennata, Owen. The name was preoccupied, see *S. atwaterana*.
percrassa, McCoy, 1855, Brit. Pal. Rocks., p. 194, Sil. Not satisfactorily identified in America.
perextensa, Meek & Worthen, 1868, Geo. Sur. Ill., vol. 3, p. 414, Ham. Gr.
 (?) *perforata*, see *Trematospira perforata*.
perlamellosa, Hall, 1857, 10th Rep. N. Y. Mus. Nat. Hist., p. 57, and Pal. N. Y., vol. 3, p. 200, Low. Held. Gr.
perpleza, McChesney, 1860, New Pal. Foss., syn. for *S. lineata*.

pertenuis, Hall, 1857, 10th Rep. N. Y. Mus. Nat. Hist., p. 163, Ham. Gr.
pharovicina, Winchell, 1862, Proc. Acad. Nat. Sci., p. 405, Portage Gr.
pinonensis, Meek, 1870, Proc. Acad. Nat. Sci., p. 60, and Expl. 40th Parallel, vol. 4, p. 45, Up. Held. Gr.
planoconvexa, Shumard, 1855, Geo. Rep. Mo., p. 202, Coal Meas.
plena, Hall, 1858, Geo. Rep. Iowa, p. 603, Burlington Gr.
plicata, Vanuxem, 1843, see *S. vanuxemi*.
pluto, Clarke, 1885, Bull. U. S. Geo. Sur., No. 16, p. 31, Genesee shales.
præmatura, Hall, 1867, Pal. N. Y., vol. 4, p. 250, Chemung Gr.
prolata, Vanuxem, 1842, (*Delthyris prolata*.) Geo. Rep. N. Y., p. 181, Chemung Gr.
propinqua, Hall, 1858, Geo. Rep. Iowa, p. 647, Keokuk Gr.
prora, Conrad, 1842, (*Delthyris prora*.) Jour. Acad. Nat. Sci., vol. 8, p. 263, Ham. Gr.
protensa, syn. for *S. disjuncta*.
pseudolineata, Hall, 1858, Geo. Rep. Iowa, p. 645, Keokuk Gr.
pulchra, Meek, 1860, Proc. Acad. Nat. Sci., p. 310, and Simpson's Gt. Basin of Utah, p. 352, Coal Meas.
pyramidalis, see *Cyrtina pyramidalis*.
pyxidata, Hall, 1859, Pal. N. Y., vol. 3, p. 428, Oriskany sandstone.
racinensis, McChesney, 1860, Pal. Foss., p. 84, Niagara Gr.
radiata, Sowerby, 1839, Murch. Sil. Syst., p. 637, and Pal. N. Y., vol. 2, pp. 66, 265, Niagara Gr.
rariocosta, Conrad, 1842, (*Delthyris rariocosta*.) Jour. Acad. Nat. Sci., vol. 8, p. 262, and Pal. N. Y., vol. 4, p. 192, Schoharie grit and Up. Held. Gr.
resupinata, as identified by d'Archiac & Verneuil. Not American.
richardsoni, Meek, 1868, Trans. Chi. Acad. Sci., p. 104, Ham. Gr.
rockymontana, Marcou, 1858, Geo. N. Amer., p. 50, Coal Meas.
rostellata, Hall, 1858, Geo. Rep. Iowa, p. 641, Keokuk Gr.
rostellum, Hall & Whitfield, 1872, 24th Rep. N. Y. Mus. Nat. Hist., p. 182, Niagara Gr.
rostrata, Morton, 1836, Am. Jour. Sci. and Arts, vol. 29, p. 149, Coal Meas.
rugicosta, Hall, 1860, Can. Nat. Geo., vol. 5, p. 144, Up. Sil.
rugatina, Conrad, 1842, (*Delthyris rugatina*.) Jour. Acad. Nat. Sci., vol. 8, p. 261, Niagara Gr.
saffordi, Hall, 1859, Pal. N. Y., vol. 3, p. 203, Low. Held. Gr.
scobina, Meek, 1860, Proc. Acad. Nat. Sci., p. 310, and Simpson's Gt. Basin of Utah, p. 351, Coal Meas.
sculptilis, Hall, 1843, (*Delthyris sculptilis*.) Geo. Rep. 4th Dist. N. Y., p. 202, and Pal. N. Y., vol. 4, p. 221, Ham. Gr.

segmenta, Hall, 1857, 10th Rep. N. Y. Mus. Nat. Hist., p. 131, and Pal. N. Y., vol. 4, p. 207, Up. Held. Gr.
 semiplicata, Hall, 1860, 13th Rep. N. Y. Mus. Nat. Hist., p. 111, Kinderhook Gr.
 setigera, Hall, 1858, Geo. Rep. Iowa, p. 705, Kaskaskia Gr.
 sheppardi, Castelnau, 1843, Syst. Sil., p. 42. Not recognized, but probably a variety of *Orthis lynx*.
 sillana, Winchell, 1865, Proc. Acad. Nat. Sci., p. 119, Cuyahoga shale.
 similior, see *Pentamerus similior*.
 solidirostris, White, 1860, Bost. Jour. Nat. Hist., vol. 7, p. 232, Kinderhook Gr.
 sowerbyi, Castelnau, 1843, Syst. Sil., p. 43. Not recognized.
 spinosa, see *Spiriferina spinosa*.
 staminea, Hall, 1843, Geo. Rep. 4th Dist. N. Y., p. 105, Niagara Gr.
 striatiformis, Meek, 1875, Ohio Pal., vol. 2, p. 289, Waverly Gr.

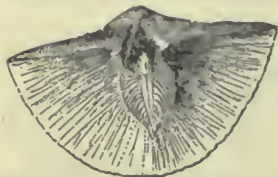


FIG. 613.—*Spirifera striata*. Interior of ventral valve.

North America, p. 49, Subcarboniferous.

substriatulus, as identified by d'Archiac & Verneuil. Not American.

strigosa, Meek, 1860, Proc. Acad. Nat. Sci., p. 309, and Simpson's Rep. Gt. Basin of Utah, p. 347, Devonian. Proposed instead of *S. macra*, Meek, which was preoccupied.

subæqualis, Hall, 1858, Geo. Rep. Iowa, p. 663, Warsaw Gr.
subattenuata, Hall, 1858, Geo. Rep., Iowa, index, p. 3, Ham. Gr.
subcardiformis, Hall, 1858, Geo. Rep. Iowa, p. 660, Warsaw Gr.

subcuspidata, Hall, 1858, Geo. Rep. Iowa, p. 646, Keokuk Gr. Preoccupied by Schnur in 1831. See *S. cuspidatiformis*.
subdecussata, Whiteaves, 1887, Cont. to Can. Pal., vol. 1, p. 114, Ham. Gr.

subelliptica, McChesney, 1860, New Pal. Foss. Not recognized, Coal Meas.

sublineata, Meek, 1868, Trans. Chi. Acad. Sci., p. 103, Ham. Gr.

submucronata, Hall, 1857, 10th Rep. N. Y. Mus. Nat. Hist., p. 62, and Pal. N. Y., vol. 3, p. 419, Oriskany sandstone.

striata, Martin, 1809, (Anomites striatus,) Petrif. Derb., tab. 23, Carb. *striata* var. *triplicata*, Marcou, 1858, Geol.



FIG. 614.—*Spirifera striata*. Interior of dorsal valve.

tenuicostata, Hall, 1858, Geo. Rep. Iowa, p. 662, Warsaw Gr.
tenuimarginata, Hall, 1858, Geo. Rep. Iowa, p. 641, Keokuk Gr.
tenuis, Hall, 1857, 10th Rep. N. Y. Mus. Nat. Hist., p. 162, Ham. Gr.
tenuistriata, Hall, 1859, Pal. N. Y., vol. 3, p. 204, Low. Held. Gr.
tenuistriata, Shaler, 1865. The name was preoccupied.
texana, Meek, 1871, Proc. Acad. Nat. Sci., p. 179, Coal Meas.
texta, Hall, 1857, 10th Rep. N. Y. Mus. Nat. Hist., p. 169, Waverly Gr.
translata, Swallow, 1863, Trans. St. Louis Acad. Sci., vol. 2, p. 85, Kaskaskia Gr.
transversa, McChesney, 1860, New Pal. Foss., Kaskaskia Gr. Not recognized.
tribulis, Hall, 1859, Pal. N. Y., vol. 3, p. 420, Oriskany sandstone.
triplicata, Hall, syn. for *Spirifera camerata*.
troosti, Castelnau, 1843, Syst. Sil., p. 41. Not recognized.
tulla, Hall, 1867, Pal. N. Y., vol. 4, p. 218, Ham. Gr.
undulata, Vanuxem, 1843, (Delthyris undulatus.) Geo. 3d Dist. N. Y., p. 132, Onondaga Gr. The name was preoccupied.
unica, Hall, 1867, Pal. N. Y., vol. 4, p. 203, Cornif. Gr.
utahensis, Meek, 1860, syn. for *S. norwoodi*.

submucronata, Hall, 1858, Geo. Rep. Iowa, vol. 1, pt. 2, Ham. Gr. This name was preoccupied. See *S. subattenuata*.

suborbicularis, Hall, 1858, Geo. Rep. Iowa, p. 644, Keokuk Gr.

subrotundata, Hall, 1858, Geo. Rep. Iowa, vol. 1, pt. 2, p. 521, Kinderhook Gr.

subsulcata, Hall, 1860, Can. Nat. and Geol., vol. 5, Up. Sil. This name was preoccupied by Dalman in 1828.

subumbonata, see *Martinia subumbonata*.
subundifera, Meek & Worthen, 1868, Geo. Sur. Ill., vol. 3, p. 434, Ham. Gr.

subvaricosa, Hall & Whitfield, 1873, 23d Rep. N. Y. Mus. Nat. Hist., p. 237, Up. Held. Gr.

subventricosa, McChesney, syn. for *S. rockymontana*.

sulcata, Hisinger, 1831, (Delthyris sulcatus.) Anteckn. Physik. Och. Geognosi., p. 119, Pal. N. Y., vol. 2, p. 261, Niagara Gr.

sulcifera, Shumard, 1858, Trans. St. Louis Acad. Sci., vol. 1, p. 293, Permian Gr.

superba, Billings, 1874, Pal. Foss., vol. 2, p. 45, Devonian. The name was preoccupied by Eichwald in 1842. See *S. billingsana*.

taneyensis, Swallow, 1860, Trans. St. Louis Acad. Sci., vol. 1, p. 645, Kinderhook Gr.

temeraria, S. A. Miller, 1881, Jour. Cin. Soc. Nat. Hist., vol. 4, p. 314, Burlington Gr.

tenuicostata, Hall, 1858, Geo. Rep. Iowa, p. 662, Warsaw Gr.

tenuimarginata, Hall, 1858, Geo. Rep. Iowa, p. 641, Keokuk Gr.

tenuis, Hall, 1857, 10th Rep. N. Y. Mus. Nat. Hist., p. 162, Ham. Gr.

tenuistriata, Hall, 1859, Pal. N. Y., vol. 3, p. 204, Low. Held. Gr.

tenuistriata, Shaler, 1865. The name was preoccupied.

texana, Meek, 1871, Proc. Acad. Nat. Sci., p. 179, Coal Meas.

texta, Hall, 1857, 10th Rep. N. Y. Mus. Nat. Hist., p. 169, Waverly Gr.

translata, Swallow, 1863, Trans. St. Louis Acad. Sci., vol. 2, p. 85, Kaskaskia Gr.

transversa, McChesney, 1860, New Pal. Foss., Kaskaskia Gr. Not recognized.

tribulis, Hall, 1859, Pal. N. Y., vol. 3, p. 420, Oriskany sandstone.

triplicata, Hall, syn. for *Spirifera camerata*.

troosti, Castelnau, 1843, Syst. Sil., p. 41. Not recognized.

tulla, Hall, 1867, Pal. N. Y., vol. 4, p. 218, Ham. Gr.

undulata, Vanuxem, 1843, (Delthyris undulatus.) Geo. 3d Dist. N. Y., p. 132, Onondaga Gr. The name was preoccupied.

unica, Hall, 1867, Pal. N. Y., vol. 4, p. 203, Cornif. Gr.

utahensis, Meek, 1860, syn. for *S. norwoodi*.

- vanuxemi, Hall, 1859, Pal. N. Y., vol. 3, p. 198, Low. Held. Gr., described as *Orthis plicata* by Vanuxem in the Geo. Rep. 3d Dist. N. Y., but that name was preoccupied.
- varicosa, Hall, 1857, 10th Rep. N. Y. Mus. Nat. Hist., p. 130, and Pal. N. Y., vol. 4, p. 205, Up. Held. Gr.
- ventricosa, see *Nucleospira ventricosa*.
- venusta, syn. for *Spirifera divaricata*.
- vernonensis, Swallow, 1860, Trans. St. Louis Acad. Sci., vol. 1, p. 644, Waverly or Chateau Gr.
- vernewilli, syn. for *S. disjuncta*.
- ? *waldronensis*, see *Triplexia waldronensis*.
- waverlyensis, Winchell, 1870, Proc. Am. Phil. Soc., vol. 12, p. 251, Marshall Gr.
- whitneyi, Hall, 1858, Geo. Rep. Iowa, p. 502, Ham. and Chemung Gr.
- wortheni, Hall, 1857, 10th Rep. N. Y. Mus. Nat. Hist., p. 156, Ham. Gr.
- ziczac, Hall, 1843. The name was preoccupied by Roemer. See *S. consobrina*.
- SPIRIFERINA**, D'Orbigny, 1847, Consid. Zool. et Geol. Sur. les Brachiopodes, Comptes rendus des Sciences de l'Académie des Sciences. [Ety. *Spirifera*, a genus; *inus*, implying resemblance.] Shell transverse, valves unequally convex; with or without mesial fold and sinus; smooth or costated; beak straight or recurved; area large, and interrupted by a pseudodeltidium, notched near the cardinal edge; structure punctate; surface spinous; tooth on each side of the fissure, supported by vertical, shelly plates, the space intervening occupied by the cardinal muscles; mesial septum wide at the base, and tapering to an acute blade; dorsal valve with dental sockets and shelly lamellæ, for the support of serrated arms in the form of two large spiral, horizontal cones. Type *S. rostrata*.
- billingsi, Shumard, 1858, Trans. St. Louis Acad. Sci., vol. 1, p. 294, Permian Gr.
- binacuta, Winchell, 1865, Proc. Acad. Nat. Sci., p. 120, Burlington Gr.
- clarksvillensis, Winchell, 1865, Proc. Acad. Nat. Sci., p. 119, Marshall Gr.
- kentuckiensis, Shumard, 1855, (*Spirifera kentuckiensis*.) Geo. Rep. Mo., p. 203, Coal Meas.

FIG. 615.—*Spiriferina kentuckiensis*.

- kentuckiensis var. *propatula*, Swallow, 1866, (*Spirifera kentuckiensis* var. *propatula*.) Trans. St. Louis Acad. Sci., vol. 2, p. 409, Coal Meas.
- spinosa, Norwood & Pratten. (*Spirifera spinosa*.) 1855, Jour. Acad. Nat. Sci., vol. 3, 2d series, p. 71, Kaskaskia Gr.
- spinosa var. *campestris*, White, 1874, Rep. Invert. Foss., p. 21, and Geo. Sur. W. 100th Mer., vol. 4, p. 139, Carb.

- subtexta, White, 1862, Proc. Bost. Soc. Nat. Hist., vol. 9, p. 8, Burlington Gr.
- Spirigera*, D'Orbigny in Comptes Rendus, t. 25, p. 268, syn. for *Athyris*.
- americana*, see *A. americana*.
- biloba*, see *A. biloba*.
- caput-serpentis*, see *A. caput-serpentis*.
- charitonensis*, see *A. charitonensis*.
- clintonensis*, see *A. clintonensis*.
- concentrica*, syn. for *A. spiriferoides*.
- corpulenta*, see *A. corpulenta*.
- eborea*, see *A. eborea*.
- euzona*, see *A. euzona*.
- formosa*, see *A. formosa*.
- fultonensis*, see *A. fultonensis*.
- hannibalensis*, see *A. hannibalensis*.
- hawni*, see *A. hawni*.
- jacksoni*, see *A. jacksoni*.
- maconensis*, see *A. maconensis*.
- minima*, see *A. minima*.
- missouriensis*, see *A. missouriensis*.
- monticola*, see *A. monticola*.
- obmaxima*, see *A. obmaxima*.
- ohioensis*, see *A. ohioensis*.
- pectinifera*, see *A. pectinifera*.
- plattensis*, see *A. plattensis*.
- prouti*, see *A. prouti*.
- reflexa*, see *A. reflexa*.
- singletoni*, see *A. singletoni*.
- spiriferoides*, see *A. spiriferoides*.
- STENOSCHISMA**, Conrad, 1839, Ann. Rep. N. Y., p. 59. [Ety. *stenos*, narrow; *schisma*, fissure.] Written *Stenocisma* by Conrad. Subtriangular, ovoid, or subglobose, hinge-line short; beak of ventral valve extended, attenuate, more or less arcuate, and appressed upon the opposite valve; mesial fold and sinus; surface plicated, valves articulated by teeth and sockets; median septum in dorsal valve, on each side of which the crura are supported. Type *S. formosum*. Conrad mentioned *Terebratula schlotheimi* as the type which is now the type of *Camarophoria*; but, as Hall shows, Conrad was mistaken in identifying what is now known as *S. formosum*, with the European *Camarophoria schlotheimi*.
- billingsi, Hall, 1867, Pal. N. Y., vol. 4, p. 336, Cornif. Gr. The same that Billings called *Rhynchonella thalia*, Can. Jour. 1860, but the name was preoccupied.
- carica, Hall, 1867, Pal. N. Y., vol. 4, p. 344, Ham. Gr.
- carolina, Hall, 1867, Pal. N. Y., vol. 4, p. 337, Cornif. Gr.
- congregatum, Conrad, 1841, (*Atrypa congregata*.) Ann. Rep. N. Y., p. 55, and Pal. N. Y., vol. 4, p. 341, Ham. Gr.
- contractum, Hall, 1843, (*Atrypa contracta*.) Geo. 4th Dist. N. Y., pl. 66, fig. 3a, and Pal. N. Y., vol. 4, p. 351, Chemung Gr.
- contractum var. *saxatile*, Hall, 1867, Pal. N. Y., vol. 4, p. 417, Chemung Gr.
- dotis, Hall, 1867, Pal. N. Y., vol. 4, p. 344, Ham. Gr.

duplicatum, Hall, 1843, (*Atrypa duplicata*.) Geo. 4th Dist. N. Y., pl. 67, fig. 2 and 2a, and Pal. N. Y., vol. 4, p. 350, Chemung Gr.

eximium, Hall, 1843, (*Atrypa eximia*.) Geo. 4th Dist. N. Y., pl. 66, and Pal. N. Y., vol. 4, p. 348, Chemung Gr.



FIG. 616.—*Stenochisma eximium*.

formosum, Hall, 1857, (*Rhynchonella formosa*.) 10th Rep. N. Y. Mus. Nat. Hist., p. 76, and Pal. N. Y., vol. 3, p. 236, Low. Held. Gr.

horsfordi, Hall, 1860, 13th Rep. N. Y. Mus. Nat. Hist., p. 87, and Pal. N. Y., vol. 4, p. 339, Cornif. Gr., Marcellus shale and Ham. Gr.

orbiculare, Hall, 1860, (*Rhynchonella orbicularis*.) 13th Rep. N. Y. Mus. Nat. Hist., p. 88, and Pal. N. Y., vol. 4, p. 353, Chemung Gr.

prolificum, Hall, 1867, Pal. N. Y., vol. 4, p. 343, Ham. Gr.

royanum, Hall, 1860, Pal. N. Y., vol. 4, p. 338, Cornif. Gr.

sappho, Hall, 1860, (*Rhynchonella sappho*.) 13th Rep. N. Y. Mus. Nat. Hist., p. 87, and Pal. N. Y., vol. 4, p. 340, Marcellus shale and Ham. Gr.

stephani, Hall, 1867, Pal. N. Y., vol. 4, p. 349, Chemung Gr.

tethys, Billings, 1860, (*Rhynchonella tethys*.) Can. Jour., vol. 5, p. 271, Cornif. Gr.

STREPTORHYNCHUS, King, 1850, Monograph of Permian Fossils, p. 107. [Ety. *strepto*, I bend or twist; *rhynchos*, beak.] Semicircular or in general form of *Strophomena*, concavo-convex, plano-convex, or both valves convex and striated; ventral beak small, or prolonged, bent and twisted, fissure beneath, closed or partially closed by a solid deltidium; area wide on the ventral valve and narrow on the dorsal; externally like *Strophomena*, but internally resembling *Orthis*. Type *S. pargonatum*.

alternatum, Hall, 1860, (*Orthisina alternata*.) 13th Rep. N. Y. Mus. Nat. Hist., p. 81, Ham. Gr.

americanum, Whitfield, 1878, (*Hemipronites americanus*.) Ann. Rep. Geo. Sur. Wis., p. 72, and Geo. Wis., vol. 4, p. 243, Hud. Riv. Gr.

antiquatum, Sowerby, 1839, (*Orthis antiquata*.) Murch. Sil. Syst., p. 630, Anticosti Gr., Div. 3, Mid. Sil.

arctostriatum, Hall, 1843, (*Strophomena arctostriata*.) Geo. Rep. 4th Dist. N. Y., p. 266, Chemung Gr.

arctostriatum, Hall, 1860, 13th Rep. N. Y. Mus. Nat. Hist., p. 80, (*Orthisina arcto-*

striata.) Ham. Gr. This name was preoccupied.

biloba, Hall, 1883, Rep. St. Geol., pl. 41, figs. 4, 5, Coal Meas.

cardinale, Whitfield, 1880, Ann. Rep. Geo. Sur. Wis., p. 61, and Geo. Wis., vol. 4, p. 261, Hud. Riv. Gr.

chemungense, Conrad, 1843, (*Strophomena chemungensis*.) Jour. Acad. Nat. Sci., vol. 8, p. 357, and Pal. N. Y., vol. 4, p. 67, Chemung Gr.

crassum, Meek & Hayden, 1858,

(*Orthisina crassa*.) Proc. Acad. Nat. Sci. Phil., p. 260, and Geo. Sur. Ill., vol. 5, p. 570, Coal Meas.

crenistriatum, Phil-

lips, 1836, (*Spirifer crenistriata*.) Geo. York., vol. 2,

p. 216, Waverly Gr.

deflectum, Conrad, 1843, (*Strophomena deflecta*.) Proc. Acad. Nat. Sci. Phil., p. 332, and Pal. N. Y., vol. 1, p. 113, Trenton Gr.

elongatum, James, 1874, Cin. Quar. Jour. Sci., vol. 1, p. 240, Hud. Riv. Gr. A variety of *S. subtentum*.

filitextum, Hall, 1847, (*Leptaena filitexta*.) Pal. N. Y., vol. 1, p. 111, Trenton and Hud. Riv. Grs.

fiabellum, Whitfield, 1882, Desc. New Spec. Foss., from Ohio, p. 200, Up. Held. Gr.

flabellum, Whitfield, 1882, Desc. New Spec. Foss., from Ohio, p. 200, Up. Held. Gr.

flabellum, Whitfield, 1882, Desc. New Spec. Foss., from Ohio, p. 200, Up. Held. Gr.

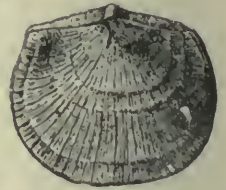


FIG. 617.—*Streptorhynchus crassum*. Dorsal view.

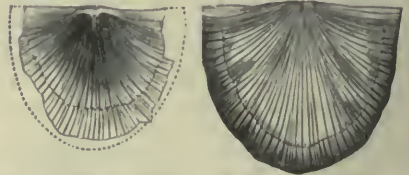


FIG. 618.—*Streptorhynchus hallanum*. Exterior and interior of dorsal valve.

hallanum, S. A. Miller, 1874, Cin. Quar. Jour. Sci., vol. 1, p. 148, Hud. Riv. Gr.

hemiaster, syn. for *S. subplanum*.

hydraulicum, Whitfield, 1882, Desc. New Spec. Foss., from Ohio, p. 193, Low. Held. Gr.

inflatum, White & Whitfield, 1862, Proc. Bost. Soc. Nat. Hist., vol. 8, p. 293, Kinderhook Gr.

lens, White, 1862, Proc. Bost. Soc. Nat. Hist., vol. 9, p. 28, Chemung Gr.

minor, Walcott, 1885, Monogr. U. S. Geo. Sur., vol. 8, p. 75, Trenton Gr.

nutans, Meek, 1873, (*Hemipronites nutans*.) Pal. Ohio, vol. 1, p. 77, Hud. Riv. Gr.

occidentale, Newberry, syn. for *Meekella striatocostata*.

occidentale, Newberry, syn. for *Meekella striatocostata*.

occidentale, Newberry, syn. for *Meekella striatocostata*.

- pandora, Billings, 1860, Can. Jour., vol. 5, p. 266, and Pal. N. Y., vol. 4, p. 68, Schoharie grit and Cornif. Gr.
- pectinaceum, Hall, 1843, (Strophomena pectinacea and S. bifurcata,) Geo. Rep. 4th Dist. N. Y., p. 266, and Pal. N. Y. vol. 4, p. 73, Chemung Gr.
- perversum, Hall, 1857, (Orthis perversa,) 10th Rep. N. Y. Mus. Nat. Hist., p. 137, and Pal. N. Y., vol. 4, p. 72, (Orthisina alternata, 1860, 13th Rep.,) Cornif. and Ham. Gr.
- planoconvexum, Hall, 1847, (Leptaena planoconvexa,) Pal. N. Y., vol. 1, p. 114, Hud. Riv. Gr.
- planumbonum, Hall, 1847, (Leptaena planumbona,) Pal. N. Y., vol. 1, p. 112, Trenton and Hud. Riv. Gr.
- primordiale, Whitfield, 1886, Bull. Am. Mus. Nat. Hist., vol. 1, p. 301, Birdseye Gr.
- pyramidale, Newberry, syn. for Meekella striatocostata.
- radiatum, Vanuxem, 1843, (Strophomena radiata,) Geo. Rep. 3d Dist. N. Y., p. 122, and Pal. N. Y., vol. 3, p. 193, Low. Held. Gr.
- rectum, Conrad, 1843, (Strophomena recta,) Proc. Acad. Nat. Sci., vol. 1, p. 332, and Pal. N. Y., vol. 1, p. 113, Black Riv. and Trenton Grs.
- sinuatum, Emmons, 1855, Am. Geol., p. 199, Hud. Riv. Gr.
- subplanum, Conrad, 1842, Jour. Acad. Nat. Sci., vol. 8, p. 258, and Pal. N. Y., vol. 2, p. 259, (Strophomena subplana,) Niagara Gr.
- subtentum, Conrad, 1847, (Strophomena subtenta,) Pal. N. Y., vol. 1, p. 115, Trenton and Hud. Riv. Gr.
- sulcatum, Verneuil, 1848, (Leptaena sulcata,) Bull. Geol. Soc. France, vol. 5, p. 350, and Ohio Pal., vol. 1, p. 85, Hud. Riv. Gr.
- tenuis, Hall, 1863, Trans. Alb. Inst., vol. 4, p. 210, Niagara Gr.
- thalia, Billings, 1860, (Strophomena thalia,) Can. Nat. and Geol., vol. 5, p. 39, Trenton Gr.
- umbraculum, Schlotheim, 1820, (Terebratulites umbraculum,) Petrefaktenkunde, p. 256, Devonian to the Permian Gr.
- vetustum, James, 1874, Cin. Quar. Jour. Sci., vol. 1, p. 241, Hud. Riv. Gr. One of the forms of S. subtentum.
- woolworthanum, Hall, 1857, (Strophomena woolworthiana,) 10th Rep. N. Y. Mus. Nat. Hist., p. 48, and Pal. N. Y., vol. 3, p. 192, Low. Held. Gr.
- Stricklandia*, Billings, 1859, Can. Nat. Geo., vol. 4. This name having been previously applied to a genus of fossil plants, the author abandoned it and proposed *Stricklandinia*.

- Stricklandinia*, Billings, 1863, Can. Nat. and Geo., vol. 8, p. 370. [Ety. proper name.] Large, elongate-oval, transversely subcircular, sometimes compressed, valves subequal; short mesial septum in the interior of the ventral valve, supporting a small triangular chamber, beneath the beak, as in *Pentamerus*; in the dorsal valve no longitudinal septum, spires, or loop; two short, rudimental plates, bearing processes. Type S. *gaspensis*.
- anticostiensis*, Billings, 1863, Can. Nat. Geo., vol. 8, p. 370, Anticosti Gr.
- (?) *arachne*, Billings, 1862, Pal. Foss., vol. 1, p. 85, Quebec Gr.
- (?) *arethusa*, Billings, 1862, Pal. Foss., vol. 1, p. 85, Quebec Gr.
- brevis*, Billings, 1859, Can. Nat. Geo., vol. 4, p. 135, Mid. Sil.
- canadensis*, Billings, 1859, Can. Nat. Geo., vol. 4, p. 135, Clinton Gr.
- castellana*, White, 1876, Proc. Acad. Nat. Sci., p. 30, Niagara Gr.
- davidsoni*, Billings, 1868, Lond. Geo. Mag., vol. 5, p. 59, Up. Sil.
- deformis*, Meek & Worthen, 1870, Proc. Acad. Nat. Sci., Phil., p. 37, and Geo. Sur. Ill., vol. 6, p. 502, Niagara Gr.
- elongata*, see *Amphigenia elongata*.
- elongata var. curta*, see *Amphigenia curta*.
- gaspensis*, Billings, 1859, Can. Nat. Geo., vol. 4, p. 134, Mid. Sil.
- melissa*, Billings, 1874, Pal. Foss., vol. 2, p. 89, Mid. Sil.
- multilirata*, Whitfield, 1878, Ann. Rep. Geo. Sur. Wis., p. 81, and Geo. Wis., vol. 4, p. 315, Niagara Gr.
- salteri*, Billings, 1874, Pal. Foss., vol. 2, p. 87, Anticosti Gr., Mid. Sil.
- STROPHALOSIA**, King, 1844, Ann. and Mag. Nat. Hist., vol. 14, p. 313. [Ety. *strophe*, a bending; *alos*, a disk.] Having the general form and muscular impressions of *Leptaena*, with the tubuliferous or spinous surface of *Productus*; possessed of a well-developed condyloid hinge, area, and deltidium. Type S. *excavata*.
- horrescens*, Geinitz, 1866, Carb. und Dyas in Neb., p. 49. Prof. Meek regarded this name as a syn. for *Productus nebrascensis*.
- numularis*, Winchell, 1863, Proc. Acad. Nat. Sci., p. 4, Marshall Gr.
- STROPHODONTA**, Hall, 1852, Pal. N. Y., vol. 2, p. 63. [Ety. *strophos*, bent; *odous*, tooth.] General form and characters as in *Strophomena*, one valve convex and the other concave, and following nearly the same curve as the convex one, leaving only a thin space for the animal, and the surface radiated; distinguished, however, by a crenulated hinge-line; the absence of a foramen in the area of the ventral valve; dental lamellæ absent, or nearly so; the divaricator muscular impressions spreading, flabelliform, without limitation, by an elevated



FIG. 620.—*Streptorhynchussulcatum*. Interior of dorsal valve.

- ridge; cardinal process in the dorsal valve bifurcated from its origin, and directed backward beneath the area of the ventral valve; on the lower side of the ventral area a bilobed process is embraced by the divisions of the cardinal process of the dorsal valve. Type *S. demissa*.
- aquicostata*, Swallow, 1860, Trans. St. Louis Acad. Sci., vol. 1, p. 639, Ham. Gr.
- altidorsata*, Swallow, 1860, Trans. St. Louis Acad. Sci., vol. 1, p. 637, Ham. Gr.
- alveata*, Hall, 1863, 16th Rep. N. Y. Mus. Nat. Hist., p. 36, and Pal. N. Y., vol. 4, p. 81, Schoharie grit.
- ampla*, see *Strophonella ampla*.
- arcuata*, Hall, 1858, Geo. of Iowa, p. 492, Ham. Gr.
- becki*, Hall, 1857, 10th Rep. N. Y. Mus. Nat. Hist., p. 52, and Pal. N. Y., vol. 3, p. 191, Low. Held. Gr.
- boonensis*, Swallow, 1860, Trans. St. Louis Acad. Sci., vol. 1, p. 638, Ham. Gr.
- cælata*, see *Strophonella cælata*.
- callawayensis*, Swallow, 1860, Trans. St. Louis Acad. Sci., vol. 1, p. 638, Ham. Gr.
- callosa*, Hall, 1863, 16th Rep. N. Y. Mus. Nat. Hist., p. 36, and Pal. N. Y., vol. 4, p. 82, Schoharie grit.
- calvini*, S. A. Miller, 1883, 2d Ed. Am. Pal. Foss., p. 298, Upper Helderberg Gr. Proposed instead of *S. quadrata*, Calvin, 1878, in Bull. U. S. Geo. Sur. Terr., vol. 4, No. 3, p. 728, which was preoccupied.
- canace*, Hall & Whitfield, 1873, 23d Rep. N. Y. Mus. Nat. Hist., p. 236, Chemung Gr.
- cavumbona*, see *Strophonella cavumbona*.
- cayuta*, Hall, 1867, Pal. N. Y., vol. 4, p. 110, Chemung Gr.
- cincta*, Winchell, 1866, Rep. Low. Penin. Mich., p. 93, Ham. Gr.
- concava*, Hall, 1857, (*Strophomena concava*), 10th Rep. N. Y. Mus. Nat. Hist., p. 115, and Pal. N. Y., vol. 4, p. 96, Cornif. and Ham. Grs.
- costata*, Owen, 1852, Geo. Sur. Wis., Iowa, and Minn., p. 585, Devonian.
- crebristriata*, Conrad, 1842, (*Strophomena crebristriata*), Jour. Acad. Nat. Sci., vol. 8, p. 254, and Pal. N. Y., vol. 4, p. 86, Schoharie grit.
- cymbiformis*, Swallow, 1860, Trans. St. Louis Acad. Sci., vol. 1, p. 635, Ham. Gr.
- demissa*, Conrad, 1842, (*Strophomena demissa*), Jour. Acad. Nat. Sci., vol. 8, p. 258, and Pal. N. Y., vol. 4, p. 81, Schoharie grit, Cornif., Ham., and Chemung Grs.
- erratica*, Winchell, 1866, Rep. Low. Peninsula Mich., p. 93, Ham. Gr.
- feildeni*, Etheridge, 1878, Quar. Jour. Geo. Soc., vol. 34, p. 598, Up. Sil.
- fragilis*, Hall, syn. for *Strophodonta pergeniculata*, Hall, 1859, Pal. N. Y., vol. 3, p. 483, Low. Held. Gr.
- headleyana*, Hall, 1857, N. Y. Mus. Nat. Hist., p. 49, and Pal. N. Y., vol. 3, p. 185, Low. Held. Gr.
- hemispherica*, Hall, 1857, (*Strophomena hemispherica*), 10th Rep. N. Y. Mus. Nat. Hist., p. 113, and Pal. N. Y., vol. 4, p. 90, Schoharie grit and Cornif. Gr.
- hybrida*, Hall & Whitfield, 1873, 23d Rep. N. Y. Mus. Nat. Hist., p. 239, Chemung Gr.
- imitata*, Winchell, 1866, Rep. Low. Penin. Mich., p. 93, Ham. Gr.
- inæquiradiata*, Hall, 1857, 10th Rep. N. Y. Mus. Nat. Hist., p. 113, and Pal. N. Y., vol. 4, p. 87, Schoharie grit and Cornif. Gr.
- inæquistriata*, Conrad, 1842, (*Strophomena inæquistriata*), Jour. Acad. Nat. Sci., vol. 8, p. 254, and Pal. N. Y., vol. 4, p. 93, Cornif. and Ham. Grs., Moscow shales.
- indenta*, Conrad, 1838, (*Leptæna indenta*), Ann. Rep., N. Y. p. 117, Low Held. Gr. Not properly defined.
- inflexa*, Swallow, 1860, Trans. St. Louis Acad. Sci., vol. 1, p. 637, Ham. Gr.
- intermedia*, Hall, 1859, Pal. N. Y., vol. 3, p. 482, Oriskany sandstone.
- iowensis*, Owen, 1852, Geo. Sur. Wis., Iowa, and Minn., p. 585, Devonian.
- junia*, Hall, 1867, Pal. N. Y., vol. 4, p. 108, Cornif., Ham. and Tully Grs. (Changed from *textilis*, in the corrigenda and index.)
- kemperi*, Swallow, 1860, Trans. St. Louis Acad. Sci., vol. 1, p. 636, Ham. Gr.
- leavenworthana*, see *Strophonella leavenworthana*.
- lepida*, Hall, syn. for *S. nacrea*.
- lincklæni*, Hall, 1857, 10th Rep. N. Y. Mus. Nat. Hist., p. 55, and Pal. N. Y., vol. 3, p. 415, Oriskany sandstone.
- magnifica*, Hall, 1857, 10th Rep. N. Y. Mus. Nat. Hist., p. 54, and Pal. N. Y., vol. 3, p. 414, Oriskany sandstone.
- magniventra*, Hall, 1857, 10th Rep. N. Y. Mus. Nat. Hist., p. 54, and Pal. N. Y., vol. 3, p. 411, Oriskany sandstone.
- mucronata*, Conrad, 1842, (*Strophomena mucronata*), Jour. Acad. Nat. Sci., vol. 8, p. 257, and Pal. N. Y., vol. 4, p. 111, Chemung Gr.
- nacrea*, Hall, 1857, (*Strophomena nacrea*), 10th Rep. N. Y. Mus. Nat. Hist., p. 144, and Pal. N. Y., vol. 4, p. 104, Cornif. and Ham. Grs.
- navalis*, Swallow, 1860, Trans. St. Louis Acad. Sci., vol. 1, p. 635, Ham. Gr.
- parva*, Owen, 1852, Geo. Sur. Wis., Iowa, and Minn., p. 584, Ham. Gr.

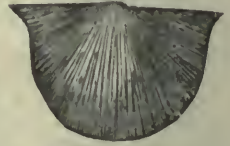


FIG. 621.—*Strophodonta inæquistriata*.

parva, Hall, 1863, 16th Rep. N. Y. Mus. Nat. Hist., p. 37, Schoharie grit. This name was preoccupied.

patersoni, Hall, 1857, (Strophomena patersoni,) 10th Rep. N. Y. Mus. Nat. Hist., p. 114, and Pal. N. Y., vol. 4, p. 89, Schoharie grit and Cornif. Gr.

perplana, Conrad, 1842, (Strophomena perplana,) Jour. Acad. Nat. Sci., vol. 8, p. 257, and Pal. N. Y., vol. 4, p. 92, Onondaga, Schoharie, Cornif., Ham., and Chemung Grs.

perplana var. *nervosa*, Hall, 1843, (Strophomena nervosa,) Geo. Rep. 4th Dist. N. Y., p. 266, and Pal. N. Y., vol. 4, p. 113, Chemung Gr.

planulata, Hall, 1859, Pal. N. Y., vol. 3, p. 184, Low. Held. Gr.

plicata, Hall, 1860, 13th Rep. N. Y. Mus. Nat. Hist., p. 90, Ham. Gr.

prisca, Hall, 1852, Pal. N. Y., vol. 2, p. 63, Clinton Gr.

profunda, Hall, 1852, (Leptæna profunda,) Pal. N. Y., vol. 2, p. 61, Clinton and Niagara Grs.

punctulifera, see Strophonella punctulifera.

quadrata, Swallow, 1860, Trans. St. Louis Acad. Sci., vol. 1, p. 639, Ham. Gr.

quadrata, Calvin, 1878, Bull. U. S. Geo. Sur. Terr., vol. 4, No. 3, p. 728. The name was preoccupied. See *S. calvini*.

reversa, see Strophonella reversa.

semifasciata, see Strophonella semifasciata.

striata, Hall, 1843, (Strophomena striata,) Geo. Rep. 4th Dist. N. Y., p. 104, Niagara Gr.

subcymbiformis, Swallow, 1860, Trans. St. Louis Acad. Sci., vol. 1, p. 636, Ham. Gr.

subdemissa, Hall, 1857, 10th Rep. N. Y. Mus. Nat. Hist., p. 145, Ham. Gr.

textilis, Hall, 1852, Pal. N. Y., vol. 2, p. 327, Coralline Limestone.

variabilis, Calvin, 1878, Bull. U. S. Geo. Sur., vol. 4, No. 3, p. 727, Up. Held. Gr.

varistriata, Conrad, 1842, (Strophomena varistriata,) Jour. Acad. Nat. Sci., vol. 8, p. 255, and Pal. N. Y., vol. 3, p. 180, Low. Held. Gr.

varistriata var. *arata*, Hall, 1859, Pal. N. Y., vol. 3, p. 183, Low. Held. Gr.

vascularia, Hall, 1859, Pal. N. Y., vol. 3, p. 182, Oriskany sandstone.

STROPHOMENA, Rafinesque, 1825, Manuel de Malacologie of Blainville, p. 513. [Ety. *strophos*, bent; *mene*, a crescent.] Shell somewhat semicircular, or somewhat semioval, though variable in outline; thin; one valve convex, the other concave, with a thin space between them for the animal; surface with radiating striae; hinge-line straight, longer or shorter than the width of the shell below; anterior end of the shell usually deflected or bent over toward the dorsal valve; ventral valve convex, flat on the umbo; beak small, and minutely per-

forated; cardinal area nearly cut in two parts by an angular notch, which is closed, or nearly closed, by the bifid cardinal process of the dorsal valve; two divergent teeth, two adductor scars, and two cardinal muscular impressions; dorsal valve having a linear area, two cardinal processes close together at the middle of the hinge-line, directed forward; sockets for the reception of the teeth of the ventral valve; two muscular scars in front of the cardinal processes. Type *S. rugosa*, which is generally regarded as synonymous with *S. rhomboidalis*.

acutiradiata, see Chonetes acutiradiatus.

alternata, Conrad, 1838, (Leptæna alternata,) Ann. Rep. N. Y., p. 115, and Pal. N. Y., vol. 1, pp. 102, 286, Trenton and Hud. Riv. Grs.

alterniradiata, Shaler, 1865, Bulletin No. 4, M. C. Z., Anticosti Gr. Not defined so as to be recognized.

alternistriata, Hall, 1847, Pal. N. Y., vol. 1, p. 109, Trenton and Hud. Riv. Grs.

alternata var. *loxorhysis*, Meek, 1873, Ohio Pal., vol. 1, p. 91, Hud. Riv. Gr.

ampla, see Strophonella ampla.

analoga, Phillips, 1836, Geol. Yorkshire, vol. 2, pl. 7, fig. 10, Subcarb.

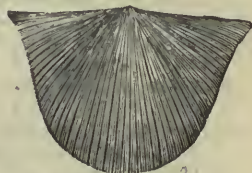


FIG. 622.—Strophomena alternata.

anticostiensis, syn. for Strophomena alternata.

antiquata, see Streptorhynchus antiquatum.

arctostriata, see Streptorhynchus arctostriatum.

arcuata, Shaler, 1865. This name was preoccupied.

arethusa, Billings, 1862, Pal. Foss., vol. 1, p. 132, Hud. Riv. Gr.

aurora, Billings, 1865, Pal. Foss., vol. 1, p. 218, Quebec Gr.

bifurcata, syn. for Streptorhynchus pectinaceum.

bipartita, Hall, 1852, (Leptæna bipartita,) Pal. N. Y., vol. 2, p. 326, Coralline Limestone.

blainvillii, Billings, 1874, Pal. Foss., vol. 2, p. 28, Up. Sil.

camerata, Conrad, 1842, Jour. Acad. Nat. Sci., vol. 8, p. 254, and Pal. N. Y., vol. 1, p. 106, Trenton Gr.

carinata, Conrad, 1838, see Tropicodoleptus carinatus.

carinata, Conrad, 1842, see Chonetes carinatus.

ceres, Billings, 1860, Can. Nat. and Geo., vol. 5, p. 54, Hud. Riv. Gr. and Mid. Sil.

chemungensis, Conrad, 1842, Jour. Acad. Nat. Sci., vol. 8, p. 257, Chemung Gr.

- concava*, see *Srophodonta concava*.
conradi, Hall, 1859, Pal. N. Y., vol. 3, p. 194, Low. Held. Gr.
convexa, Owen, 1840, Rep. on Mineral Lands, p. 70, Calcif. Gr.
cornuta, see *Chonetes cornutus*.
corrugata, Conrad, 1842, Jour. Acad. Nat. Sci., vol. 3, p. 256, and Pal. N. Y., vol. 2, p. 59, Clinton Gr.
crebristriata, see *Srophodonta crebri-striata*.
crenistris, syn. for *Srophodonta perplana*.
declivis, James, syn. for *Srophomena alternata*.
deflecta, see *Streptorhynchus deflectum*.
deltoidea, Conrad, 1839, Ann. Rep. N. Y., p. 64, and Pal. N. Y., vol. 4, p. 106, Trenton Gr.
delthyris, syn. for *Srophodonta perplana*.
demissa, see *Srophodonta demissa*.
depressa, Sowerby, 1825, (*Producta depressa*.) Min. Conchology, vol. 5, p. 86, and Pal. N. Y., vol. 2, p. 257, Up. Sil. Generally regarded as a synonym for *S. rhomboidalis*.
depressa var. ventricosa, see *Srophomena rugosa var. ventricosa*.
donneti, Salter, 1852, Sutherland's Jour., vol. 2, App., p. 218, Devonian.
elegantula, Hall, 1843, Geo. Rep., 4th Dist. N. Y., p. 73, Clinton Gr.
elongata, Conrad, 1842, Jour. Acad. Nat. Sci., vol. 8, p. 259, Low. Held. Gr.
elliptica, Conrad, 1839, Ann. Rep. N. Y., p. 64, Niagara Gr.
fasciata, Hall, 1847, (*Leptæna fasciata*.) Pal. N. Y., vol. 1, p. 20, Chazy Gr.
filixata, see *Streptorhynchus flitextum*.
fluctuosa, Billings, 1860, Can. Nat. Geo., vol. 5, p. 57, Trenton and Hud. Riv. Grs.
fontinalis, White, 1874, Rep. Invert. Foss., p. 10, and Geo. Sur. W. 100th Mer., vol. 4, p. 54, Quebec Gr.
fracta, Meek, 1873, (*S. alternata var. fracta*.) Pal. Ohio, vol. 1, p. 91, Hud. Riv. Gr.
fragilis, syn. for *Srophodonta perplana*.
galatea, Billings, 1874, Pal. Foss., vol. 2, p. 20, Gaspe limestone No. 8, Devonian.
geniculata, Shaler, (*Brachyprion geniculatum*.) The name was preoccupied.
gibbosa, Conrad, 1841, Ann. Geo. Rep. N. Y., p. 25, Onondaga Gr.
hecuba, Billings, 1860, Can. Nat. Geo., vol. 5, p. 60, Hud. Riv. Gr.
hemispherica, see *Srophodonta hemispherica*.
imbecilis, Billings, 1865, Pal. Foss., vol. 1, p. 219, Quebec Gr.
imbrex, Pander, 1845, in Russia and Ural Mountains, Hud. Riv. Gr. The identification very doubtful in America.
impressa, syn. for *Srophodonta vari-striata*.
incrassata, Hall, 1847, (*Leptæna incrassata*.) Pal. N., vol. 1, p. 19, Chazy to Hud. Riv. Gr.
inæquiradiata, see *Srophodonta inæquiradiata*.
inæquistriata, see *Srophodonta inæquistriata*.
interstitialis, Phillips, in Geo. 4th Dist. N. Y., see *Srophodonta cayuta*.
irene, Billings, 1874, Pal. Foss., vol. 2, p. 27, Devonian.
ithacensis, Vanuxem, 1842, Geo. Rep. N. Y., p. 174, Portage Gr.
julia, Billings, 1862, Pal. Foss., vol. 1, p. 127, Anticosti Gr., Div. 4, Mid. Sil.
kingi, Whitfield, 1878, Ann. Rep. Geo. Sur. Wis., p. 72, and Geo. Wis., vol. 4, p. 261, Hud. Riv. Gr.
lachrymosa, see *Productella lachrymosa*.
lævis, Emmons, 1842, Geo. Rep. N. Y., p. 385, Birdseye Gr.
leda, Billings, 1860, Can. Nat. Geo., vol. 5, p. 55, Mid. Sil.
lepida, syn. for *Srophodonta naerea*.
lima, see *Productella lachrymosa var. lima*.
lineata, see *Chonetes lineatus*.
macra, syn. for *Srophodonta semifasciata*.
magniventra, see *Srophodonta magniventra*.
membranacea, of Phillips, as identified by Vanuxem, 1842, Geo. 3d Dist. N. Y., see *Productella hirsuta*.
modesta, Conrad, 1839, Ann. Rep. N. Y., p. 64, Niagara Gr.
mucronata, see *Srophodonta mucronata*.
naerea, see *Srophodonta naerea*.
nasuta, Conrad, 1842, Jour. Acad. Nat. Sci., vol. 8, p. 260, Trenton and Hud. Riv. Grs.
nasula, Conrad, 1846, Proc. Acad. Nat. Sci., vol. 3, p. 23. Not defined so as to be recognized.
nemea, Hall & Whitfield, 1877, U. S. Geo. Sur. 40th parallel, vol. 4, p. 233, Quebec Gr.
nervosa, see *Srophodonta perplana var. nervosa*.
niagarensis, Winchell & Marcy, syn. for *Srophodonta profunda*.
nitens, Billings, 1860, Can. Nat. Geo., vol. 5, p. 53, Hud. Riv. Gr.
nutans, see *Streptorhynchus nutans*.
obscura, Hall, 1852, (*Leptæna obscura*.) Pal. N. Y., vol. 2, p. 62, Clinton Gr.
orthididea, Hall, 1852, (*Leptæna orthididea*.) Pal. N. Y., vol. 1, p. 62, Clinton Gr.
patenta, Hall, 1852, (*Leptæna patenta*.) Pal. N. Y., vol. 2, p. 60, Clinton Gr.
patersoni, see *Srophodonta patersoni*.
pecten, Linnæus, 1758, (*Anomia pecten*.) Syst. Nat., Niagara Gr. Not American.
pectinacea, see *Streptorhynchus pectinaceum*.
perplana, see *Srophodonta perplana*.
philomela, Billings, 1860, Can. Nat. Geo., vol. 5, p. 56, Mid. Sil.
planoconvexa, see *Streptorhynchus planoconvexum*.
planumbona, see *Streptorhynchus planumbonum*.

plicata, syn. for *Streptorhynchus subtentum*.

plicifera, Hall, 1847, (*Leptæna plicifera*.) Pal. N. Y., vol. 1, p. 19, Chazy Gr.

pluristriata, syn. for *Strophodonta perplana*.

profunda, see *Strophodonta profunda*.

punctulifera, see *Strophonella punctulifera*.

pustulosa, syn. for *Productella truncata*.

radiata, see *Streptorhynchus radiatum*.

recta, see *Streptorhynchus rectum*.

rectilateris, syn. for *Strophodonta varistriata*.

reticulata, Shaler, 1865, Bulletin No. 4, M. C. Z., Anticosti Gr. Not defined so as to be recognized.

rhomboidalis, Wilkins, 1769, (*Conchites rhomboidalis*.) Nachricht von Seltenen Verst., p. 77. This species ranges from the Trenton Gr. to the Keokuk, regarding *S. tenuistriata*, *S. depressa*, and *S. rugosa* as varieties only. The type, however, is the Devonian form.

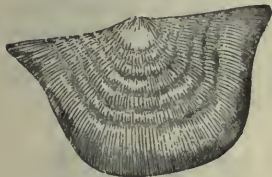


FIG. 623.—*Strophomena rugosa*.

rugosa, Dalman, 1827, (*Leptæna rugosa*.) Vet. Acad. Handlinger, p. 106, and Pal. N. Y., vol. 3, p. 195, Niagara and Low.

Held. Gr. This form is supposed to be the type of Rafinesque's genus *Strophomena*. The species is usually regarded as merely a variety of *S. rhomboidalis*.

rugosa var. *ventricosa*, Hall, 1857, (*S. depressa* var. *ventricosa*.) 10th Rep. N. Y. Mus. Nat. Hist., p. 53, and Pal. N. Y., vol. 3, p. 417, Oriskany sandstone.

setigera, see *Chonetes setigerus*.

semiovalis, Conrad, syn. for *Leptæna sericea*.

semiovalis, Shaler. The name had been twice preoccupied.

squamula, James, 1874, Cin. Quar. Jour. Sci., vol. 1, p. 335, Hud. Riv. Gr.

striata, see *Strophodonta striata*.

subdemissa, syn. for *Strophodonta demissa*.

subplana, see *Streptorhynchus subplanum*.

subtenta, see *Streptorhynchus subtentum*.

syrtalis, syn. for *Chonetes carinatus*.

tenuilineata, Conrad, 1842, Jour. Acad. Nat. Sci., vol. 8, p. 259, and Pal. N. Y., vol. 1, p. 115, Trenton Gr.

tenuistriata, Sowerby, 1839, (*Leptæna tenuistriata*.) Murch. Sil. Syst., p. 636, and Pal. N. Y., vol. 1, p. 108, Low. Sil.

textilis, see *Strophodonta junia*.

thalia, see *Streptorhynchus thalia*.

transversalis, see *Leptæna transversalis*.

trilobata, Owen, 1852, (*Leptæna trilobata*.) Geo. Sur. Wis., Iowa, and Minn., p. 584, Trenton Gr.

tullia, Billings, 1874, Pal. Foss., vol. 2, p. 29, Low. Devonian.

undulata, syn. for *S. rhomboidalis*.

undulosa, Conrad, 1841, Ann. Rep. N. Y., p. 54, Low. Held. Gr.

unicostata, Meek & Worthen, 1868, Geo. Sur. Ill., vol. 3, p. 335, Hud. Riv. Gr.

varistriata, see *Strophodonta varistriata-ventricosa*, Shaler, (*Brachyprion ventricosum*.) The name was preoccupied.

wisconsinensis, Whitfield, 1880, Ann. Rep. Geo. Sur. Wis., p. 61, and Geo. Wis., vol. 4, p. 263, Hud. Riv. Gr.

woolworthana, see *Streptorhynchus woolworthanum*.

STROPHONELLA, Hall, 1879, 28th Rep. N. Y., Mus. Nat. Hist., p. 153. [Ety. diminutive of *strophos*, twisted.] Distinguished from *Strophodonta* by the resupinate character, the strong and more restricted muscular impression of the ventral valve and strong median septum of the dorsal valve; and from *Streptorhynchus* by the cardinal process, the crenulations on the inner margins of the cardinal area, and the solid area, with sometimes a triangular deltidium.

Type *S. semifasciata*.

ampla, Hall, 1857, (*Strophomena ampla*.) 10th Rep. N. Y., Mus. Nat. Hist., p. 111, and Pal. N. Y., vol. 4, p. 93, Up. Held. Gr.

cælata, Hall, 1867, (*Strophodonta cælata*.) Pal. N. Y., vol. 4, p. 112, Chemung Gr.

cavumbona, Hall, 1857, (*Strophodonta cavumbona*.) 10th Rep. N. Y. Mus. Nat. Hist., p. 51, and Pal. N. Y., vol. 3, p. 187, Low. Held. Gr.

leavenworthana, Hall, 1857, (*Strophodonta leavenworthana*.) 10th Rep. N. Y. Mus. Nat. Hist., p. 53, and Pal. N. Y., vol. 3, p. 189, Low. Held. Gr.

punctulifera, Conrad, 1838, (*Leptæna punctulifera*.) Ann. Rep. N. Y., p. 117, and Pal. N. Y., vol. 3, p. 188, Low. Held. Gr.

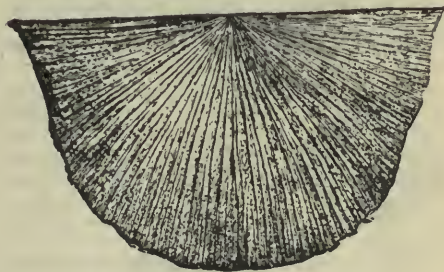


FIG. 624.—*Strophonella punctulifera*.

reversa, Hall, 1858, (*Strophodonta reversa*.) Geo. Rep. Iowa, p. 494, Ham. Gr.

semifasciata, Hall, 1863, (*Strophodonta semifasciata*.) Trans. Alb. Inst., vol. 4, p. 210, Niagara Gr.

SYNTRIELASMA, Meek & Worthen, 1865, Proc. Acad. Nat. Sci., p. 277. [Ety. *syn*, together; *treis*, three; *elasma*, plate.] Shell thin, gibbous; valves articulated by teeth and sockets; hinge-line short; area higher in the ventral valve than

in the dorsal; beaks incurved, subequal; surface radiated, forming interlocking angular projections at their terminations; shell structure punctate. Type *S. hemiplicatum*.

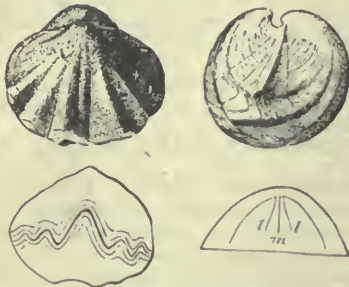


FIG. 625.—*Syntriclasma hemiplicatum*. *l*, Dental laminae; *m*, mesial septum.

hemiplicatum, Hall, 1852, (*Spirifera hemiplicata*.) Stan.'s Ex. to Great Salt Lake, p. 409, Coal Meas.

SYRINGOTHYRIS, Winchell, 1863, Proc. Acad. Nat. Sci., p. 6. [Ety. *syrix*, a tube; *thyris*, a window.] General aspect like *Spirifera*; shell substance fibrous and impunctate; beak extremely elevated; area of ventral valve large, with a narrow triangular fissure closed toward the apex by an external, convex pseudo-deltidium, beneath which, and diverging from it, is another transverse plate, connecting the vertical dental lamellae, arched above, and beneath giving off a couple of median parallel lamellae, which are incurved so as to nearly join their inferior edges, thus forming a slit-bearing tube, which projects into the interior of the shell. Type *S. typus*.

halli, Winchell, 1863, Proc. Acad. Nat. Sci., p. 8, Marshall Gr.

typus, Winchell, 1863, Proc. Acad. Nat. Sci. Phil., p. 7, Marshall Gr.

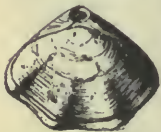


FIG. 626.—*Terebratula maxillata*.

short, truncated by a foramen; deltidium in one or two pieces; loop short; confined to the posterior portion of the shell, not more than one-third the length of the valve, simply attached to a hinge plate; two ribbon-shaped lamellae are united by a transverse lamella bent upward in the middle; the cirrated arms are supported by the crura, and project in front of the loop; no median septum in the socket valve. Type *T. vitrea* and *T. maxillata*.

acuminatissima, Castelnau, 1843, Syst. Sil., p. 40. Not recognized.

affinis, syn. for *Atrypa reticularis*.

aprinis, see *Rhynchonella aprinis*.

arcuata, Swallow, 1863, Trans. St. Louis Acad. Sci. The name was preoccupied by Roemer in 1840. See *T. shumardana*.

argentea, see *Athyris argentea*.

aspera, see *Atrypa aspera*.

bidentata, see *Rhynchonella bidentata*.

bisaculata, McChesney, 1860, New Pal. Foss., p. 82, Kaskaskia Gr. Not recognized.

borealis, Castelnau, 1843, Syst. Sil., p. 40. Not recognized.

bovidens, Morton, 1836, Am. Jour. Sci., vol. 29, p. 150, Coal Meas.

brevirostris, see *Rhynchonella brevirostris*.
brevilobata, Swallow, 1863, Trans. St. Louis Acad. Sci., vol. 2, p. 84, Kaskaskia Gr.

burkingtonensis, White, 1860, Bost. Jour. Nat. Hist., p. 228, and Geo. Sur. W. 100th Mer., vol. 4, p. 93, Kinderhook Gr.
concentrica, syn. for *Athyris spiriferoides*.
cooperensis, n. sp., Keokuk Gr. Proposed instead of *T. parva*, Swallow, 1863, Trans. St. Louis Acad. Sci., vol. 2, p. 83, which name was preoccupied.



FIG. 627.—*Terebratula bovidens*.

crenulata, Sowerby, 1840, (*Atrypa crenulata*.) Geo. Trans., 2d series, vol. 5, p. 704, Devonian.

cuneata, see *Rhynchonella cuneata*.

elia, Hall, 1867, Pal. N. Y., vol. 4, p. 390, Up. Held. Gr.

formosa, Hall, 1858, Trans. Alb. Inst., vol. 4, p. 6, and Bull. Am. Mus. Nat. Hist., p. 55, Warsaw Gr.

geniculosa, syn. for *Terebratula bovidens*.
gracilis, Swallow, 1863, Trans. St. Louis Acad. Sci. The name was preoccupied by Von Buch in 1834. See *T. swallovana*.

harmonia, Hall, 1867, Pal. N. Y., vol. 4, p. 388, Up. Held. Gr.

inornata, McChesney, 1860, New Pal. Foss. Carb.

insperata, Phillips, 1841, Pal. Foss., Devonian.

interplicata, see *Anastrophia interplicata*.
jucunda, Hall, 1867, Pal. N. Y., vol. 4, p. 390, Up. Held. Gr.

lacunosa. Not American.

lapillus, Morton, 1836, Am. Jour. Sci. and Arts, vol. 29, p. 149, Coal Meas.

lens, see *Cryptonella lens*.

laticosta, see *Atrypa laticosta*.

lincklæni, see *Cryptonella lincklæni*.

lynx, see *Orthis lynx*.

marcyi, see *Retzia marcyi*.

marginalis, see *Atrypa marginalis*.
micelini, see *Orthis micelini*.
millepunctata, syn. for *T. bovidens*.
mormoni, see *Retzia mormoni*.
navicella, Hall, 1867, Pal. N. Y., vol. 4, p. 391, Ham. Gr.
nuciformis, Morton, 1836, Am. Jour. Sci. and Arts, vol. 29, p. 149, Coal Meas.
nucula, see *Rhynchonella nucula*.
ontario, Hall, 1867, Pal. N. Y., vol. 4, p. 418, Ham. Gr.
ovoides, see *Rensselæria ovoides*.
parva, Swallow, 1863, Trans. St. Louis Acad. Sci., p. 83. The name was preoccupied by d'Archiac in 1846. See *Terebratula cooperensis*.
pennata, see *Spirifera pennata*.
perinflata, Shumard, 1859, Trans. St. Louis Acad. Sci., vol. 1, p. 392, Permian Gr.
planirostra, see *Cryptonella planirostra*.
rectirostra, see *Cryptonella rectirostra*.
reticularis, see *Atrypa reticularis*.
rockymontana, see *Rhynchonella rocky-montana*.
roemingeri, Hall, 1863, 16th Rep. N. Y. Mus. Nat. Hist., p. 48, and Pal. N. Y., vol. 4, p. 389, Ham. Gr.
rowleyi, Worthen, 1884, Bull. No. 2, Ill. St. Mus. Nat. Hist., p. 23, Burlington Gr.
sacculus, Martin, 1809, Petrif. Derb., Low. Carb.
schlotheimi, see *Camerophoria schlotheimi*.
shumardana, S. A. Miller, 1883, 2d Ed. Am. Pal. Foss., p. 299, Kaskaskia Gr. Proposed instead of *T. arcuata*, Swallow, 1863, Trans. St. Louis Acad. Sci., vol. 2, p. 83, which was preoccupied.
simulator, Hall, 1867, Pal. N. Y., vol. 4, p. 391, Ham. Gr.
spiriferoides, see *Athyris spiriferoides*.
stricklandi, see *Rhynchonella stricklandi*.
subretziaforma, McChesney, 1860, Pal. Foss., p. 82, Kaskaskia Gr. Not recognized.
subtilita, see *Athyris subtilita*.
sullivanti, Hall, 1867, Pal. N. Y., vol. 4, p. 387, Up. Held. Gr.
swallovana, S. A. Miller, 1883, 2d Ed. Am. Pal. Foss., p. 299, Kaskaskia Gr. Proposed instead of *T. gracilis*, Swallow, 1863, Trans. St. Louis Acad. Sci., vol. 2, p. 83, which was preoccupied.
traversensis, Winchell, 1866, Rep. Low. Penin. Mich., p. 95, Ham. Gr.
trinuclea, see *Athyris trinuclea*.
turgida, Hall, 1858, Trans. Alb. Inst., vol. 4, p. 6, and Bull. Am. Mus. Nat. Hist., p. 54, Warsaw Gr.
uta, see *Rhynchonella uta*.
utah, Hall & Whitfield, 1877, U. S. Geo. Expl. 40th parallel, vol. 4, p. 258, Waverly Gr.
valencienni, Castelnau, 1843, Syst. Sil., p. 39. Not recognized.
wilsoni, see *Rhynchonella wilsoni*.
Terebratulites, Schlotheim, syn. for *Spirifera*.
biforatus, see *Orthis biforata*.

TREMATIS, Sharpe, 1848, Quar. Jour. Geo. Soc., vol. 13, p. 66. [Ety. *trema*, an opening.] Shell suborbicular or transversely oval, lenticular; valves unequally convex; umbo of the upper or dorsal valve submarginal, slightly projecting; lower or ventral valve with a subcentral umbo, behind which a narrow, oblong, oval slit reaches to near the posterior margin, and afforded passage to the pedicle fibers of attachment; shell punctate in the outer layers, and fibrous and of a pearly luster within. Type *T. terminalis*.

cæolata, see *Obolella cæolata*.

cancellata, Sowerby, 1825, (*Orbicula cancellata*.) Zool. Jour., vol. 2, Trenton Gr.

crassa, see *Obolella crassa*.

crassipuncta, Ulrich, 1889, Am. Geo., vol. 4, p. 22, Hud. Riv. Gr.

dyeri, S. A. Miller, 1874,

Cin. Quar. Jour. Sci., vol. 1, p. 347, Hud. Riv. Gr.

filosa, see *Schizocrania filosa*.

fragilis, Ulrich, 1889, Am. Geo., vol. 4, p. 21, Utica Slate.

huronensis, Billings, 1862, Pal. Foss., vol. 1, p. 53, matis *dyeri*. Black Riv. Gr.

montrealensis, Billings, 1862, Pal. Foss., vol. 1, p. 52, Trenton Gr.

millepunctata, Hall, 1866, 24th Rep. N. Y. Mus. Nat. Hist., p. 221, Hud. Riv. Gr.

oblata, Ulrich, 1889, Am. Geo., vol. 4, p. 23, Hud. Riv. Gr.

ottawensis, Billings, 1862, Pal. Foss., vol. 1, p. 53, Trenton Gr.

pannulus, see *Kutorgina pannulus*.

punctostriata, Hall & Whitfield, 1873, 23d Rep. N. Y. Mus. Nat. Hist., p. 243, Trenton and Hud. Riv. Gr.

(?) *pustulosa*, Hall, 1866, 24th Rep. N. Y. Mus. Nat. Hist., p. 222, Hud. Riv. Gr.

quincuncialis, Miller & Dyer, 1878, Cont. to Pal. No. 2, p. 8, Hud. Riv. Gr.

rudis, Hall & Whitfield, 1873, 23d Rep. N. Y. Mus. Nat. Hist., p. 243, Trenton Gr.

terminalis, Emmons, 1842, (*Orbicula terminalis*.) Geo. Rep. N. Y., p. 395, and Pal. N. Y., vol. 1, p. 100, Trenton Gr.

umbonata, Ulrich, 1889, Am. Geo., vol. 4, p. 23, Hud. Riv. Gr.

TREMATOSPIRA, Hall, 1859, 12th Rep. N. Y. Mus. Nat. Hist., p. 27. [Ety. *trema*, foramen; *spira*, a spire, in allusion to the perforation in the beak of the ventral valve.] Transverse, elliptical or subrhomboidal, inequivalve; mesial fold and sinus; surface plicated; internal spires, as in *Spirifera*; hinge-line short; cardinal angles rounded; valves articulated by teeth and sockets; beak of ventral valve produced or incurved,

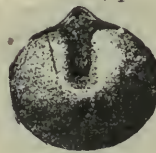


FIG. 629. — Trematis millepunctata.

and truncated by a small, round perforation, separated from the hinge-line by a deltidium; deep, triangular pit beneath the beak of the ventral valve, which is filled by the closely incurved beak of the dorsal valve; structure punctate. Type *T. costata* and *T. multistriata*.



FIG. 630.—*Trematospira acadiae*.

- acadiae*, Hall, 1860, Can. Nat. and Geo., vol. 5, p. 144, Up. Sil.
camura, Hall, 1852, (*Atrypa camura*.) Pal. N. Y., vol. 2, p. 273, Low. Held. Gr.
costata, Hall, 1859, Pal. N. Y., vol. 3, p. 210, Low. Held. Gr.
deweyi, see *Rhynchospira deweyi*.
formosa, see *Rhynchospira formosa*.
gibbosa, Hall, 1860, 13th Rep. N. Y. Mus. Nat. Hist., p. 82, and Pal. N. Y., vol. 4, p. 272, Ham. Gr.
globosa, Hall, 1857, 10th Rep. N. Y. Mus. Nat. Hist., p. 87, and Pal. N. Y., vol. 3, p. 215, (*Waldheimioglobosa*), Low. Held. Gr.
granulifera, Meek, 1872, Proc. Acad. Nat. Sci. Phil., p. 318, and Ohio Pal., vol. 1, p. 128, Hud. Riv. Gr.
hirsuta, Hall, 1857, (*Atrypa hirsuta*.) 10th Rep. N. Y. Mus. Nat. Hist., p. 168, and Pal. N. Y., vol. 4, p. 274, Up. Held. and Ham. Gr.
imbricata, Hall, 1857, (*Leptocoelia imbricata*.) 10th Rep. N. Y. Mus. Nat. Hist., p. 108, and Pal. N. Y., vol. 3, p. 246, Low. Held. Gr.
infrequens, Walcott, 1885, Mongr. U. S. Geo. Sur., vol. 8, p. 151, Lower Devonian.
mathewsoni, McChesney, 1861, New Pal. Foss., p. 71, Niagara Gr.
multistriata, Hall, 1857, (*Spirifer multistriatus*.) 10th Rep. N. Y. Mus. Nat. Hist., p. 59, Low. Held. Gr.
liniuscula, Winchell, 1866, Rep. Low. Peninsula Mich., p. 94, Ham. Gr.
 (?) *nobilis*, Hall, 1860, (*Rhynchospira nobilis*.) 13th Rep. N. Y. Mus. Nat. Hist., p. 83, Ham. Gr.
perforata, Hall, 1857, (*Spirifera perforata*.) 10th Rep. N. Y. Mus. Nat. Hist., p. 60, Low. Held. Gr.
 (?) *quadriplicata*, see *Rhynchotretra quadriplicata*.
rectirostris, Hall, 1856, (*Waldheimia rectirostra*.) 10th Rep. N. Y. Mus. Nat. Hist., p. 49, and Pal. N. Y., vol. 3, p. 217, Low. Held. Gr.
simplex, Hall, 1856, Pal. N. Y., vol. 3, p. 211, Low. Held. Gr.
Trigonotretra, König, 1825, Icon. Foss. Sect., p. 3. [Ety. *trigonos*, a triangle; *tretos*, perforated.] Syn. for *Spirifera*. Meek, concluding that *S. cuspidatus* mentioned by Sowerby in Minn. Conch., vol. 2, p. 42, should be considered as the type of *Spirifera*, proposed to retain *Trigonotretra* for shells of the type of *S. striata*, contrary to the views of most authors. See Pal. Up. Mo., p. 18.

TRIMERELLA, Billings, 1862, Pal. Foss., vol. 1, p. 166. [Ety. *treis*, three; *meros*, part; *ella*, diminutive.] Large subovate or subcircular; valves convex; beaks solid and transversely striated;

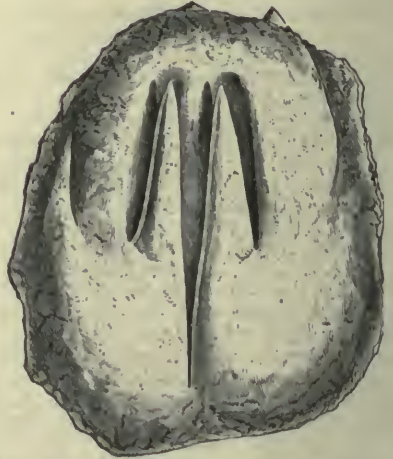


FIG. 631.—*Trimerella grandis*. Cast of dorsal valve.

shell thick, and surface concentrically striated; area of pedicle valve longer than wide; deltidium large; hinge thick, elevated, rudely or slightly denticulate; cardinal facet large; crescent well defined; platforms elevated and doubly vaulted, occasionally solid and slightly raised; median plate in both valves, longest in the brachial one. Type *T. grandis*.



FIG. 632.—*Trimerella grandis*. Cast of ventral valve.

- acuminata*, Billings, 1862, Pal. Foss., vol. 1, p. 167, Guelph Gr.
billingsi, Dall, 1871, Am. Jour. Conch., vol. 7, p. 82, Guelph Gr.

dalli, Davidson & King, 1872, Brighton Meeting Brit. Assoc., and Quar. Jour. Geo. Soc., 1874, p. 154, Guelph Gr.

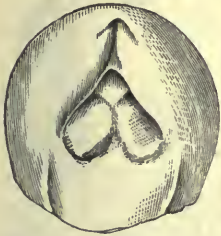


FIG. 633.—*Trimerella galtensis*.

galtensis, Billings, 1862, (Obolus *galtensis*.) Pal. Foss., vol. 1, p. 168, Guelph Gr. *grandis*, Billings, 1862, Pal. Foss., vol. 1, p. 166, Guelph Gr. *minor*, Dall, syn. for *T. galtensis*.

ohioensis, Meek, 1871, Am. Jour. Sci., 2d series, vol. 1, p. 315, and Ohio Pal., vol. 1, p. 183, Niagara Gr.

TRIPLESIA, Hall, 1858, 12th Rep. N. Y.

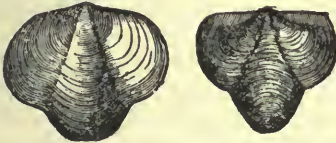


FIG. 634.—*Triplesia extans*.

Mus. Nat. Hist., p. 44. [Ety. *triplosias*, thrice; in allusion to the trilobate character of the shell.] Shell transverse or elongate, trilobate or subtrilobate; ventral valve deeply sinuous and dorsal, having a corresponding fold; hinge-line straight; area small; foramen triangular; surface concentrically striated; ventral valve with a strong tooth on each side of the fissure; muscular impressions small; dorsal valve with a prominent bifurcating cardinal process, on each side of which there is a brachial process directed obliquely inward and laterally. Type *T. extans*.

congesta, Conrad, 1842, (*Atrypa congesta*.) Jour. Acad. Nat. Sci., vol. 8, p. 265, and Pal. N. Y., vol. 2, p. 67, Clinton Gr. *cuspidata*, Hall, 1847, (*Atrypa cuspidata*.) Pal. N. Y., vol. 1, p. 138, Trenton Gr.

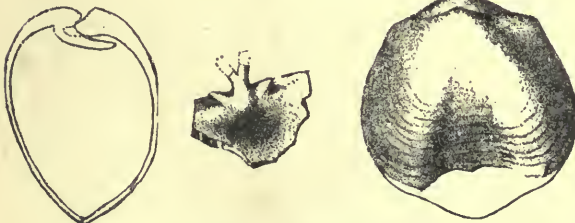


FIG. 635.—*Triplesia ortonii*.

extans, Emmons, 1842, (*Atrypa extans*.) Geo. Rep. 2d Dist. N. Y., p. 395, and Pal. N. Y., vol. 1, p. 137, Trenton Gr. *lateralis*, Whitfield, 1886, Bull. Am. Mus. Nat. Hist., vol. 1, p. 303, Birdseye Gr.

nucleus, Hall, 1847, (*Atrypa nucleus*.) Pal. N. Y., vol. 1, p. 138, Trenton Gr. *ortonii*, Meek, 1872, (*Dicraniscus ortonii*.) Am. Jour. Sci. and Arts, 3d ser., vol. 4, p. 280, and Ohio Pal., vol. 1, p. 178, Niagara Gr.

primordialis, Whitfield, 1878, Ann. Rep. Geo. Sur. Wis., p. 51, and Geo. Wis., vol. 4, p. 172, Potsdam Gr. *putillus*, Hall, syn. for *T. waldronensis*. *radiata*, Whitfield, 1889, Bull. Am. Mus. Nat. Hist., vol. 2, p. 43, Calciferous Gr. *waldronensis*, Miller & Dyer, 1878, (*Spirifera* ? *waldronensis*.) Jour. Cin. Soc. Nat. Hist., vol. 1, p. 37, Niagara Gr.

TROPIDOLEPTUS, Hall, 1857, proposed in 10th Rep., but described in 1859 in 12th Rep. N. Y. Mus. Nat. Hist., p. 31. [Ety. *tropis*, the keel or bottom of a ship; *leptos*, slender.] General form of *Strophomena*; surface plicated; structure punctate; ventral valve convex, with an area and wide fissure beneath the beak; dental lamellæ distinct from the margin of the fissure, crenulate; dorsal valve concave, with crenulate dental fossets; a strong, cardinal process, with diverging lobes in the interior, which support slender crura that converge to and unite with the median crest. Type *T. carinatus*.

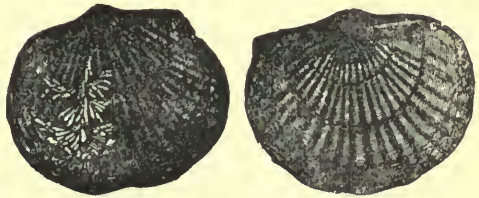


FIG. 636.—*Tropidoleptus carinatus*.

carinatus, Conrad, 1839, (*Strophomena carinata*.) Ann. Geo. Rep. N. Y., p. 64, and Pal. N. Y., vol. 4, p. 407, Ham. Gr. *occidens*, Hall, 1860, 13th Rep. N. Y. Mus. Nat. Hist., p. 91, and Pal. N. Y., vol. 4, p. 408, Ham. Gr.

VITULINA, Hall, 1860, 13th Rep. N. Y. Mus. Nat. Hist., p. 72. [Ety. mythological name.] Externally it is like *Leptocœlia*, but distinguished by its strong dental lamellæ and processes. Type *V. pustulosa*.

pustulosa, Hall, 1860, 13th Rep. N. Y. Mus. Nat. Hist., p. 72, and Pal. N. Y., vol. 4, p. 410, Tully limestone.

WALDHEIMIA, King, 1849, Monograph of Permian Fossils, p. 145. [Ety. proper name.] Shell circular, subquadrate, transverse or elongated; valves unequally convex, smooth, or plicated; beak truncated, perforated; deltidium in one or two pieces; loop long, formed of lamellæ attached by the crura to the hinge

plate; one tooth on each side of the deltidium, supported by plates, and fitting in the sockets of the dorsal valve; structure punctate. Type *W. australis*.



FIG. 637.—*Waldhelmia australis*. Dorsal valve; *f*, cardinal process; *t*, dental sockets; *p*, hinge plate; *s*, septum; *c*, crura of the loop; *l*, reflected portion of the loop; *m*, quadruple adductor adductor impression. Ventral valve; *f*, foramen; *d*, deltidium; *t*, teeth; *a*, single adductor impression; *r*, cardinal muscle; *z*, accessory muscles; *p*, pedicle muscles; *v*, position of the vent; *z*, attachment of pedicle sheath.

compacta, White & St. John, 1868, Trans.

Chi. Acad. Sci., p. 119, Up. Coal Meas.

deweyi, see *Retzia deweyi*.

formosa, see *Retzia formosa*.

globosa, see *Trematospira globosa*.

globosa.

rectirostra, see *Trematospira rectirostra*.



FIG. 638.—*Waldhelmia australis*.

WHITFIELDIA, Davidson, 1881,

Lond. Geo. Mag., vol. 8,

p. 289. [Ety. proper

name.] While *Meristella*

is distinguished

from *Merista* by having

no shoe-lifter process; *Whitfieldia* is distinguished from both by the absence of those peculiar ring-shaped processes attached to the loop, and has instead only a short, bifurcating process, where in *Merista* and *Meristella* the rings are formed. These internal differences in the spirals seem to distinguish the genera. Type *W. tumida*.

maria, Hall, 1863, (*Meristella maria*.) Trans. Alb. Inst., vol. 4, p. 212, Niagara Gr.

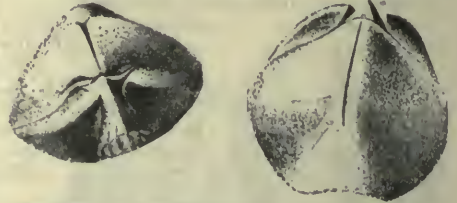


FIG. 639.—*Whitfieldia maria*. Internal casts.

ZYGOSPIRA, Hall, 1862, 15th Rep. N. Y. Mus.

Nat. Hist., p. 126. [Ety. *zygos*, yoke;

spira, spire.] General form of *Atrypa*

with internal spires having a broad

loop passing from the outer limbs of

the spiral band entirely across from

side to side, near to or above the center,

and close to the inner side of the dorsal

valve. Type *Z. modesta*.

concentrica, Ulrich, 1879, Jour. Cin. Soc.

Nat. Hist., vol. 2, p. 14, Hud. Riv. Gr.

headi, Billings, 1862, (*Athyris headi*.) Pal.

Foss., vol. 1, p. 147, Hud. Riv. Gr.

headi var. *anticostiensis*, Billings, 1862,

(*Athyris headi* var. *anticostiensis*.) Pal.

Foss., vol. 1, p. 147, Hud. Riv. Gr.

headi var. *borealis*, Billings, 1862, (*Athyris*

headi var. *borealis*.) Pal. Foss., vol. 1,

p. 147, Hud. Riv. Gr.

headi, Meek, see *Glassia headi*.

minima, Hall, 1879, Desc. New Spec.

Foss., p. 14, and 11th Rep. Geo. and

Nat. Hist. Ind., p. 305, Niagara Gr.

modesta, Say, 1847, (*Atrypa modesta*.)

Pal. N. Y., vol. 1, p. 141, Trenton and

Hud. Riv. Gr.

modesta var. *cincinnatiensis*,

Meek, 1872, Pal. Ohio, vol.

1, p. 126, Hud. Riv. Gr.

pauper, Billings, 1866, Catal.

Sil. Foss. Antic., p. 46, An-

subconca, Meek & Wor-

then, 1868, Geo. Sur. Ill., vol. 3, p. 380,

Low. Held. Gr.



FIG. 640.—*Zygospira modesta*.

CLASS PTEROPODA.

THE Class Pteropoda consists wholly of marine animals of small size, furnished with a pair of fins at the sides of the head, by means of which they swim in the open sea. The living forms are divided into two orders: the Gymnosomata and Thecosomata. The Gymnosomata have no shells, and occur in such prodigious numbers that they furnish food for whales and many sea-birds. The Thecosomata have either straight or coiled shells, some of which are glassy in their texture and very beautiful. It may well be doubted whether or not any of the Palæozoic fossils belong to this order. They are referred to the following families:

FAMILY ASPIDELLIDÆ.—Aspidella.

FAMILY CLATHROCELIIDÆ.—Clathrocellia.

FAMILY CONULARIIDÆ.—Conularia.

FAMILY HYOLITHIDÆ.—Coleolus, Coleoprion, Diplotheca, Hyolithellus, Hyolithes, Pharetrella, Stenotheca.

FAMILY MATTHEVIDÆ.—Matthevia.

FAMILY PTEROTHECIDÆ.—Pterotheca,

FAMILY SCENELLIDÆ.—Scenella.

FAMILY TENTACULITIDÆ.—Styliola, Tentaculites.

ASPIDELLA, Billings, 1872, Am. Jour. Sci., 3d ser., vol. 3, and Pal. Foss., vol. 2, p. 76. [Ety. *aspidella*, little shield.] Small, ovate, bordered by a narrow ring within which it is concave; in the middle there is a ridge, from which grooves radiate to the border. Type *A. terranovica*.



FIG. 641.—*Aspidella terranovica*.

terranovica, Billings, 1872, Am. Jour. Sci., 3d ser., vol. 3, and Pal. Foss., vol. 2, p. 77, Taconic.

Camerotheca, Matthew, 1885, Can. Rec. Sci., vol. 1, p. 149, syn. for *Hyolithes gracilis*, see *Hyolithes gracilis*.

CLATHROCELLIA, Hall, 1879, Pal. N. Y., vol. 5, pt. 2, p. 203. [Ety. *clathro*, latticed; *kollia*, belly.] An oblique conical tube, expanding more rapidly on one side than the other; interior crossed by unsymmetrical, arching, septal lines and longitudinal ones, which give it a cancellated aspect; shell thin, translucent, lamellose. Type *C. eborica*.

eborica, Hall, 1879, Pal. N. Y., vol. 5, pt. 2, p. 204, Ham. Gr.

Clioderma, Hall, syn. for *Pterotheca*.

attenuata, see *Pterotheca attenuata*.

expansa, see *Pterotheca expansa*.

COLEOLUS, Hall, 1879, Pal. N. Y., vol. 5, pt. 2, p. 184. [Ety. *koleos*, sheath.] Tubuliform, elongate-conical, straight or slightly curved, annulated, sometimes obliquely, sometimes longitudinally striated, interior smooth. Type *C. tenuicinctus*.



FIG. 642.—*Coleolus acicula*.

acicula, Hall, 1843, (*Orthoceras acicula*) Geo. Sur. 4th Dist. N. Y., p. 243, and Pal. N. Y., vol. 5, pt. 2, p. 187, Genesee Slate.

aciculatus, Hall, 1860, (*Dentalium aciculatum*) 13th Rep. N. Y. St. Mus. Nat. Hist., p. 107, Marcellus Shale and Portage Grs.

crenatocinctus, Hall, 1879, Pal. N. Y., vol. 5, pt. 2, p. 188, Up. Held. Gr.

gracilis, Hall, 1879, Pal. N. Y., vol. 5, pt. 2, p. 190, Chemung Gr.

herzeri, Hall, 1888, Pal. N. Y., vol. 7, p. 7, Waverly Gr.

lævis, Walcott, 1885, Monogr. U. S. Geo. Sur., vol. 8, p. 199, Devonian.

mohri, Hall, 1879, Pal. N. Y., vol. 5, pt. 2, p. 189, Up. Held. Gr.

spinulus, Hall, 1879, Desc. New Spec. Foss., p. 18, and 11th Rep. Geo. and Nat. Hist. Ind., p. 322, Niagara Gr.

- tenuicinctus, Hall, 1876, (Coleoprion tenuicinctum,) *Illust. Devon. Foss.*, pl. 27, Ham. Gr.
- COLEOPRION, Sandberger, 1847, Leonhardt & Bronn, *Jahrbuch*, vol. 1, p. 25. [Ety. *koleos*, sheath; *prion*, saw.] Tubuliform, appearing as an elongate cone, encircled by oblique annulations, which are interrupted along a longitudinal line, and attenuate at their extremities; internal walls smooth. Type *C. gracilis*.
- minutum, Walcott, 1885, *Monogr. U. S. Geo. Sur.*, vol. 8, p. 85, Trenton Gr.
- tenuis, Hall, 1879, *Pal. of N. Y.*, vol. 5, pt. 2, p. 184, Ham. Gr.
- tenuicinctum*, see *Coleolus tenuicinctus*.
- CONULARIA, Miller, 1821, in Sowerby's *Minn. Conch.*, vol. 3, p. 107. [Ety. *conulus*, little cone.] Elongate pyramidal; transverse section varying from quadrangular to octagonal; angles indented by longitudinal grooves; septum near the apex; surface reticulated and ornamented. Type *C. quadrisulcata*.
- asperata, Billings, 1866, *Catal. Sil. Foss. Antic.*, p. 21, Hud. Riv. Gr.
- bifurca, Ringueberg, 1886, *Bull. Buf. Soc. Nat. Sci.*, vol. 5, p. 18. Not properly defined.
- byblis, White, 1862, *Proc. Bost. Soc. Nat. Hist.*, vol. 9, p. 22, Waverly Gr.
- cayuga, Hall, 1876, *Illust. Devonian Foss.*, pl. 28, and *Pal. N. Y.*, vol. 5, pt. 2, p. 211, Ham. Gr.
- chesterensis, Worthen, 1883, *Geo. Sur. Ill.*, vol. 7, p. 325, Kaskaskia Gr.
- congregata, Hall, 1876, *Illust. Devonian Foss.*, pl. 28, and *Pal. N. Y.*, vol. 5, pt. 2, p. 214, Portage Gr.
- continens, Hall, 1876, *Illust. Devonian Foss.*, pl. 28, and *Pal. N. Y.*, vol. 5, pt. 2, p. 212, Marcellus Shale.
- continens var. rudis, Hall, 1879, *Pal. N. Y.*, vol. 5, pt. 2, pl. 28, Ham. Gr.
- crawfordsvillensis, Owen, 1862, *Geo. Sur. Ind.*, p. 362, Keokuk Gr.
- crebristriata, Hall, 1876, *Illust. Devonian Foss.*, pl. 29, and *Pal. N. Y.*, vol. 5, pt. 2, p. 210, Ham. Gr.
- crustula, White, 1880, 12th Rep. U. S. Geo. Sur. Terr., p. 170, Coal Meas.
- elegantula, Meek, 1871, *Proc. Acad. Nat. Sci. Phil.*, p. 85, and *Ohio Pal.*, vol. 1, p. 288, Up. Held. Gr.
- formosa, Miller & Dyer, 1878, *Jour. Cin. Soc. Nat. Hist.*, vol. 1, p. 38, Hud. Riv. Gr.
- gattingeri, Safford, 1869, *Geo. of Tenn.*, p. 289, Trenton Gr.
- gracilis, Hall, 1847, *Pal. N. Y.*, vol. 1, p. 224, Trenton Gr.
- granulata, Hall, 1847, *Pal. N. Y.*, vol. 1, p. 223, Trenton Gr.
- hudsoni, Emmons, 1856, *Am. Geo.*, vol. 1, p. 208, Hud. Riv. Gr.
- huntana, Hall, 1859, *Pal. N. Y.*, vol. 3, p. 348, Low. Held. Gr.
- indentata, Conrad, 1854, *Proc. Acad. Nat. Sci.*, vol. 7, p. 31, Trenton Gr.
- infrequens, Hall, 1879, *Desc. New Spec. Foss.*, p. 17, and 11th Rep. Geo. and Nat. Hist. Ind., p. 321, Niagara Gr.
- laqueata, Conrad, 1841, *Ann. Rep. N. Y.*, p. 57, Niagara Gr.
- lata, Hall, 1859, *Pal. N. Y.*, vol. 3, p. 479, Oriskany sandstone.
- longa, Hall, 1852, *Pal. N. Y.*, vol. 2, p. 295, Niagara Gr.
- magnifica, Spencer, 1884, *Bull. No. 1, Mus. Univ. St. Mo.*, p. 58, Niagara Gr.
- marionensis, Swallow, 1860, *Trans. St. Louis Acad. Sci.*, vol. 1, p. 656, Ham. Gr.
- miconema, Meek, 1871, *Proc. Acad. Nat. Sci. Phil.*, p. 84, and *Ohio Pal.*, vol. 2, p. 316, Waverly Gr.
- missouriensis, Swallow, 1860, *Trans. St. Louis Acad. Sci.*, vol. 1, p. 657, and *Geo. Sur. Ill.*, vol. 5, p. 541, St. Louis Gr.
- molaris, White, 1876, *Proc. Acad. Nat. Sci.*, p. 33, Devonian.
- multicostata, Meek & Worthen, 1865, *Proc. Acad. Nat. Sci.*, p. 252, Waverly Gr.
- multipuncta*, Ringueberg, 1886, *Bull. Buf. Soc. Nat. Sci.*, vol. 5, p. 18. Not properly defined.
- newberryi, Winchell, 1865, *Proc. Acad. Nat. Sci.*, p. 130, Waverly Gr.
- niagarensis, Hall, 1852, *Pal. N. Y.*, vol. 2, p. 294, Niagara Gr.
- osagensis, Swallow, 1863, *Trans. St. Louis Acad. Sci.*, vol. 2, p. 98, Kaskaskia Gr.
- papillata, Hall, 1847, *Pal. N. Y.*, vol. 1, p. 223, Trenton Gr.
- planocostata, Dawson, 1868, *Acad. Geol.*, p. 307, Carb.
- pyramidalis, Hall, 1859, *Pal. N. Y.*, vol. 3, p. 347, Low. Held. Gr.
- quadrata, Walcott, 1876, 28th Rep. N. Y. St. Mus. Nat. Hist., p. 93, Trenton Gr.
- quadrisulcata, (?) Miller, 1821, *Minn. Conch.*, vol. 3, p. 107, Niagara Gr.
- rugosa, Spencer, 1884, *Bull. No. 1, Mus. Univ. St. Mo.*, p. 59, Niagara Gr.
- splendida, Billings, 1866, *Catal. Sil. Foss. Antic.*, p. 21, Hud. Riv. Gr.
- subcarbonaria, Meek & Worthen, 1865, *Proc. Acad. Nat. Sci.*, p. 253, and *Geo. Sur. Ill.*, vol. 5, p. 520, Keokuk Gr.
- subulata, Hall, 1858, *Trans. Alb. Inst.*, vol. 4, p. 32, and *Bull. Am. Mus. Nat. Hist.*, p. 91, Warsaw Gr.
- transversa, Ringueberg, 1886, *Bull. Buf. Soc. Nat. Sci.*, vol. 5, p. 19, Niagara Gr.

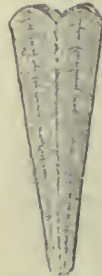


FIG. 644.—*Conularia quadrisulcata*.

trentonensis, Hall, 1847, Pal. N. Y., vol. 1, p. 222, Trenton and Hud. Riv. Grs. triplicata, Swallow, 1860, Trans. St. Louis Acad. Sci., vol. 1, p. 657, Ham. Gr. undulata, Conrad, 1841, Ann. Rep. N. Y., p. 57, and Pal. N. Y., vol. 5, pt. 2, p. 208, Ham. Gr. verneuilana, Emmons, 1846, Am. Quar. Jour. Agr. and Sci., vol. 4, p. 330. Subcarboniferous. victa, White, 1862, Proc. Bost. Soc. Nat. Hist., vol. 9, p. 22, Burlington Gr. whitii, Meek & Worthen, 1865, Proc. Acad. Nat. Sci., p. 253, Waverly Gr. wilkinsi, Spencer, 1884, Bull. No. 1, Mus. Univ. St. Mo., p. 59, Niagara Gr.

DIPLOTHECA, Matthew, 1885, Am. Jour. Sci. and Arts, 3d ser., vol. 30, p. 293. [Ety. *diploos*, double; *Theca*, a genus.] Slender, conical, section triangular; internal septa dividing it in segments; body cavity separated from one side by a thin partition, supported by delicate transverse septa; distinguished from *Hyalolithes* by more rapidly expanding, and by a firmer, rounder side, where it has the support of the lateral septa. Type *D. acadica*.

acadica, Matthew, 1885, Am. Jour. Sci. and Arts, 3d ser., vol. 30, p. 294, St. John Gr.

hyattana, Matthew, 1885, Am. Jour. Sci. and Arts, 3d ser., vol. 30, p. 294, St. John Gr.

hyattana var. *caudata*, Matthew, 1885, Am. Jour. Sci. and Arts, 3d ser., vol. 30, p. 294, St. John Gr.

HYOLITHELLUS, Billings, 1871, Can. Nat. and Geol., vol. 6, p. 240, and Am. Jour. Sci. and Arts, 3d ser., vol. 3, p. 360. [Ety. diminutive of *Hyalolithes*.] Distinguished from *Hyalolithes* by its long, slender form and structure of the operculum. Type *H. micans*.



FIG. 645.—*Hyalithes micans*. Terminal portion enlarged.

the base to an acute extremity; dorsal side usually more convex than the ventral, and often longitudinally sinuate; aperture usually oblique and extended on the ventral side; surface smooth, or having arching or transverse striae. Type *H. acutus*.

acilis; Hall, 1876, Illust. Devonian Foss., pl. 27, and Pal. N. Y., vol. 5, pt. 2, p. 197, Ham. Gr.

aculeatus, Hall, 1860, (*Theca aculeata*.) 13th Rep. N. Y. St. Mus. Nat. Hist., p. 107, Kinderhook Gr.

americanus, Billings, 1871, (*Theca triangularis*.) Hall, Can. Nat. and Geol., vol. 6, p. 213, Up. Taconic.

baconi, Whitfield, 1878, Ann. Rep. Geo. Sur. Wis., p. 77, and Geo. Wis., vol. 4, p. 225, Trenton Gr.

carbonaria, Walcott, Monogr. U. S. Geo. Sur., vol. 8, p. 264, Subcarboniferous.

centennialis, Barrett, 1877, Ann. Lyc. Nat. Hist., vol. 11, p. 299, Low. Held. Gr.

communis, Billings, 1871, Can. Nat. and Geol., vol. 6, p. 213, Up. Taconic.

danianus, Matthew, 1884, Bull. U. S. Geo. Sur., vol. 2, p. 283, St. John Gr.

emmonsii, Ford, 1873, Am. Jour. Sci., 3d ser., vol. 5, p. 214, Up. Taconic.

excellens, Billings, 1874, Pal. Foss., vol. 2, p. 70, Up. Taconic.

gibbosus, Hall & Whitfield, 1873, 23d Rep. N. Y. St. Mus. Nat. Hist., p. 242, Potsdam Gr.

gracilis, Matthew, 1885, (*Camerotherca gracilis*.) Can. Rec. Sci., vol. 1, p. 149, St. John Gr.

gregarius, Meek & Hayden, 1861, Proc. Acad. Nat. Sci. Phil., p. 436, and Pal. Up. Mo., p. 5, Potsdam Gr.

heros, Hall, 1888, Pal. N. Y., vol. 7, p. 7, Low. Held. Gr.

impar, Ford, 1872, Am. Jour. Sci., 3d ser., vol. 3, p. 419, Up. Taconic.

ligea, Hall, 1863, (*Theca ligea*.) 15th Rep. N. Y. St. Mus. Nat. Hist., p. 62, and Pal. N. Y., vol. 5, pt. 2, p. 195, Up. Held. Gr.

micans, see *Hyalithellus micans*.

micmac, Matthew, 1884, Bull. U. S. Geo. Sur., vol. 2, p. 283, St. John Gr.

neapolis, Clarke, 1885, Bull. U. S. Geo. Sur., No. 16, p. 56, Portage Gr.

parviusculus, Hall, 1862, (*Theca parviusculla*.) Geo. Rep. Wis., p. 425, Hud. Riv. Gr.

primordialis, Hall, 1861, (*Theca primordialis*.) Geo. Rep. Wis., p. 48, and Geo. Wis., vol. 4, p. 175, Potsdam Gr.

princeps, Billings, 1871, Can. Nat. and Geol., vol. 6, p. 213, and Am. Jour. Sci. and Arts, 3d ser., vol. 3, p. 355, Up. Taconic.

principalis, Hall, 1876, Illust. Devonian Foss., pl. 27, and Pal. N. Y., vol. 5, pt. 2, p. 196, Schoharie grit.

shaleri, Walcott, 1885, Bull. U. S. Geo. Sur., p. 283, Up. Taconic.

singulus, Hall, 1879, Pal. N. Y., vol. 5, pt. 2, p. 202, Ham. Gr.



FIG. 646.—*Hyalithes primordialis*.

striatus, Hall, 1876, *Illust. Devonian Foss.*, pl. 27, and *Pal. N. Y.*, vol. 5, pt. 2, p. 199, *Ham. Gr.*

subimbricatus, Ringueberg, 1888, *Proc. Acad. Nat. Sci. Phil.*, p. 135, *Niagara Gr.*

triliratus, Hall, 1879, *Pal. N. Y.*, vol. 5, pt. 2, p. 201, *Ham. Gr.*

vanuxemi, Walcott, 1885, *Monogr. U. S. Geo. Sur.*, vol. 8, p. 85, *Chazy Gr.*

MATTHEVIA, Walcott, 1885, *Am. Jour. Sci. and Arts*, 3d ser., vol. 30, p. 17. [Ety. proper name.] Shell conical; aperture sinuous, transverse section, ovate, elliptical or rounded subquadrate; two elongate interior chambers, diverging from the apex, open into the terminal chamber, and are crossed by a single



FIG. 647.—*Matthevia variabilis*.

imperforate septum; surface papillose; operculum calcareous, nucleus excentric, lines of growth concentric. Type *M. variabilis*.

variabilis, Walcott, 1885, *Am. Jour. Sci. and Arts*, 3d ser., vol. 30, p. 18, *Calceiferous Gr.*

PHARETRELLA, Hall, 1888, *Pal. N. Y.*, vol. 7, p. 7. Shell large, elongate, *Hyalolithes*-like in outline; apex acute; surface ornamented with transverse, undulating striae. Type *P. tenebrosa*.

tenebrosa, Hall, 1888, *Pal. N. Y.*, vol. 7, p. 7, *Genesee Slate*.

PTEROTHECA, Salter, 1852, *Rep. Brit. Ass'n*, p. 61. [Ety. *pteron*, wing; *Theca*, a genus.] Shells arcuate, somewhat calyptraeform, subtriangular, or oval; apex marginal and incurved on the same plane, carinate upon the back, abruptly and broadly expanding, with the anterior margin sinuate; interior concave, shallow; a concave, shelly partition covers the posterior half of the cavity. Type *P. transversa*.

anatiformis, Hall, 1847, (*Tellinomya anatiformis*.) *Pal. N. Y.*, vol. 1, p. 154, *Trenton Gr.*

attenuata, Hall, 1861, (*Cleioderma attenuata*.) 14th *Rep. N. Y. St. Mus. Nat. Hist.*, p. 98, *Trenton Gr.*

canaliculata, Hall, 1861, (*Cleioderma canaliculata*.) 14th *Rep. N. Y. St. Mus. Nat. Hist.*, p. 97, *Trenton Gr.*

expansa, Emmons, 1842, (*Delthyris expansus*.) *Geo. Rep. N. Y.*, p. 397, *Black Riv. and Trenton Grs.*

saffordi, Hall, 1861, (*Cleioderma saffordi*.) 14th *Rep. N. Y. St. Mus. Nat. Hist.*, p. 96, *Trenton Gr.*

transversa, Salter, 1852, *Rep. Brit. Ass'n*, p. 61, *Hud. Riv. Gr.*

undulata, Hall, 1861, (*Cleioderma undulata*.) 14th *Rep. N. Y. St. Mus. Nat. Hist.*, p. 97, *Trenton Gr.*

Pugiunculus aculeatus, see *Hyalolithes aculeatus*.

SCENELLA, Billings, 1872, *Can. Nat. and Geol.*, vol. 6, p. 479, and *Pal. Foss.*, vol. 2, p. 77. [Ety. *scene*, tent; *ella*, diminutive.] Shell small, depressed, conical; apex central, an obscure carina extending from the apex to the margin; apex slightly incurved opposite the carina; aperture nearly circular; surface finely reticulated. Type *S. reticulata*.

conica, Whiteaves, 1884, *Pal. Foss.*, vol. 3, p. 32, *Guelph Gr.*



conula, Walcott, 1885, *FIG. 648.—Scenella conica. Side view.*

Sur., vol. 8, p. 15, *Up. Taconic*.

reticulata, Billings, 1872, *Can. Nat. and Geol.*, vol. 6, p. 479, and *Pal. Foss.*, vol. 2, p. 77, *Up. Taconic*.

retusa, Ford, 1873, *Am. Jour. Sci. and Arts*, 3d series, vol. 5, p. 213, *Up. Taconic*.

varians, Walcott, 1886, *Bull. U. S. Geo. Sur.*, vol. 30, p. 127, *Up. Taconic*.

STENOTHECA, Hicks, 1872, *Quar. Jour. Geo. Soc.*, vol. 28, p. 180. [Ety. *stenos*, narrow; *Theca*, genus.] Shell small, curved; lines of growth strongly marked transversely. Type *S. cornucopia*.

acadica, Hartt, 1868, (*Discina acadica*.) *Acad. Geol.*, p. 644, *St. John Gr.*

concentrica, Matthew, 1885, *Trans. Roy. Soc. Can.*, p. 57, *St. John Gr.*

elongata, Walcott, 1885, *Monogr. U. S. Geo. Sur.*, vol. 8, p. 23, *Up. Taconic*.

hicksana, Matthew, 1885, *Trans. Roy. Soc. Can.*, p. 56, *St. John Gr.*

nasuta, Matthew, 1885, *Trans. Roy. Soc. Can.*, p. 58, and *Can. Nat. and Geol.*, vol. 6, p. 479, *St. John Gr.*

pauper, Billings, 1872, *Pal. Foss.*, vol. 2, p. 77, *Up. Taconic*.

radiata, Matthew, 1885, *Trans. Roy. Soc. Can.*, p. 57, *St. John Gr.*



FIG. 649.—*Stenotheca rugosa*.

rugosa, Hall, 1847, (*Meotoptoma rugosa*.) *Pal. N. Y.*, vol. 1, p. 306, *Up. Taconic*.

triangularis, Matthew, 1885, *Trans. Roy. Soc. Can.*, p. 58, *St. John Gr.*

STYLIOLA, Lesueur, 1826. [Ety. *stylos*, pillar.] Small, conical, without annulations which distinguishes it from *Tentaculites*.

fissurella, Hall, 1843, (*Tentaculites fissurellus*.) *Geo. 4th Dist. N. Y.*, p. 180, and *Pal. N. Y.*, vol. 5, pt. 2, p. 178, *Marcellus Shale and Genesee Slate*.

fissurella var. *intermittens*, Hall, 1879, *Pal. N. Y.*, vol. 5, pt. 2, p. 181, *Genesee Slate*.

fissurella var. *obsolescens*, Hall, 1879, *Pal. N. Y.*, vol. 5, pt. 2, p. 180, *Ham. Gr.*

fissurella var. *strigata*, Hall, 1879, *Pal. N. Y.*, vol. 5, pt. 2, p. 180, *Marcellus Shale*.

obtusa, Hall, 1879, Pal. N. Y., vol. 5, pt. 2, p. 182, Ham. Gr.
 spica, Hall, 1888, Pal. N. Y., vol. 7, p. 7, Ham. Gr.
TENTACULITES, Schlotheim, 1820, Petrefakten., p. 377. [Ety. *tentaculum*, feeler; *lithos*, stone.] Straight, elongate, attenuately conical tubes, annulated by abruptly elevated rings closely arranged near the apex, and more distant and stronger with the increasing size of the shell and distance from the apex; surface marked by fine transverse striæ, rarely by longitudinal striæ. Type *T. scalaris*.
 acula, Hall, 1888, Pal. N. Y., vol. 7, p. 6, Low. Held. Gr.
 arenosus, Hall, 1876, Illust. Devon. Foss., pl. 26, and Pal. N. Y., vol. 5, pt. 2, p. 166, Oriskany sandstone.
 attenuatus, Hall, 1876, Illust. Devonian Foss., pl. 26, and Pal. N. Y., vol. 5, pt. 2, p. 170, Ham. Gr.
 bellulus, Hall, 1876, Illust. Devonian Foss., pl. 26, and Pal. N. Y., vol. 5, pt. 2, p. 169, Ham. Gr.
 dexithea, Hall, 1888, Pal. N. Y., vol. 7, p. 6, Schoharie grit.
distans, see *Cornulites distans*.
 elongatus, Hall, 1859, Pal. N. Y., vol. 3, p. 136, Low. Held. Gr.
fissurella, see *Styliola fissurella*.
flexuosa, see *Conchicolites flexuosus*.
 gracilistriatus, Hall, 1879, Pal. N. Y., vol. 5, pt. 2, p. 173, Marcellus Shale.
 hoyti, White, 1876, Proc. Acad. Nat. Sci., p. 34, Devonian.
 gyracanthus, Eaton, 1832, (*Echinus gyracanthus*.) Geo. Text-book, p. 128, Low. Held. Gr.
 incurvus, Shumard, 1856, Geo. Rep. Mo., p. 195, Trenton Gr.
irregularis, Hall, 1859, Pal. N. Y., vol. 3, syn. for *T. gyracanthus*.
 minutus, Hall, 1843, Geo. Rep. 4th Dist. N. Y., p. 72, and Pal. N. Y., vol. 2, p. 183, Clinton Gr.

neglectus, Nicholson & Hinde, 1874, Can. Jour., p. 9, Clinton Gr.

niagarensis,
 Hall, 1852,
 Pal. N. Y.,
 vol. 2, p.
 352, Niag-
 ara Gr.



FIG. 650.—*Tentaculites richmondensis*.

niagarensis var. *cumberlandiæ*, Hall, 1888, Pal. N. Y., vol. 7, p. 5, Niagara Gr.
 oswegoensis, Meek & Worthen, 1865, Proc. Acad. Nat. Sci. Phil., p. 254, and Geo. Sur. Ill., vol. 3, p. 342, Hud. Riv. Gr. richmondensis, S. A. Miller, 1874, Cin. Quar. Jour. Sci., vol. 1, p. 234, Hud. Riv. Gr.
 scalariformis, Hall, 1876, Illust. Devonian Foss., pl. 26, and Pal. N. Y., vol. 5, pt. 2, p. 167, Up. Held. Gr.
scalaris, Schlotheim, 1820, Petref. Not an American species.
 sicula, Hall, 1876, Illust. Devonian Foss., pl. 26, Up. Held. Gr.
 spicula, Hall, 1876, Illust. Devonian Foss., pl. 26, and Pal. N. Y., vol. 5, pt. 2, p. 172, Chemung Gr.
 sterlingensis, Meek & Worthen, 1865, Proc. Acad. Nat. Sci. Phil., p. 255, and Geo. Sur. Ill., vol. 3, p. 342, Hud. Riv. Gr.
 subtilis, Winchell, 1866, Rep. Low. Peninsula Mich., p. 92, Ham. Gr.
 tenuistriatus, Meek & Worthen, 1865, Proc. Acad. Nat. Sci. Phil., p. 255, and Geo. Sur. Ill., vol. 3, p. 343, Hud. Riv. Gr.
Theca, Sowerby, 1845, syn. for *Hyolithes*.
aculeata, see *Hyolithes aculeatus*.
gregaria, see *Hyolithes gregarius*.
ligea, see *Hyolithes ligea*.
parviuscula, see *Hyolithes parviusculus*.
primordialis, see *Hyolithes primordialis*.
triangularis, Hall, 1847, Pal. N. Y., vol. 1, p. 313. This name was preoccupied by Portlock in 1843. Billings described it as *Hyolithes americanus*.

CLASS GASTEROPODA.

[Ety. *gaster*, under side of body; *pous*, foot.]

THE locomotive organ in the Gasteropoda consists of a broad, muscular under-surface, or foot, upon which the animal creeps with a gliding motion. The expansion and contraction of the muscles may be seen when a snail is moving over glass. This form of the foot is the most important characteristic of the Gasteropoda. The head is distinct, and usually furnished with tentacles and eyes. The mouth is on the lower surface, and is often furnished with one or two teeth, or jaws, in the upper part, and a ribbon-like tongue, with minute silicious teeth on its upper surface, which are used with the upper teeth in separating the food. The teeth on the tongue are called the lingual teeth.

The body is generally much larger on one side than on the other, which produces a spiral shell in the growth of the animal, because the shell is secreted at the edge of the mantle. The shell nearly always consists of one piece (univalve), forming a conical tube, twisted spirally; but the tube is not perfect, because the inner wall of each whorl is formed of the preceding whorl with only a thin coating of shelly matter. Sometimes the tube is rolled in a plane, producing a discoid shell; and there are all grades of form, from the discoid to the upright. The right side of the animal is usually the larger, and the shell produced is dextral; but in some species and in some abnormal specimens of dextral species, the spire is turned in the opposite direction, and the shell is therefore called sinistral. The winding of the tube in the spiral shells as the animal grows, produces a central axis, which is called the columella. It extends from the apex to the base, and forms the inner margin of the aperture. The columella is usually hollow, and terminates at the base of the shell with a small opening, called the umbilicus. The margins of the aperture are called the lips. When the columella forms the inner lip, it is called the columellar lip. The outer lip forms the convexity of the shell. Sometimes the lips are continuous, and sometimes the outer lip is more or less deeply notched; and both lips may be furnished with teeth or denticulated edges. The last whorl of the shell is called the body whorl, from its receiving the body of the animal, and the remaining whorls constitute the spire. The line which separates the whorls is the suture. Many Gasteropoda have a calcareous plate attached to the hinder part of the foot, which closes the aperture when the animal retracts itself within the shell; this covering is called an operculum.

The Gasteropoda are divided into two subclasses: the Heteropoda and Gasteropoda proper. The Heteropoda, also called the Nucleobranchiata, are all inhabitants of the ocean, and usually have a shell covering only the essential organs of the body. They swim rapidly near the surface of the water with the back downward, and when the foot is present it is used to attach the animal to floating sea-weeds.

The Gasteropoda proper are divided into two orders: one breathing air, the Pulmonifera; and the other water, the Branchifera. The Pulmonifera include the

land snails and their allies; the Branchifera are furnished with gills, and include nearly all Palæozoic shells of this Class.

FAMILY BELLEROPHONTIDÆ.—Bellerophon, Bucanella, Bucania, Phragmota, Porcellia, Tremanotus.

FAMILY BULIMORPHIDÆ.—Bulimorpha.

FAMILY CALYPTRÆIDÆ.—Capulus, Conchopeltis, Metoptoma, Platyceras.

FAMILY CHITONIDÆ.—Chiton.

FAMILY CLISOSPIRIDÆ.—Billingsia, Clisospira.

FAMILY CODONCHILIDÆ.—Codonochilus.

FAMILY CYCLONEMIDÆ.—Cyclonema, Eunema, Holoepa, Holopella, Platyschisma, Orthonema, Palæacmæa, Trochonema.

FAMILY CYCLORIDÆ.—Cyclora.

FAMILY CYRTOLITIDÆ.—Carinaropsis, Conchopeltis, Cyrtolites, Cyrtonella, Microceras.

FAMILY DENTALIIDÆ.—Dentalium.

FAMILY EUOMPHALIDÆ.—Calaurops, Eccyliomphalus, Euomphalus, Omphalotrochus, Ophileta, Pleuronotus, Straparollina, Straparollus.

FAMILY FUSISPIRIDÆ.—Fusispira.

FAMILY HELICIDÆ.—Anthracopupa, Dawsonella, Pupa, Streptaxis, Strophites, Zonites.

FAMILY LITTORINIDÆ.—Xenophora.

FAMILY MACLURIIDÆ.—Maclurea.

FAMILY NATACOPSIDÆ.—Callonema, Isonema, Naticopsis, Trachydomia.

FAMILY PATELLIDÆ.—Lepetopsis, Tryblidium.

FAMILY PLATYSTOMIDÆ.—Orthostoma, Platystoma, Scævogyra, Strophostylus.

FAMILY PLEUROTOMARIIDÆ.—Helicotoma, Lophospira, Microdoma, Murchisonia, Pleurotomaria, Raphistoma, Scalites.

FAMILY PSEUDOPHORIDÆ.—Pseudophorus.

FAMILY PYRAMIDELLIDÆ.—Loxonema, Macrochilina, Soleniscus, Zapychius.

FAMILY ROTELLIDÆ.—Anomphalus, Rotella.

FAMILY SUBULITIDÆ.—Polyphemopsis, Subulites.

FAMILY TROCHIDÆ.—Eotrochus, Palæotrochus.

FAMILY TURRITELLIDÆ.—Aclisina, Turritella.

Aclis, Loven, 1846, Index, Mollusc. litora Scandin. occid. habit., p. 16. Not an American Palæozoic genus.
minuta, see *Aclisina minuta*.
robusta, see *Aclisina robusta*.
stevensoni, see *Aclisina stevensoni*.
swallowana, see *Aclisina swallowana*.

ACLISINA, DeKoninck, 1881, Faune du Calcaire Carbonifère de la Belgique Ann. d. Mus. Roy. d'Hist. Nat., t. 6, p. 86. [Ety. diminutive of *Aclis*.] An elongated, banded, conical, spiral shell; distinguished from *Murchisonia* by its oval aperture, and from *Loxonema* by its spiral bands. Type *A. striatula*.
minuta, Stevens, 1858, (*Aclis minuta*.) Am. Jour. Sci., vol. 25, p. 259, Coal Meas.

robusta, Stevens, 1858, (*Aclis robusta*.) Am. Jour. Sci., vol. 25, p. 259, and Geo. Sur. Ill., vol. 5, p. 596, Coal Meas.
stevensoni, White, 1882, (*Aclis stevensoni*.) Rep. Invert. Foss. New. Mex., p. xxxv, Coal Meas.

swallowana, Geinitz, 1866, (*Turbonilla swallowana*.) Carb. und Dyas in Neb., p. 5, Coal Meas.

Acroculia, Phillips, 1841, Pal. Foss. Cornwall, Devon, and W. Somerset, p. 93, syn. *Aclisina swallowana*.
angulata, see *Platyceras angulatum*.



FIG. 651.
Aclisina swallowana.

erecta, see *Platyceras erectum*.

ovalis, see *Platyceras ovale*.

niagarensis, see *Platyceras niagarensis*.

trigonalis, see *Platyceras trigonale*.

Ampullaria, Lamarck, 1801, *Syst. An. sans Vert.* [Ety. *ampulla*, a flask.] Not a Palæozoic genus.

helicoïdes, see *Soleniscus helicoïdes*.

powelli, Walcott, 1883, *Science*, vol. 2, p. 808, and *Monogr. U. S. Geo. Sur.*, vol. 8, p. 261, Subcarboniferous.

ANOMPHALUS, Meek & Worthen, 1866, *Proc. Acad. Nat. Sci.*, p. 268. [Ety. *anomphalos*, without an umbilicus.] A helioid shell of three or more volutions, and having an aperture transversely suboval. Type A rotulus.

meeki, see *Dawsonella meeki*.

rotulus, Meek & Worthen, 1866, *Proc. Acad. Nat. Sci. Phil.*, p. 268, and *Geo. Sur. Ill.*, vol. 5, p. 597, Coal Meas.

ANTIIRACOPUPA, Whitfield, 1881, *Am. Jour. Sci. and Arts*, 3d ser., vol. 21, p. 126. [Ety. *anthrax*, coal; *Pupa*, a genus.] Shell minute, pupiform, few volutions, last unsymmetrical; axis imperforate; aperture large, nearly vertical; peristome thickened, united above by a thin callus, on which may occur one or more palatal teeth; other tooth-like projections on the inner margin of lip; circular notch, as in *Pupina*, on inner edge of outer limb, near body whorl; surface vertically lined. Type A. ohioensis.

meeki, see *Dawsonella meeki*.

rotulus, Meek & Worthen, 1866, *Proc. Acad. Nat. Sci. Phil.*, p. 268, and *Geo. Sur. Ill.*, vol. 5, p. 597, Coal Meas.

ANTIIRACOPUPA, Whitfield, 1881, *Am. Jour. Sci. and Arts*, 3d ser., vol. 21, p. 126. [Ety. *anthrax*, coal; *Pupa*, a genus.] Shell minute, pupiform, few volutions, last unsymmetrical; axis imperforate; aperture large, nearly vertical; peristome thickened, united above by a thin callus, on which may occur one or more palatal teeth; other tooth-like projections on the inner margin of lip; circular notch, as in *Pupina*, on inner edge of outer limb, near body whorl; surface vertically lined. Type A. ohioensis.

ohioensis, Whitfield, 1881, *Am. Jour. Sci. and Arts*, 3d ser., vol. 21, p. 126, Coal Meas.

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ohioensis, Whitfield, 1881, *Am. Jour. Sci. and Arts*, 3d ser., vol. 21, p. 126, Coal Meas.

ANTIIRACOPUPA, Whitfield, 1881, *Am. Jour. Sci. and Arts*, 3d ser., vol. 21, p. 126. [Ety. *anthrax*, coal; *Pupa*, a genus.] Shell minute, pupiform, few volutions, last unsymmetrical; axis imperforate; aperture large, nearly vertical; peristome thickened, united above by a thin callus, on which may occur one or more palatal teeth; other tooth-like projections on the inner margin of lip; circular notch, as in *Pupina*, on inner edge of outer limb, near body whorl; surface vertically lined. Type A. ohioensis.

ohioensis, Whitfield, 1881, *Am. Jour. Sci. and Arts*, 3d ser., vol. 21, p. 126, Coal Meas.

ANTIIRACOPUPA, Whitfield, 1881, *Am. Jour. Sci. and Arts*, 3d ser., vol. 21, p. 126. [Ety. *anthrax*, coal; *Pupa*, a genus.] Shell minute, pupiform, few volutions, last unsymmetrical; axis imperforate; aperture large, nearly vertical; peristome thickened, united above by a thin callus, on which may occur one or more palatal teeth; other tooth-like projections on the inner margin of lip; circular notch, as in *Pupina*, on inner edge of outer limb, near body whorl; surface vertically lined. Type A. ohioensis.

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ANTIIRACOPUPA, Whitfield, 1881, *Am. Jour. Sci. and Arts*, 3d ser., vol. 21, p. 126. [Ety. *anthrax*, coal; *Pupa*, a genus.] Shell minute, pupiform, few volutions, last unsymmetrical; axis imperforate; aperture large, nearly vertical; peristome thickened, united above by a thin callus, on which may occur one or more palatal teeth; other tooth-like projections on the inner margin of lip; circular notch, as in *Pupina*, on inner edge of outer limb, near body whorl; surface vertically lined. Type A. ohioensis.

ohioensis, Whitfield, 1881, *Am. Jour. Sci. and Arts*, 3d ser., vol. 21, p. 126, Coal Meas.

ANTIIRACOPUPA, Whitfield, 1881, *Am. Jour. Sci. and Arts*, 3d ser., vol. 21, p. 126. [Ety. *anthrax*, coal; *Pupa*, a genus.] Shell minute, pupiform, few volutions, last unsymmetrical; axis imperforate; aperture large, nearly vertical; peristome thickened, united above by a thin callus, on which may occur one or more palatal teeth; other tooth-like projections on the inner margin of lip; circular notch, as in *Pupina*, on inner edge of outer limb, near body whorl; surface vertically lined. Type A. ohioensis.

ohioensis, Whitfield, 1881, *Am. Jour. Sci. and Arts*, 3d ser., vol. 21, p. 126, Coal Meas.

ANTIIRACOPUPA, Whitfield, 1881, *Am. Jour. Sci. and Arts*, 3d ser., vol. 21, p. 126. [Ety. *anthrax*, coal; *Pupa*, a genus.] Shell minute, pupiform, few volutions, last unsymmetrical; axis imperforate; aperture large, nearly vertical; peristome thickened, united above by a thin callus, on which may occur one or more palatal teeth; other tooth-like projections on the inner margin of lip; circular notch, as in *Pupina*, on inner edge of outer limb, near body whorl; surface vertically lined. Type A. ohioensis.

ohioensis, Whitfield, 1881, *Am. Jour. Sci. and Arts*, 3d ser., vol. 21, p. 126, Coal Meas.

ANTIIRACOPUPA, Whitfield, 1881, *Am. Jour. Sci. and Arts*, 3d ser., vol. 21, p. 126. [Ety. *anthrax*, coal; *Pupa*, a genus.] Shell minute, pupiform, few volutions, last unsymmetrical; axis imperforate; aperture large, nearly vertical; peristome thickened, united above by a thin callus, on which may occur one or more palatal teeth; other tooth-like projections on the inner margin of lip; circular notch, as in *Pupina*, on inner edge of outer limb, near body whorl; surface vertically lined. Type A. ohioensis.

ohioensis, Whitfield, 1881, *Am. Jour. Sci. and Arts*, 3d ser., vol. 21, p. 126, Coal Meas.

ANTIIRACOPUPA, Whitfield, 1881, *Am. Jour. Sci. and Arts*, 3d ser., vol. 21, p. 126. [Ety. *anthrax*, coal; *Pupa*, a genus.] Shell minute, pupiform, few volutions, last unsymmetrical; axis imperforate; aperture large, nearly vertical; peristome thickened, united above by a thin callus, on which may occur one or more palatal teeth; other tooth-like projections on the inner margin of lip; circular notch, as in *Pupina*, on inner edge of outer limb, near body whorl; surface vertically lined. Type A. ohioensis.

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ohioensis, Whitfield, 1881, *Am. Jour. Sci. and Arts*, 3d ser., vol. 21, p. 126, Coal Meas.

ANTIIRACOPUPA, Whitfield, 1881, *Am. Jour. Sci. and Arts*, 3d ser., vol. 21, p. 126. [Ety. *anthrax*, coal; *Pupa*, a genus.] Shell minute, pupiform, few volutions, last unsymmetrical; axis imperforate; aperture large, nearly vertical; peristome thickened, united above by a thin callus, on which may occur one or more palatal teeth; other tooth-like projections on the inner margin of lip; circular notch, as in *Pupina*, on inner edge of outer limb, near body whorl; surface vertically lined. Type A. ohioensis.

ohioensis, Whitfield, 1881, *Am. Jour. Sci. and Arts*, 3d ser., vol. 21, p. 126, Coal Meas.

ANTIIRACOPUPA, Whitfield, 1881, *Am. Jour. Sci. and Arts*, 3d ser., vol. 21, p. 126. [Ety. *anthrax*, coal; *Pupa*, a genus.] Shell minute, pupiform, few volutions, last unsymmetrical; axis imperforate; aperture large, nearly vertical; peristome thickened, united above by a thin callus, on which may occur one or more palatal teeth; other tooth-like projections on the inner margin of lip; circular notch, as in *Pupina*, on inner edge of outer limb, near body whorl; surface vertically lined. Type A. ohioensis.

ohioensis, Whitfield, 1881, *Am. Jour. Sci. and Arts*, 3d ser., vol. 21, p. 126, Coal Meas.

ANTIIRACOPUPA, Whitfield, 1881, *Am. Jour. Sci. and Arts*, 3d ser., vol. 21, p. 126. [Ety. *anthrax*, coal; *Pupa*, a genus.] Shell minute, pupiform, few volutions, last unsymmetrical; axis imperforate; aperture large, nearly vertical; peristome thickened, united above by a thin callus, on which may occur one or more palatal teeth; other tooth-like projections on the inner margin of lip; circular notch, as in *Pupina*, on inner edge of outer limb, near body whorl; surface vertically lined. Type A. ohioensis.

ohioensis, Whitfield, 1881, *Am. Jour. Sci. and Arts*, 3d ser., vol. 21, p. 126, Coal Meas.

ANTIIRACOPUPA, Whitfield, 1881, *Am. Jour. Sci. and Arts*, 3d ser., vol. 21, p. 126. [Ety. *anthrax*, coal; *Pupa*, a genus.] Shell minute, pupiform, few volutions, last unsymmetrical; axis imperforate; aperture large, nearly vertical; peristome thickened, united above by a thin callus, on which may occur one or more palatal teeth; other tooth-like projections on the inner margin of lip; circular notch, as in *Pupina*, on inner edge of outer limb, near body whorl; surface vertically lined. Type A. ohioensis.

ohioensis, Whitfield, 1881, *Am. Jour. Sci. and Arts*, 3d ser., vol. 21, p. 126, Coal Meas.

ANTIIRACOPUPA, Whitfield, 1881, *Am. Jour. Sci. and Arts*, 3d ser., vol. 21, p. 126. [Ety. *anthrax*, coal; *Pupa*, a genus.] Shell minute, pupiform, few volutions, last unsymmetrical; axis imperforate; aperture large, nearly vertical; peristome thickened, united above by a thin callus, on which may occur one or more palatal teeth; other tooth-like projections on the inner margin of lip; circular notch, as in *Pupina*, on inner edge of outer limb, near body whorl; surface vertically lined. Type A. ohioensis.

ohioensis, Whitfield, 1881, *Am. Jour. Sci. and Arts*, 3d ser., vol. 21, p. 126, Coal Meas.

ANTIIRACOPUPA, Whitfield, 1881, *Am. Jour. Sci. and Arts*, 3d ser., vol. 21, p. 126. [Ety. *anthrax*, coal; *Pupa*, a genus.] Shell minute, pupiform, few volutions, last unsymmetrical; axis imperforate; aperture large, nearly vertical; peristome thickened, united above by a thin callus, on which may occur one or more palatal teeth; other tooth-like projections on the inner margin of lip; circular notch, as in *Pupina*, on inner edge of outer limb, near body whorl; surface vertically lined. Type A. ohioensis.

bilabiatus, White & Whitfield, 1862, *Proc. Bost. Soc. Nat. Hist.*, vol. 8, p. 304, Kinderhook Gr.

bilobatus, Sowerby, 1839, Murch. Sil. Syst., p. 643, and Pal. N. Y., vol. 1, p. 184, Black Riv. to Mid. Sil.



FIG. 652.—*Bellerophon bilobatus*.

bilobatus var.

acutus, Hall, 1847, *Pal. N. Y.*, vol. 1, p. 185, Trenton Gr.

bilobatus var. *corrugatus*, Hall, 1847, *Pal. N. Y.*, vol. 1, p. 185, Trenton Gr.

blaneyanus, syn. for *B. carbonarius*.

bowmani, White, 1876, *Proc. Acad. Nat. Sci.*, p. 32, Devonian.

brevilineatus, Conrad, 1842, *Jour. Acad. Nat. Sci.*, vol. 8, p. 269, and *Pal. N. Y.*, vol. 5, p. 2, p. 107, Ham. Gr.

canadensis, Billings, 1866, *Catal. Sil. Foss. Antic.*, p. 18, Hud. Riv. Gr.

cancellatus, Hall, 1847, *Pal. N. Y.*, vol. 1, p. 307, Hud. Riv. Gr.

cancellatus, Hall, 1858, *Trans. Alb. Inst.*, vol. 4. The name was preoccupied. See *B. textilis*.

carbonarius, Cox, 1857, *Geo. Rep. Ky.*, vol. 3, p. 562, Coal Meas.

carbonarius var. *subpapillosus*, White, 1876, *Geo. Uinta Mountains*, p. 92, Up. Aubrey Gr.

carinatus, Sowerby, 1839, Murch. Sil. Syst., p. 634, Devonian.

cassinensis, Whitfield, 1886, *Bull. Am. Mus. Nat. Hist.*, vol. 1, p. 318, Birds-eye Gr.

charon, Billings, 1860, *Can. Nat. and Geol.*, vol. 5, p. 169, Black Riv. and Trenton Grs.

combsi, Wolcott, 1885, *Monogr. U. S. Geo. Sur.*, vol. 8, p. 193, Devonian.

convolutus, Eaton, 1832, *Geo. Text-book*, p. 28, Up. Sil.

crassus, Meek & Worthen, 1860, *Proc. Acad. Nat. Sci.*, p. 458, and *Geo. Sur. Ill.*, vol. 2, p. 385, Coal Meas.

crenistris, Hall, 1876, *Illust. Devonian Foss.*, pl. 25, and *Pal. N. Y.*, vol. 5, pt. 2, p. 116, Ham. Gr.

curvilineatus, Conrad, 1842, *Jour. Acad. Nat. Sci.*, vol. 8, p. 269, Onondaga, Schoharie and Up. Held. Gr.

cyrtolites, Hall, 1860, 13th Rep. N. Y. Mus. Nat. Hist., p. 107, Kinderhook Gr.

declivis, Conrad, 1842, *Jour. Acad. Nat. Sci.*, vol. 8, p. 269, Trenton Gr.

disculus, Billings, 1860, *Can. Nat. and Geol.*, vol. 5, p. 168, Black Riv. and Trenton Gr.

ellipticus, McChesney, 1860, *Desc. New Pal. Foss.*, p. 58, Coal Meas.

expansus, see *Bucania expansa*.

explanatus, Hall, 1879, *Pal. N. Y.*, vol. 5, pt. 2, p. 109, Chemung Gr.

fiscellostriatus, Foerste, 1885, Bull. Sci., Lab. Denison Univ., p. 99, Niagara Gr. fraternus, Billings, 1866, Catal. Sil. Foss., Antic., p. 19, Hud. Riv. Gr. galericulatus, Winchell, 1862, Proc. Acad. Nat. Sci., p. 426, Marshall Gr. gibsoni, White, 1882, 11th Rep. Geol. and Nat. Hist. Indiana, p. 360, St. Louis Gr. giganteus, Worthen, 1884, Bull. No. 2, Ill. St. Mus. Nat. Hist., p. 8, and Geo. Sur. Ill., vol. 8, p. 143, Low. Coal Meas. globosus, Stevens, 1858, Am. Jour. Sci., vol. 25, p. 258, Coal Meas. harrodi, Gurley, 1883, New Carb. Foss., p. 5. Publication not such as to establish a species. helena, Hall, 1879, Pal. N. Y., vol. 5, pt. 2, p. 114, Ham. Gr. hiulcus, Sowerby, Min. Conch. Not American. hyalina, Hall, 1879, Pal. N. Y., vol. 5, pt. 2, p. 99, Up. Held. Gr. incisus, Clarke, 1885, Bull. U. S. Geo. Sur., vol. 16, p. 53, Portage Gr. inspeciosus, White, 1882, Rep. Invert. Foss. New Mex., p. xxx, Coal Meas. interlineatus, Portlock, 1843, Geo. of Londonderry, p. 402, Coal Meas. Probably not American. kansasensis, Shumard, 1858, Trans. St. Louis Acad. Sci., vol. 1, p. 204, Coal Meas. leda, Hall, 1862, 15th Rep. N. Y. Mus. Nat. Hist., p. 58, and Pal. N. Y., vol. 5, pt. 2, p. 110, Ham. Gr. lineolatus, Hall, 1860, 13th Rep. N. Y. Mus. Nat. Hist., p. 107, Waverly or Kinderhook Gr. lindsleyi, Safford, 1869, Geo. of Tenn., p. 289, Nashville Gr. lyra, Hall, 1862, 15th Rep. N. Y. Mus. Nat. Hist., p. 59, and Pal. N. Y., vol. 5, pt. 2, p. 113, Ham. Gr. macer, Billings, 1865, Pal. Foss., vol. 1, p. 347, CalCIFerous Gr. mæra, Hall, 1876, Illust. Devonian Foss., pl. 22, and Pal. N. Y., vol. 5, pt. 2, p. 119, Chemung Gr.

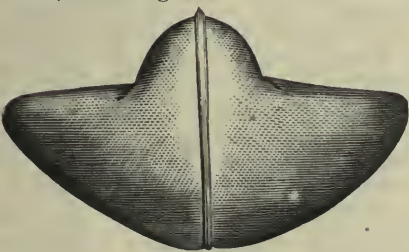


FIG. 653.—*Bellerophon mohri*.

majusculus, Walcott, 1885, Monogr. U. S. Geo. Sur., vol. 8, p. 256, Subcarb. marcouanus, Geinitz, 1866, Carb. and Dyas in Neb., p. 7, and Pal. E. Neb., p. 226, Coal Meas. meekanus, Swallow, 1858, Trans. St. Louis Acad. Sci., vol. 1, p. 204, Coal Meas.

michiganensis, Winchell, 1862, Proc. Acad. Nat. Sci., p. 427, Marshall Gr. miser, Billings, 1866, Catal. Sil. Foss. Antic., p. 20, Hud. Riv. Gr. missouriensis, Swallow, 1863, Trans. St. Louis Acad. Sci., vol. 2, p. 100, Kaskaskia Gr. mohri, S. A. Miller, 1874, Cin. Quar. Jour. Sci., vol. 1, p. 306, Hud. Riv. Gr. montfortanus, Norwood & Pratten, 1855, Jour. Acad. Nat. Sci., vol. 3, p. 74, Coal Meas.



FIG. 654.—*Bellerophon palinurus*.

morrowensis, Miller & Dyer, 1878, Cont. to Pal., No. 2, p. 8, Hud. Riv. Gr. nactus, Hall, 1879, Pal. N. Y., vol. 5, pt. 2, p. 121, Chemung Gr. nashvillensis, Troost, 1840, 5th Geo. Rep. Tenn., p. 54, Trenton Gr. natator, Hall, 1862, (Phragmostoma natator,) 15th Rep. N. Y. Mus. Nat. Hist., p. 60, and Pal. N. Y., vol. 5, pt. 2, p. 108, Ham. Gr. nautiloides, Winchell, 1862, Proc. Acad. Nat. Sci., p. 427, Marshall Gr. neleus, Hall & Whitfield, 1876, Illust. Devonian Foss., pl. 22, and U. S. Geo. 40th Parallel, p. 250, Chemung Gr. newberryi, Meek, 1871, Proc. Acad. Nat. Sci., p. 77, and Ohio Pal., vol. 1, p. 222, Up. Held. Gr. nodocarinatus, Hall, 1858, Geo. Rep. Iowa, p. 723, Coal Meas. obsoletus, Hall, 1876, Illust. Devonian Foss., pl. 22, Chemung Gr. otsego, Hall, 1862, 15th Rep. N. Y. Mus. Nat. Hist., p. 60, and Pal. N. Y., vol. 5, pt. 2, p. 104, Ham. Gr. palinurus, Billings, 1865, Pal. Foss., vol. 1, p. 311, Quebec Gr. panneus, White, 1862, Proc. Bost. Soc. Nat. Hist., vol. 9, p. 21, Marshall Gr. patersoni, Hall, 1862, Geo. Rep. Wis., p. 55, Hud. Riv. Gr. patulus, Hall, 1843, Geo. Rep. 4th Dist. N. Y., p. 196, and Pal. N. Y., vol. 5, pt. 2, p. 100, Ham. Gr. pelops, Hall, 1862, 15th Rep. N. Y. Mus. Nat. Hist., p. 56, and Pal. N. Y., vol. 5, pt. 2, p. 95, Schoharie and Up. Held. Gr. pelops var. exponens, Hall, 1879, Pal. N. Y., vol. 5, pt. 2, p. 96, Up. Held. Gr. percarinatus, Conrad, 1842, Jour. Acad. Nat. Sci., vol. 8, p. 268, Coal Meas. perelegans, White & Whitfield, 1862, Proc. Bost. Soc. Nat. Hist., vol. 8, p. 304, Kinderhook Gr. perforatus, Winchell & Marcy, 1866, syn. for *Tremanotus chicagoensis*.

- perplexus, Walcott, 1885, Monogr. U. S. Geo. Sur., vol. 8, p. 193, Devonian.
- perlatus, Conrad, 1842, Jour. Acad. Nat. Sci., vol. 8, p. 270, Coal Meas.
- platystoma, Meek & Worthen, 1868, Geo. Sur. Ill., vol. 3, p. 312, Galena Gr.
- plenus, Billings, 1874, Pal. Foss., vol. 2, p. 62, Gaspé limestone No. 8, Devonian.
- profundus, Emmons, Geo. Rep., 2d Dist. N. Y., p. 393, Trenton Gr.
- propinquus, Meek, 1871, Proc. Acad. Nat. Sci., p. 78, and Ohio Pal., vol. 1, p. 226, Up. Held. Gr.
- punctifrons*, see *Bucania punctifrons*.
- reperius, Hall, 1879, Pal. N. Y., vol. 5, pt. 2, p. 128, Ham. Gr.
- rotalina, Hall, 1879, Pal. N. Y., vol. 5, pt. 2, p. 115, Ham. Gr.
- rudis, Hall, 1862, 15th Rep. N. Y. Mus. Nat. Hist., p. 57, and Pal. N. Y., vol. 5, pt. 2, p. 103, Ham. Gr.
- rugosiusculus, Winchell, 1862, Proc. Acad. Nat. Sci., p. 425, Marshall Gr.
- rugosus, Emmons, 1856, Am. Geol., p. 166, Hud. Riv. Gr.
- scriptiferus, White, 1862, Proc. Bost. Soc. Nat. Hist., vol. 9, p. 21, Marshall Gr.
- scissile, Conrad, 1844, Proc. Acad. Nat. Sci., vol. 2, p. 175, Kaskaskia Gr. Very poorly defined.
- solitarius, Billings, 1866, Catal. Sil. Foss. Antic., p. 20, Hud. Riv. Gr.
- stamineus, Conrad, 1842, Jour. Acad. Nat. Sci., vol. 8, p. 269, Marshall Gr.
- stevensanus, McChesney, 1860, Desc. New Pal. Foss., p. 61, Coal Meas.
- sublaevis, Hall, 1858, Trans. Alb. Inst., vol. 4, p. 32, and Geo. Sur. Iowa, p. 666, Warsaw Gr.
- subpapillosus, White, 1879, Bull. U. S. Geo. Sur. Ter., vol. 3, p. 218, and Cont. to Pal. No. 6, p. 138, Carboniferous.
- sulcatinus*, see *Bucania sulcatina*.
- textiliformis*, Gurley, 1883, New Carb. Foss., p. 6. Publication not valid.
- textilis, Hall, 1877, 1st Ed. Am. Pal. Foss., p. 243, Warsaw Gr. Proposed instead of *B. cancellatus*, Hall, 1858, which was preoccupied.
- thalia, Hall, 1862, 15th Rep. N. Y. Mus. Nat. Hist., p. 60, and Pal. N. Y., vol. 5, pt. 2, p. 105, Ham. Gr.
- tricarinatus, Shumard, 1858, Trans. St. Louis Acad. Sci., vol. 1, p. 204, Coal Meas.
- tricarinata*, Hall, 1876, Illust. Devonian Foss. The name was preoccupied. See *B. triliratus*.
- triliratus, Hall, 1877, 1st Ed. Am. Pal. Foss., p. 243, and Pal. N. Y., vol. 5, pt. 2, p. 117, Chemung Gr. Proposed instead of *B. tricarinatus*, Hall, 1876, which was preoccupied.
- troosti, D'Orbigny, 1840, Ceph., p. 206, and Geo. of Tenn., p. 289, Trenton Gr.
- tuber, Hall, 1876, 28th Rep. N. Y. Mus. Nat. Hist., p. 177, Niagara Gr.
- urii, Fleming, 1828, British Animals, p. 338, Devonian. American species. (?)
- vinculatus, White & Whitfield, 1862, Proc. Bost. Soc. Nat. Hist., vol. 8, p. 304, Kinderhook Gr.
- vitatus*, syn. for *B. carbonarius*.
- volutus, Eaton, 1832, Geol. Text-book, p. 28, Up. Sil.
- whittleseyi, Winchell, 1865, Proc. Acad. Nat. Sci., p. 130, Cuyahoga shale.
- wisconsinensis, Whitfield, 1878, Ann. Rep. Geo. Sur. Wis., p. 76, and Geo. Wis., vol. 4, p. 223, Trenton Gr.
- Billingsia*, Walcott, 1888, Bull. No. 30, U. S. Geo. Sur., p. 61. [Ety. proper name.] Syn. (?) for *Clisospira*. Turbinate, whorls, subcircular. Type *B. saratogensis*. Preoccupied.
- saratogensis*, Walcott, 1888, Bull. No. 30, U. S. Geo. Sur., p. 61, Up. Taconic.
- BUCANELLA, Meek, 1870, Proc. Am. Phil. Soc., vol. 11, p. 426. [Ety. diminutive of *Bucania*.] Type *B. nana*.
- nana, Meek, 1870, Proc. Am. Phil. Soc., vol. 11, p. 426, Silurian.
- BUCANIA, Hall, 1847, Pal. N. Y., vol. 1, p. 32. [Ety. *bukane*, trumpet.] Convolute, spire equally concave on either side; volutions in the same plane, all visible, outer one ventricose, inner one usually angulated on the edge, concave on the ventral side; aperture rounded oval, somewhat compressed on the inner side by contact with the next volution, laterally and dorsally abruptly expanded. Type *B. sulcatina*.
- angustata, Hall, 1852, Pal. N. Y., vol. 2, p. 349, Niagara and Guelph Gr.
- bellipuncta, Hall, 1852, Pal. N. Y., vol. 2, p. 93, Clinton Gr.
- bidorsata, Hall, 1847, (Bellerophon bidorsatus,) Pal. N. Y., vol. 1, p. 186, Trenton Gr.
- buelli, Whitfield, 1878, Ann. Rep. Geo. Sur. Wis., p. 76, and Geo. Wis., vol. 4, p. 24, Trenton Gr.
- chicagoensis*, see *Tremanotus chicagoensis*.
- costata, James, 1872, (Cyrtilites costatus,) Am. Jour. Sci., 3d ser., vol. 3, p. 26, and Ohio Pal., vol. 1, p. 150, Hud. Riv. Gr.
- crassolaris, McChesney, 1861, New Pal. Foss., p. 91, Niagara Gr.
- devonica, Hall & Whitfield, 1872, 24th Rep. N. Y. Mus. Nat. Hist., p. 195, Up. Held. Gr.
- euomphaloides, Owen, 1862, Geo. Sur. Ind., p. 362. Not very satisfactorily defined.
- exigua*, Foerste, 1885, Bull. Sci. Lab. Denison Univ., p. 99. Not properly defined.
- expansa, Hall, 1847, Pal. N. Y., vol. 1, p. 186, Trenton Gr.
- intexta, Hall, 1847, Pal. N. Y., vol. 1, p. 317, Trenton Gr.
- lirata, Hall, 1862, Geo. Rep. Wis., p. 55, Trenton Gr.



FIG. 655.—*Billingsia saratogensis*.

pervoluta, McChesney, 1861, New Pal. Foss., p. 91, Niagara Gr.
 profunda, Conrad, 1841, (Euomphalus profundus,) Ann. Rep. N. Y., p. 37, and Pal. N. Y., vol. 3, p. 341, Up. Held. Gr.

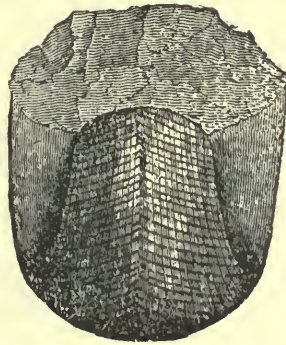


FIG. 656.—*Bucania sulcatina*.

punctifrons, Emmons, 1842, (Bellerophon punctifrons,) Geo. Rep. 2d Dist., N. Y., p. 392, and Pal. N. Y., vol. 1, p. 187, Black River and Trenton Grs.

rotundata, Hall, 1847, Pal. N. Y., vol. 1, p. 33, Chazy Gr.

stigmaosa, Hall, 1852, Pal. N. Y., vol. 2, p. 92, Clinton Gr.

sulcatina, Emmons, 1842, (Bellerophon sulcatinus,) Geo. Rep. 2d Dist. N. Y., p. 312, Pal. N. Y., vol. 1, p. 32, Chazy, Black Riv., and Trenton Grs.

trilobata, Conrad, 1839, (Planorbis trilobatus,) Ann. Rep. N. Y., p. 65, and Pal. N. Y., vol. 2, pp. 13 and 93, Medina sandstone and Clinton Gr.

tripla, Whitfield, 1889, Bull. Am. Mus. Nat. Hist., vol. 2, p. 55, Calciferous Gr.

Bulimella, Hall, 1858, Trans. Alb. Inst., vol. 4. This name was preoccupied by Pfeiffer in 1852. See *Bulimorpha*.

bulimiformis, see *Bulimorpha bulimiformis*.
canaliculata, see *Bulimorpha canaliculata*.
elongata, see *Bulimorpha elongata*.

BULIMORPHIA, Whitfield, 1882, Bull. Am. Mus. Nat. Hist., No. 3, p. 74. [Ety.

Bulimus, a genus; *morphe*, form.] Fusiform, volutions convex; columella bent, truncated at the base, separated



FIG. 657.—*Bulimorpha bulimiformis*.

from the outer lip by a notch, as in *Achatina*; outer lip slightly notched near the upper end; surface smooth. Type B. *bulimiformis*.

bulimiformis, Hall, 1858, (*Bulimella bulimiformis*,) Trans. Alb. Inst., vol. 4, p. 29, and Bull. Am. Mus. Nat. Hist., p. 74, Warsaw Gr.

canaliculata, Hall, 1858, (*Bulimella canaliculata*,) Trans. Alb. Inst., vol. 4, p.

29, and Bull. Am. Mus. Nat. Hist., p. 74, Warsaw Gr.

elongata, Hall, 1858, *Bulimella elongata*.) Trans. Alb. Inst., vol. 4, p. 30, and Bull. Am. Mus. Nat. Hist., p. 75, Warsaw Gr.
CALLONEMA, Hall, 1879, Pal. N. Y., vol. 5, pt. 2, p. 50. [Ety. *kallos*, beautiful;

nema, thread.] Subglobose, turbinate or ovoid-conical; volutions rounded or subangular above and below; outer lip thin; columnar lip thickened, spreading over the volution above and extended below; axis umbilicate; surface marked by striae extending backward from the sutures over the volutions. Type C. *bellatulum*.

bellatulum, Hall, 1861, (*Loxonema bellatulum*,) 14th Rep. N. Y. Mus. Nat. Hist., p. 104, and Pal. N. Y., vol. 5, pt. 2, p. 51,

Up. Held. Gr.

imitator, Hall & Whitfield, 1872, (*Pleurotomaria imitator*,) 24th Rep. N. Y. Mus. Nat. Hist., p. 195, Ham. Gr.



FIG. 658.—*Callonema bellatulum*.

lichas, Hall, 1861, (*Platystoma lichas*,) 14th Rep. N. Y. Mus. Nat. Hist., p. 106, Up. Held. Gr.

occidentale, Walcott, 1885, Monogr. U. S. Geo. Sur., vol. 8, p. 189, Devonian.

CALAUROPS, Whitfield, 1886, Bull. Am. Mus. Nat. Hist., vol. 1, p. 314. [Ety. *kalaurops*,

a shepherd's crook.] Univalve, discoidal, convolute, inner volutions closely coiled, outer one disunited and projected in a straight line. Type C. *lituiformis*. It seems to be distinguished from *Eccyliomphalus* only by having the last whorl straightened, which may or may not be of generic importance.

lituiformis, Whitfield, 1886, Bull. Am. Mus. Nat. Hist., vol. 1, p. 315, Chazy Gr.

CAPULUS, Montfort, 1810, Conch. Syst., vol. 2, p. 55. [Ety. *capulus*, a head-piece or cap.] Shell wide, cap-shaped, apex

obliquely inclined backward and inrolled toward the left side; aperture broad, oval, edge irregularly sinuated; muscular scar horseshoe-shaped, open in front. Type C. *hungaricus*. The horseshoe-shaped, muscular impression has never been observed in any American Palaeozoic fossil, and hence the species referred to this genus do not belong to it. Those named have been so poorly defined, their generic relations can not be determined, and they may as well be struck from the list of names.

acutirostris, see *Platyceras acutirostrum*.

auriformis, Hall, 1847, Pal. N. Y., vol. 1, p. 31, Chazy Gr.

parvus, Swallow, 1858, Trans. St. Louis Acad. Sci., vol. 1, p. 205, Coal Meas.

triplicatus, Swallow, 1858, Trans. St. Louis Acad. Sci., vol. 1, p. 205, Coal Meas.

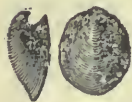


FIG. 659.—*Carinaropsis patelliformis*.

CARINAROPSIS, Hall, 1847, Pal. N. Y., vol. 1, p. 183.

[Ety. from its resemblance to *Carinaria*.] Shell subconical, patelliform; apex incurved or convolute, subcentral; aperture oval, expanded, narrowed posteriorly. Type *C. carinata*.

carinata, Hall, 1847, Pal. N. Y., vol. 1, p. 183, Trenton Gr.

orbiculata, Hall, 1847, Pal. N. Y., vol. 1, p. 306, Hud. Riv. Gr.

patelliformis, Hall, 1847, Pal. N. Y., vol. 1, p. 183, Trenton and Hud. Riv. Grs.

Chemnitzia, D'Orbigny, 1837, Mollusques, Echinodermes, Foraminiferes et Polypiers, etc. Slender, elongated, many whorled, plaited; apex sinistral; aperture simple, ovate; peristome incomplete; operculum horny; subspiral. Type *C. elegantissima*. Not an American Palaeozoic genus.

attenuata, see *Loxonema attenuatum*.

parva, see *Loxonema parvum*.

swallowana, see *Loxonema swallowanum*.

tenuilineata, see *Loxonema tenuilineatum*.



FIG. 660.—*Chiton squamosus*.

Chiton, Linnaeus, 1758, Syst. Nat., ed. 10, p. 667. [Ety. *chiton*, a coat of mail.] Shell composed of eight transverse imbricating plates, lodged in a coriaceous mantle, which forms an expanded margin round the body. Type *C. squamosus*. Not an American Palaeozoic genus.

canadensis, see *Metopoma canadense*.

carbonarius, Stevens, 1859, Am. Jour. Sci., vol. 25, p. 264, and Geo. Sur. Ill., vol. 5, p. 608. Probably a crustacean, Coal Meas.

parvus, Stevens, 1859, Am. Jour. Sci., vol. 25, p. 264, Coal Meas.

CLISOSPIRA, Billings, 1865, Pal. Foss., vol. 1, p. 186 and 420.

[Ety. *kleio*, to lock; *spira*, whorl.] Shell conical; aperture widely expanded all round in a plane at a right angle to the longitudinal axis of the conical spire; suture in the spire, but obsolete below. Type *C. curiosa*.

curiosa, Billings, 1865, Pal. Foss., vol. 1, pp. 186 and 420, Up. Taconic.

lirata, Whitfield, 1886, Bull. Am. Mus. Nat. Hist., vol. 1, p. 308, Birdseye Gr.



FIG. 661.—*Clisospira curiosa*.

occidentalis, Whitfield, 1878, Ann. Rep. Geo. Sur. Wis., p. 75, and Geo. Wis., vol. 4, p. 222, Trenton Gr.

CODONCHILUS, Whiteaves, 1884, Pal. Foss., vol. 3, p. 17. [Ety. *kodon*, a trumpet; *cheilos*, lip.] Tur-

reted, subfusiform; volutions numerous, compressed, closely inrolled; outer half of body whorl produced obliquely outward and downward; lip thin, expanded; aperture nearly circular. Type *C. striatum*.



FIG. 662.—*Codonchilus striatum*.

striatum, Whiteaves, 1884, Pal. Foss., vol. 3, p. 17, Guelph Gr.

CONCHOPELTS, Walcott, 1876, 28th Rep. N. Y., Mus. Nat. Hist., p. 93. [Ety. *conche*, shell; *pelte*, shield.] Patelliform,

more or less conical, apex central or subcentral, vertically striated, older specimens lined concentrically. Type *C. alternata*.

alternata, Walcott, 1876, 28th Rep. N. Y. Mus. Nat. Hist., p. 93, Trenton Gr.

minnesotensis, Walcott, 1876, 28th Rep. N. Y. Mus. Nat. Hist., p. 94, Trenton Gr.

CYCLONEMA, Hall, 1852, Pal. N. Y., vol. 2, p. 89. [Ety. *kuklos*, circle; *nema*, thread.]

Turbinate, thin, whorls ventricose, striae concentric and crossed by oblique lines of growth; no umbilicus; mouth rounded and with an imperfect peritreme; inner lip thin, closely reflected, and a little concave. Type *C. bilix*.



FIG. 663.—*Cyclonema bilix*.

bellulum, Billings, 1866, Catal. Sil. Foss. Antic., p. 55, Anticosti Gr.

bilix, Conrad, 1842, (Pleurotomaria bilix,) Jour. Acad. Nat. Sci., vol. 8, p. 271, and Pal. N. Y., vol. 1, p. 305,

Trenton and Hud. Riv. Grs.

bilix var. *conicum*, S. A. Miller, 1874, Cin. Quar. Jour. Sci., vol. 1, p. 320, Hud. Riv. Gr.

bilix var. *fluctuatum*, James, 1874, (Cyclonema fluctuata,) Cin. Quar. Jour. Sci., vol. 1, p. 152, Hud. Riv. Gr.

cancelatum, Hall, 1843, (Littorina cancellata,) Geo. Rep. 4th Dist. N. Y., p. 72,

and Pal. N. Y., vol. 2, p. 90, Clinton Gr.

cincinnatiense, S. A. Miller, 1882, Jour. Cin. Soc. Nat. Hist., vol. 5, p. 230, Utica Slate Gr.

commune, Billings, 1866, Catal. Sil. Foss. Antic., p. 55, Anticosti Gr.

concinnum, Hall, 1876, Illust. Devonian Foss., pl. 12, and Pal. N. Y., vol. 5, pt. 2, p. 38, Chemung Gr.

crenistris, Hall, 1876, Illust. Devonian Foss., pl. 12, Schoharie grit.

crenulatum, Meek, 1871, Proc. Acad. Nat. Sci., p. 79, and Ohio Pal., vol. 1, p. 213, Up. Held. Gr.

decorum, Billings, 1866, Catal. Sil. Foss. Antic., p. 56, Anticosti Gr.

doris, Hall, 1862, (Pleurotomaria doris,) 15th Rep. N. Y. Mus. Nat. Hist., p. 43, and Pal. N. Y., vol. 5, pt. 2, p. 34, Up. Held. Gr.
 elevatum, Hall, 1868, 20th Rep. N. Y. Mus. Nat. Hist., p. 391, Niagara Gr.

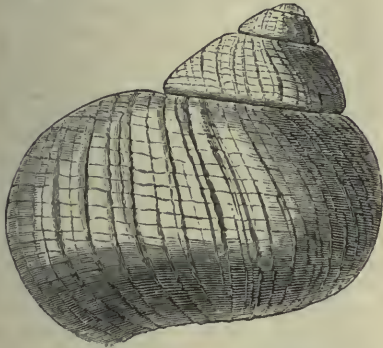


FIG. 664.—*Cyclonema hageri*.

hageri, Billings, 1862, Pal. Foss., vol. 1, p. 29, Trenton Gr.
 hallanum, Salter, 1859, Can. Org. Rem., Decade 1, p. 26, Black Riv. Gr.
 hamiltonie, Hall, 1862, 15th Rep. N. Y. Mus. Nat. Hist., p. 47, and Pal. N. Y., vol. 5, pt. 2, p. 37, Ham. Gr.
 humile, Billings, 1866, Catal. Sil. Foss. Antic., p. 56, Anticosti Gr.



FIG. 665.—*Cyclonema hallanum*.

leavenworthanum, Hall, 1858, (Pleurotomaria leavenworthana,) Trans. Alb. Inst., vol. 4, p. 24, and Bull. Am. Mus. Nat. Hist., p. 75, Warsaw Gr.
 liratum, Hall, 1862, 15th Rep. N. Y. Mus. Nat. Hist., p. 47, and Pal. N. Y., vol. 5, pt. 2, p. 35, Ham. Gr.
 mediocre, Billings, 1866, Catal. Sil. Foss. Antic., p. 56, Anticosti Gr.
 montrealense, Billings, 1862, Pal. Foss., vol. 1, p. 30, Trenton Gr.
 multiliratum, Hall, 1862, 15th Rep. N. Y. Mus. Nat. Hist., p. 48, and Pal. N. Y., vol. 5, pt. 2, p. 36, Ham. Gr.
 obsolescens, Hall, 1877, 1st Ed. Am. Pal. Foss., p. 243, and Pal. N. Y., vol. 5, pt. 2, p. 38, Chemung Gr. Proposed instead of *C. obsoleta*, Hall, 1876, which was preoccupied.
 obsoletum, Hall, 1852, Pal. N. Y., vol. 2, p. 90, Clinton Gr.
 obsoleta, Hall. The name was preoccupied. See *C. obsolescens*.
 percarinatum, Hall, 1847, (Pleurotomaria percarinata,) Pal. N. Y., vol. 1, p. 177, Trenton and Hud. Riv. Grs.
 percingulatum, Billings, 1857, Rep. of Progr. Geo. Sur. Can., p. 304, Clinton and Niagara Grs.
 phædra, Billings, 1865, Pal. Foss., vol. 1, p. 188, Quebec Gr.

pyramidatum, James, 1874, Cin. Quar. Jour. Sci., vol. 1, p. 152, Hud. Riv. Gr.
 rugilineatum, Hall & Whitfield, 1872, 24th Rep. N. Y. Mus. Nat. Hist., p. 186, Niagara Gr.
 semicarinatum, Salter, 1859, Can. Org. Rem., Decade 1, p. 27, Black Riv. Gr.
 subangulatum, Hall, 1858, (Pleurotomaria subangulata,) Trans. Alb. Inst., vol. 4, p. 25, and Bull. Am. Mus. Nat. Hist., p. 76, Warsaw Gr.
 sulcatum, Hall, 1852, Pal. N. Y., vol. 2, p. 347, Guelph Gr.
 tennesseense, Roemer, 1860, (Turbo tennesseensis,) Sil. Fauna. des West Tenn., p. 77, Niagara Gr.
 thalia, Billings, 1857, (Pleurotomaria thalia,) Rep. of Progr. Geo. Sur. Can., p. 303, Hud. Riv. Gr.
 varians, Billings, 1857, Rep. of Progr. Geo. Sur. Can., p. 305, Mid. Sil.
 varicosum, Hall, 1870, 24th Rep. N. Y. Mus. Nat. Hist., pl. 8. (Published by mistake in 14th Rep. 1861, as *C. ventricosa*.) Trenton Gr.
 ventricosum, Hall, 1852, Pal. N. Y., vol. 2, p. 90, Clinton Gr.

CYCLORA, Hall, 1845, Am. Jour. Sci., vol. 48, p. 294. [Ety. *kuklos*, circle.] Shells minute, suture deep, surface smooth, lip thin, aperture circular. Type *C. minuta*.
 alta, Foerste, 1885, Bull. Sci. Lab. Denison Univ., p. 96, Niagara Gr. Does not belong to this genus.
 depressa, Ulrich, 1879, Jour. Cin. Soc. Nat. Hist., vol. 2, p. 13, Hud. Riv. Gr.
 hoffmanni, S. A. Miller, 1874, Cin. Quar. Jour. Sci., vol. 1, p. 313, Hud. Riv. Gr.
 minuta, Hall, 1845, Am. Jour. Sci., vol. 48, p. 294, Utica Slate and Hud. Riv. Gr.



FIG. 666.—*Cyclora hoffmanni*.

nana, syn. for *Cyclora minuta*.
 parvula, Hall, 1845, (Turbo parvula,) Am. Jour. Sci., vol. 48, p. 294, and Ohio Pal., vol. 1, p. 154, Hud. Riv. Gr.
 pulcella, S. A. Miller, 1882, Jour. Cin. Soc. Nat. Hist., vol. 5, p. 231, Hud. Riv. Gr.
 turbinata, Whiteaves, 1881, Can. Nat., vol. 10, p. 101, Devonian.
 valvatiformis, Whiteaves, 1881, Can. Nat., vol. 10, p. 100, Devonian.
Cyclostoma, Lamarek, 1801, Syst. An. sans Vert. [Ety. *kuklos*, circle; *stoma*, mouth.] Not a Palæozoic genus.
pervetusta, see *Pleurotomaria pervetusta*.

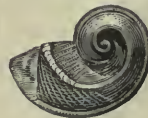


FIG. 667.—*Cyrtolites carinatus*.

CYRTOBITES, Conrad, 1838, Ann. Rep. N. Y., p. 118. [Ety. *kurtos*, curved; *lithos*, stone.] Shell coiled in the same plane, gradually tapering, volutions one or more, angular or carinated on the back and sides; section subquadrate; aperture not expanded; surface ornamented. Type *C. ornatus*.

carinatus, S. A. Miller, 1874, Cin. Quar. Jour. Sci., vol. 1, p. 311, Utica Slate.
 compressus, Conrad, 1838, (Phragmolites compressus,) Ann. Rep. N. Y., p. 119, and Pal. N. Y., vol. 1, p. 188, Black Riv. and Trenton Grs.

conradi, Hall, 1862, Geo. Rep. Wis., p. 55, Trenton Gr.

costatus, see Bucania costata.

cristatus, Safford, 1869, Geo. of Tenn., p. 289, Nashville Gr.

desideratus, Billings, 1866, Catal. Sil. Foss. Antic., p. 21, Hud. Riv. Gr.

dyeri, Hall, 1871, 24th Rep. N. Y. Mus. Nat. Hist., p. 230, Hud. Riv. Gr.

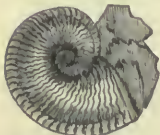


FIG. 668.—Cyrtolites elegans.

elegans, S. A. Miller, 1874, Cin. Quar. Jour. Sci., vol. 1, p. 310, Hud. Riv. Gr.

expansus, Hall, 1859, Pal. N. Y., vol. 3, p. 479, Oriskany sandstone.

filosus, Emmons, 1842, Geo. Rep. 2d Dist. N. Y., p. 372, and Pal. N. Y., vol. 1, p. 190, Trenton Gr.

gillanus, White & St. John, 1868, Trans. Chi. Acad. Sci., p. 123, Coal Meas.

imbricatus, Meek & Worthen, 1868, Geo. Sur. Ill., vol. 3, p. 340, Hud. Riv. Gr.

magnus, S. A. Miller, 1878, Jour. Cin. Soc. Nat. Hist., vol. 1, p. 103, Hud. Riv. Gr.

mitella, see Cyrtionella mitella.

nitidulus, Ulrich, 1878, Jour. Cin. Soc. Nat. Hist., vol. 2, p. 12, Utica Slate Gr.

ornatus, Conrad, 1838, Ann. Rep. N. Y., p. 118, and Pal. N. Y., vol. 1, p. 308, Hud. Riv. Gr.

pannosus, Billings, 1866, Catal. Sil. Foss. Antic., p. 20, Hud. Riv. Gr.

pileolus, see Cyrtionella pileolus.

sinuatus, Hall & Whitfield, 1877, U. S. Geo. Expl. 40th parallel, vol. 4, p. 237, Quebec Gr.

sinuosus, Hall, 1876, 28th Rep. N. Y. Mus. Nat. Hist., p. 178, Niagara Gr.

trentonensis, Conrad, 1842, Jour. Acad. Nat. Sci., vol. 8, p. 270, and Pal. N. Y., vol. 1, p. 189, Trenton Gr.

CYRTONELLA, Hall, 1879, Pal. N. Y., vol. 5, pt. 2, p. 123. [Ety. diminutive of Cyrtolites.]

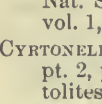


FIG. 670.—Cyrtionella pileolus.

Shells ovoid, trumpet-shaped; volutions one or more in the same plane; apex minute, making about a single turn, and rapidly expanding beyond; peristome entire; dorsum angular or subcarinate; surface sculptured; distinguished from Cyrtolites by the rapid expansion. Type C. mitella.

mitella, Hall, 1862, (Cyrtolites mitella,) 15th Rep. N. Y. Mus. Nat. Hist., p. 61, and Pal. N. Y., vol. 5, pt. 2, p. 123, Ham. Gr.

pileolus, Hall, 1862, (Cyrtolites pileolus,) 15th Rep. N. Y. Mus. Nat. Hist., p. 61, and Pal. N. Y., vol. 5, pt. 2, p. 125, Ham. Gr.

DAWSONELLA, Bradley, 1874, Am. Jour. Sci., 3d series, vol. 7, p. 151. [Ety. proper name.]

Helicoid, having a thin plate attached to the columella, covering half or more than half of the aperture of the shell as in Navicella. Type D. meeki.

meeki, Bradley, 1872, (Anomphalus meeki,) Am. Jour. Sci., 3d series, vol. 4, p. 88, Coal Meas.

DENTALIUM, Linnaeus, 1740, Syst. Nat., 2d Ed., p. 64. [Ety. dens, tooth.]

Shell elongate, terete, or angular, smooth, costate, or striate; aperture circular; lip simple, entire; margin of the posterior opening without a fissure. Type D. elephantinum.

aciculatum, see Coleolus aciculatus.

acutisulcatum, Gurley, 1883, New Carb. Foss., p. 7. Publication not valid.

annulostriatum, Meek & Worthen, 1870, Proc. Acad. Nat. Sci., vol. 5, p. 589, Coal Meas.

barquense, Winchell, 1862, Proc. Acad. Nat. Sci., p. 425, Marshall Gr.

canna, White, 1874, Rep. Invert. Foss., p. 23, and Geo. Sur. W. 100th Mer., vol. 4, p. 156, Carb.

grandævum, Winchell, 1863, Proc. Acad. Nat. Sci., p. 18, Marshall Gr.

illinoisense, Worthen, 1883, Geo. Sur. Ill., vol. 7, p. 325, and Geo. Sur. Ill., vol. 8, p. 145, Kaskaskia Gr.

martini, Whitfield, 1882, Ann. N. Y. Acad. Sci., vol. 2, p. 203, Up. Held. Gr.

meekanum, Geinitz, 1866, Carb. and Dyas in Neb., p. 13, and Geo. Sur. Ill., vol. 5, p. 590, Coal Meas.

missouriense, Swallow, 1863, Trans. St. Louis Acad. Sci., vol. 2, p. 99, Kaskaskia Gr.

obsoletum, Hall. Preoccupied by Schlotheim in 1832. See D. sublæve.

primarium, Hall, 1858, Geo. Rep. Iowa, p. 666, Warsaw Gr.

sublæve, Hall, 1877, 1st Ed. Am. Pal. Foss., p. 244, Coal Meas. Proposed instead of D. obsoletum, Hall, 1858, Geo. Sur. Iowa, which was preoccupied.

venustum, Meek & Worthen, 1861, Proc. Acad. Nat. Sci., p. 145, and Geo. Sur. Ill., vol. 2, p. 284, St. Louis Gr.

Discolites, Emmons, syn. for Cyclora. minutus, see Cyclora minuta.

ECCYLIOMPHALUS, Portlock, 1843, Geol. Rep. Lond., p. 411. [Ety. eccyliomphalus, unrolled umbilicus.]

Shell discoid, a few



FIG. 671.—Dentalium elephantinum.



FIG. 669.—Cyrtolites ornatus.

tapering, widely disconnected whorls; upper surface usually flattened in one plane, or slightly elevated; lower surface of whorls round; no chambers.

Type *E. bucklandi*.

atlanticus, Billings, 1865, Pal. Foss., vol. 1, p. 250, Quebec Gr.

canadensis, Billings, 1861, Can. Nat. and Geol., vol. 6, p. 320, Quebec Gr.

circinatus, Whiteaves, 1884, Pal. Foss., vol. 3, p. 35, Guelph Gr.

comes, Hall, 1876, Illust. Devon. Foss., pl. 16, Ham. Gr.

devonicus, Walcott, 1885, Monogr. U. S. Geo. Sur., vol. 8, p. 187, Devonian.

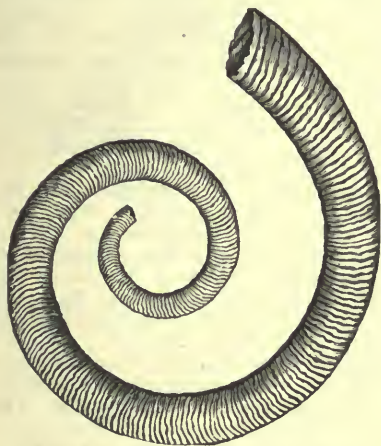


FIG. 672.—*Ecyllomphalus distans*.

distans, Billings, 1865, Pal. Foss., vol. 1, p. 249, Quebec Gr.

eboracensis, Hall, 1861, (*Euomphalus eboracensis*,) 15th Rep. N. Y. Mus. Nat. Hist., p. 55, and Pal. N. Y., vol. 5, pt. 2, p. 61, Ham. Gr.

gyroceras, Roemer, 1852, (*Euomphalus gyroceras*,) Kreid. von Texas, p. 91, Silurian.

intortus, Billings, 1861, Can. Nat. and Geol., vol. 6, p. 321, Quebec Gr.

laxus, Hall, 1861, (*Euomphalus laxus*,) 15th Rep. N. Y. Mus. Nat. Hist., p. 54, and Pal. N. Y., vol. 5, pt. 2, p. 60, Up. Held. Gr.

paradoxus, Winchell, 1863, (*Phanerotinus paradoxus*,) Proc. Acad. Nat. Sci., p. 21, and Pal. N. Y., vol. 5, pt. 2, p. 60, Marshall Gr.

priscus, Whitfield, 1889, Bull. Am. Mus. Nat. Hist., vol. 2, p. 46, Calciferous Gr.

spiralis, Billings, 1861, Can. Nat. and Geol., vol. 6, p. 321, Quebec Gr.

superbus, Billings, 1865, Pal. Foss., vol. 1, p. 250, Quebec Gr.

undulatus, Hall, 1861, Geo. Rep. Wis., p. 37, Trenton Gr.

volutatus, Whitfield, 1886, Bull. Am. Mus. Nat. Hist., vol. 1, p. 314, Birdseye Gr.

EOTROCHUS, Whitfield, 1882, Bull. Am. Mus. Nat. Hist., p. 77. [Ety. *eos*, dawn;

Trochus, a genus.] Conical above, flat or concave beneath, and broadly and deeply umbilicated; aperture very oblique, and the outer angle of volutions strongly carinated; surface ornamentation unlike on the upper and lower parts. Type *E. concavus*.

concavus, Hall, 1858, (*Pleurotomaria concava*,) Trans. Alb. Inst., vol. 4, p. 24, and Bull. Am. Mus. Nat. Hist., p. 78, Warsaw Gr.



FIG. 673.—*Eotrochus concavus*.

Eulima, Risso, 1826, Histoire Naturelle des Principales, p. 123. Not an American Palaeozoic genus.

peracuta, see *Polyphemopsis peracuta*.

EUNEMA, Salter, 1859, Can. Org. Rem., Decade 1, p. 24. [Ety. *eu*, beautiful; *nema*, line.] Turbinate, thin; few angular whorls, strong concentric ridges, crossed by sinuate or oblique lines of growth; inner lip not reflected; peritreme simple; mouth rather effuse below; no umbilicus. Type *E. strigillatum*.

cerithioides, Salter, 1859, Can. Org. Rem., Decade 1, p. 30, Black Riv. Gr.

erigone, Billings, 1862, Pal. Foss., vol. 1, p. 35, Black Riv. Gr.

pagoda, Salter, 1859, Can. Org. Rem., Decade 1, p. 30, Black Riv. Gr.



FIG. 674.—*Eunema cerithioides*.

priscum, Billings, 1859, Can. Nat. and Geo. vol. 4, p. 360, Calciferous Gr.

salteri, see *Orthonema salteri*.

strigillatum, Salter, 1859, Can. Org. Rem., Decade 1, p. 29, Black Riv. Gr.

trilineatum, Hall, 1867, 20th Rep. N. Y. Mus. Nat. Hist., p. 397, Niagara Gr.

EUOMPHALUS, Sowerby, 1812, Min. Conch., vol. 1, p. 97. [Ety. *eu*, wide; *omphalos*,

umbilicus.] Shell discoid, spire flattened; whorls numerous, angulated; umbilicus very wide, exposing volutions; mouth nearly circular; peritreme entire, not indented by the preceding whorl; surface usually sculptured. Type *E. pentangulatus*.

ammon, White & Whitfield, 1862, Proc. Bost. Soc. Nat. Hist., vol. 8, p. 301, Kinderhook Gr.

boonensis, Swallow, 1863, Trans. St. Louis Acad. Sci., vol. 2, p. 99, Burlington Gr.

calciferus, Whitfield, 1889, Bull. Am. Mus. Nat. Hist., vol. 2, p. 47, Calciferous Gr.



FIG. 675.—*Euomphalus pentangulatus*.

- catilloides, Conrad, 1842, (Inachus catilloides,) Jour. Acad. Nat. Sci., vol. 8, p. 273, Coal Meas.
- circumliratus, Whitfield, 1886, Bull. Am. Mus. Nat. Hist., vol. 1, p. 308, Birds-eye Gr.
- clymenioides, see Straparollus clymenioides.
- comes, Hall, syn. for Phanerotinus laxus.
- conradi, syn. for Pleuronotus decewi.
- cyclostomus, see Straparollus cyclostomus.
- decewi, see Pleuronotus decewi.
- decollatus, Hall, 1877, 1st Ed. Am. Pal. Foss., p. 244, Low. Held. Gr. Proposed instead of *E. disjunctus*, Hall, 1859, Pal. N. Y., vol. 3, p. 340.
- depressus, Hall, 1843. Preoccupied by Goldfuss in 1832. See Straparollus hecale.
- disjunctus, Hall. Preoccupied by Goldfuss. See *E. decollatus*.
- eboracensis, see Ecyliomphalus eboracensis.
- exortivus, Dawson, 1868, Acad. Geol., p. 308, Carboniferous.
- expansus, Conrad, 1842, Jour. Acad. Nat. Sci., vol. 8, p. 273, Niagara Gr.
- gyroceras, see Ecyliomphalus gyroceras.
- hecale, see Straparollus hecale.
- hecale var. *corpulens*, see Straparollus hecale var. *corpulens*.
- hemispherica, see platystoma hemisphericum.
- inops, see Straparollus inops.
- latus, Hall, 1858, Geo. Rep. Iowa, p. 605, Burlington Gr.
- laxus, see Ecyliomphalus laxus.
- lens, see Straparollus lens.
- luxus, White, 1875, Expl. W. 100th Meridian, vol. 4, p. 94, Subcarboniferous.
- macrolincatus, Whitfield, 1878, Ann. Rep. Geo. Sur. Wis., p. 82, and Geo. Sur. Wis., vol. 4, p. 294, Niagara Gr.
- minnesotensis, Owen, 1852, Geo. Sur. Wis., Iowa, and Minn., p. 581, Calciferous Gr.
- minutissimus, Castelneau, 1843, Syst. Sil., p. 35. Not recognized.
- obtusus, Hall, 1858, Geo. Rep. Iowa, p. 523, Kinderhook Gr.
- ophirensis, see Straparollus ophirensis.
- pernodosus, Meek & Worthen, 1870, (Straparollus pernodosus,) Proc. Acad. Nat. Sci., p. 45, and Geo. Sur. Ill., vol. 5, p. 604, Coal Meas.
- perspectivus, Swallow, 1863, Trans. St. Louis Acad. Sci., vol. 2, p. 98, Kaskaskia Gr.
- pervetus, Conrad, 1843, (Inachus pervetus,) Proc. Acad. Nat. Sci., vol. 1, p. 334, Trenton Gr.
- planidorsatus, Meek & Worthen, 1860, Proc. Acad. Nat. Sci., p. 462, and Geo. Sur. Ill., vol. 2, p. 302, Kaskaskia Gr.
- planispira, see Straparollus planispiratus.
- planodiscus, Hall, 1860, 13th Rep. N. Y. Mus. Nat. Hist., p. 109, and Pal. N. Y., vol. 5, pt. 2, p. 57, Ham. Gr.
- polygyratus, Roemer, 1852, Kreid. von Texas, p. 91, Silurian.
- profundus, see Bucania profunda.
- quadrivolvus, see Straparollus quadrivolvus.
- roberti, White, 1862, Proc. Bost. Soc. Nat. Hist., vol. 9, p. 22, Burlington Gr.
- rotuliformis, Meek, 1870, Proc. Acad. Nat. Sci., p. 61, Calciferous Gr.
- rotundus, see Pleurotomaria rotunda.
- rudis, see Straparollus rudis.
- rugilineatus, see Cyclonema rugilineatum.
- rugosus, Hall, 1858, Geo. Sur. Iowa, p. 722. Preoccupied by Sowerby in 1812. See *E. subrugosus*.
- sanctisabæ, see Straparollus sanctisabæ.
- sinuatus, see Straparollus sinuatus.
- spergenensis, see Straparollus spergenensis.
- spergenensis var. *planorbiformis*, see Straparollus spergenensis var. *planorbiformis*.
- spirorbis, see Straparollus spirorbis.
- springvalensis, White, 1876, Proc. Acad. Nat. Sci., p. 32, and Cont. to Pal., No. 8, p. 167, Kinderhook Gr.
- strongi, Whitfield, 1878, Ann. Rep. Geo. Sur. Wis., p. 66, and Geo. Wis., vol. 4, p. 200, Lower Magnesian Gr.
- subplanus, see Straparollus subplanus.
- subquadratus, Meek & Worthen, 1870, (Straparollus subquadratus,) Proc. Acad. Nat. Sci., p. 46, and Geo. Sur. Ill., vol. 5, p. 605, Up. Coal Meas.
- subrugosus, Meek & Worthen, 1873, Geo. Sur. Ill., vol. 5, p. 607, Coal Meas. Proposed instead of *E. rugosus*, Hall, which was preoccupied.
- sulcatus, Hall, 1843, Geo. Rep. 4th Dist. N. Y., p. 138, Onondaga Gr.
- tioga, Hall, 1876, Illust. Devonian Foss., pl. 15, and Pal. N. Y., vol. 5, pt. 2, p. 56, Chemung Gr.
- triliratus, Conrad, 1843, Proc. Acad. Nat. Sci., p. 333, Trenton Gr.
- trochiscus, see Rafinistoma trochiscum.
- umbilicatus, see Straparollus umbilicatus.
- uniangulatus, see Ophileta uniangulata.
- utahensis, see Straparollus utahensis.
- vaticanus, Hall, 1863, 16th Rep. N. Y. Mus. Nat. Hist., p. 136, Potsdam Gr.
- verneuili, Castelneau, 1843, Syst. Sil., p. 34. Not recognized.
- whitneyi, see Omphalotrochus whitneyi.
- FUSISPIRA, Hall, 1871, 24th Rep. N. Y. Mus. Nat. Hist., p. 229. [Ety. *fusus*, spindle; *spira*, spire.] Fusiform, imperforate; spire elevated, with rounded volutions; aperture elongate-ovate or elliptical, produced below, forming a subrimate canal; columella slightly twisted, without folds; peristome sharp. Type *F. ventricosa*.
- compacta, Hall & Whitfield, 1877, U. S. Expl. 40th Parallel, vol. 4, p. 236, Quebec Gr.
- elongata, Hall, 1871, 24th Rep. N. Y. Mus. Nat. Hist., p. 229, Trenton Gr.
- subfusiformis, Hall, 1847, (Murchisonia subfusiforme,) Pal. N. Y., vol. 1, p. 180, Trenton and Hud. Riv. Grs.

terebriformis, Hall, 1871, 24th Rep. N. Y. Mus. Nat. Hist., p. 230, Hud. Riv. Gr.



ventricosa, Hall, 1871, 24th Rep. N. Y. Mus. Nat. Hist., p. 229, Trenton Gr.

vittata, Hall, 1847, (Murchisonia vittata,) Pal. N. Y., vol. 1, p. 181, Trenton Gr.

Fusus, Bruguiere, 1789, Encyc. Meth. This genus is unknown in the Palæozoic rocks. *inhabilis*, syn.

FIG. 676.—*Fusispira ventricosa*.

for *Macrochilina primigenia*.

HELICOTOMA, Salter, 1859, Can. Org. Rem., Decade 1, p. 13. [Ety. *Helix*, genus of shells; *tome*, notch.] Depressed discoid, spire nearly flat, whorls obtusely angular externally, rounded below; umbilicus broad; form helicoid. Type *H. planulata*.

declivis, Safford, 1869, Geo. of Tenn. Not defined.

eucharis, Billings, 1865, Pal. Foss., vol. 1, p. 249, Quebec Gr.



FIG. 677.—*Helicotoma eucharis*.

gorgonea, Billings, 1865, Pal. Foss., vol. 1, p. 248, Quebec Gr.

larvata, Salter, 1859, Can. Org. Rem., Decade 1, p. 15, Black Riv. and Trenton Grs.

misera, Billings, 1865, Pal. Foss., vol. 1, p. 309, Quebec Gr.

muricata, Salter, 1859, (*H. planulata* var. *muricata*.) Can. Org. Rem., Decade 1, p. 14, Black Riv. and Trenton Grs.

naresii, Etheridge, 1878, Quar. Jour. Geo. Soc., vol. 34, p. 602, Up. Sil.

perstriata, Billings, 1859, Can. Nat. and Geo., vol. 4, p. 356, Calciferous Gr.

planulata, Salter, 1859, Can. Org. Rem., Decade 1, p. 14, Black Riv. and Trenton Grs.

proserpina, Billings, 1865, Pal. Foss., vol. 1, p. 247, Quebec Gr.

serotina, Nicholson, 1874, Rep. Pal. Ont., p. 120, Up. Held. Gr.

spinosa, Salter, 1859, Can. Org. Rem., Decade 1, p. 15, Black Riv. Gr.

tennesseensis, Safford, 1869, Geo. of Tenn. Not defined.

tritonia, Billings, 1865, Pal. Foss., vol. 1, p. 247, Quebec Gr.

HOLOPEA, Hall, 1847, Pal. N. Y., vol. 1, p. 169. [Ety. *holos*, entire; *ope*, aperture.] Shell conical, ventricose, more or less oblique, or nearly direct; aperture round, ovate; margin entire; surface marked by fine curved striæ or cancellated; distinguished from *Cyclonema* by the presence of an umbilicus. Type *H. symmetrica* and *H. obliqua*.

antiqua, Vanuxem, 1843, (*Littorina antiqua*.) Geo. Rep. 3d Dist. N. Y., p. 112, and Pal. N. Y., vol. 3, p. 294, Low. Held. Gr.

antiqua var. *pervetusta*, Hall, 1859, Pal. N. Y., vol. 3, p. 295, Low. Held. Gr.

cassina, Whitfield, 1886, Bull. Am. Mus. Nat. Hist., p. 310, Birdseye Gr.

chicagoensis, Winchell & Marcy, 1865, Mem. Bost. Soc. Nat. Hist., p. 99, Niagara Gr.

conica, Winchell, 1863, Proc. Acad. Nat. Sci., p. 21, Marshall Gr.

danai, Hall, 1859, Pal. N. Y., vol. 3, p. 295, Low. Held. Gr.

dilucula, Hall, 1847, (*Turbo dilucula*.) Pal. N. Y., vol. 1, p. 12, Calciferous Gr.

(?) *elongata*, Hall, 1859, Pal. N. Y., vol. 3, p. 295, Low. Held. Gr.

eriansis, Nicholson, 1874, Rep. Pal. Ont., p. 120, Up. Held. Gr.

gracia, Billings, 1862, Pal. Foss., vol. 1, p. 159, Guelph Gr.

guelphensis, Billings, 1862, Pal. Foss., vol. 1, p. 159, Guelph Gr.

harmonia, Billings, 1862, Pal. Foss., vol. 1, p. 158, Guelph Gr.

lavinia, Billings, 1862, Pal. Foss., vol. 1, p. 28, Trenton Gr.

leiosoma, Billings, 1865, Pal. Foss., vol. 1, p. 187, Quebec Gr.

magniventra, Whitfield, 1878, Ann. Rep. Geo. Sur. Wis., p. 83, and Geo. Wis., vol. 4, p. 316, Niagara Gr.

nana, Meek, 1871, Proc. Acad. Nat. Sci., p. 172, syn. for *Cyclora minuta*.

nereis, Billings, 1862, Pal. Foss., vol. 1, p. 27, Trenton and Black Riv. Grs.

newtonensis, Whitfield, 1882, Ann. N. Y. Acad. Sci., vol. 2, p. 224, Kaskaskia Gr.

niagarensis, Winchell & Marcy, 1865, Mem. Bost. Soc. Nat. Hist., p. 99, Niagara Gr.

obesa, Whitfield, 1882, Geo. Wis., vol. 4, p. 348, Low. Magnesian Gr.

obliqua, Hall, 1847, Pal. N. Y., vol. 1, p. 170, Trenton and Hud. Riv. Gr.

obscura, Hall, 1847, (*Turbo obscura*.) Pal. N. Y., vol. 1, p. 12, Calciferous Gr.

occidentalis, Nicholson, 1875, Quar. Jour. Geo. Soc. Lond., vol. 31, p. 550, Guelph Gr.

ophelia, Billings, 1865, Pal. Foss., vol. 1, p. 222, Quebec Gr.



FIG. 678. *Holopea dilucula*.

ovalis, Billings, 1859, Can. Nat. and Geo., vol. 4, p. 351, Calciferous Gr.
 paludiformis, Hall, 1847, Pal. N. Y., vol. 1, p. 171, Trenton Gr.
 proserpina, Billings, 1862, Pal. Foss., vol. 1, p. 28, Calciferous and Chazy Grs.
 proutana, Hall, 1858, Trans. Alb. Inst., vol. 4, p. 30, and Bull. Am. Mus. Nat. Hist., p. 72, Warsaw Gr.
 pyrene, Billings, 1862, Pal. Foss., vol. 1, p. 27, Black Riv. Gr.
 reversa, Hall, 1860, Can. Nat. and Geo. vol. 5, p. 154, Up. Silurian.
 subconica, Hall, 1859, Pal. N. Y., vol. 3, p. 294, Low. Held. Gr.
 subconica, Winchell, 1863, Proc. Acad. Nat. Sci., p. 21. This name was preoccupied.
 sweeti, Whitfield, 1880, Ann. Rep. Geo. Sur. Wis. and Geo. Wis., vol. 4, p. 174, Potsdam Gr.
 symmetrica, Hall, 1847, Pal. N. Y., vol. 1, p. 170, Black Riv. Gr.
 turgida, Hall, 1847, (Pleurotomaria turgida,) Pal. N. Y., vol. 1, p. 12, Calciferous Gr.
 ventricosa, Hall, 1847, Pal. N. Y., vol. 1, p. 171, Trenton Gr.

HOLOPELLA, McCoy, 1855, Brit. Pal. Foss., p. 303. [Ety. diminutive of *Holopea*.] Shell spiral, elongate, slender, of numerous gradually increasing whorls, generally crossed by slightly arched striae; mouth circular, with the peritreme entire; base rounded, with or without a minute umbilicus. Type *H. cancellata*.

mira, Winchell, 1863, Proc. Acad. Nat. Sci., p. 22, Marshall Gr.

Inachus catilloides, see *Euomphalus catilloides*.

pervetus, see *Euomphalus pervetus*.

pervetustus, see *Pleurotomaria pervetusta*.

undatus, see *Lituites undatus*.

ISONEMA, Meek & Worthen, 1866, Proc. Acad. Nat. Sci. Phil., p. 251. [Ety. *isos*, equal; *nema*, thread.] Depressed turbinate, subglobose, obtusely angular around the middle of the body whorl; aperture subrhombic; outer lip thin, entire; inner lip a little flattened in the umbilical region; surface ornamented with transverse, very regular lines on the upper side of the volutions. Type *I. depressum*.

bellatulum, see *Callonema bellatulum*.



FIG. 679.—*Isonema depressum*.

humile, Meek, 1871, Proc. Acad. Nat. Sci., p. 79, and Ohio Pal., vol. 1, p. 214, Up. Held. Gr.

lichas, see *Callonema lichas*.

LEPETOPSIS, Whitfield, 1882 Bull. Am. Mus. Nat. Hist., No. 3, p. 67. [Ety. *Lepeta*, a

genus; *opsis*, resemblance.] Shell patelliform, more or less regularly round or oval, apex subcentral, posterior to the middle, directed backward, the nucleus dextrally coiled; muscular imprint horseshoe-shaped, open in front, consisting of an irregular narrow band, which expands more or less at the anterior extremities; surface with six radiating lines, two anterior, two posterior, and two lateral.

Type *L. levettii*.

chesterensis, Worthen, 1884, Bull. No. 2, Ill. St. Mus. Nat. Hist., p. 25, and Geo. Sur. Ill., vol. 8, p. 140, Kaskaskia Gr.

levettii, White, 1882, (Patella levettei,) 11th Rep. Geo. of Indiana, p. 359, Warsaw Gr.

Littorina, Ferussac, 1821, Tab. Syst. An. Mollusques, etc.

antigua, see *Holopea antiqua*.

cancellata, see *Cyclonema cancellatum*.

wheeleri, see *Naticopsis wheeleri*.

LOPIOSPIRA, Whitfield, 1886, Bull. Am. Mus. Nat. Hist., vol. 1, p. 312. [Ety. *lophos*,

the keel; *spira*, a whorl.] Spire elevated, strongly keeled, and axis minutely perforate, when whorls are not disconnected. The types are *Murchisonia milleri*, Hall, and *M. helicteris*; but as the generic characters are not very satisfactorily or clearly defined, I leave the species with *Murchisonia*.

cassina, see *Murchisonia cassina*.

calcifera, see *Murchisonia calcifera*.

LOXONEMA, Phillips, 1841, Pal. Foss., Cornwall, etc., p. 98. [Ety. *loxos*, oblique; *nema*, thread.] Shell elongate, many whorled; aperture simple, attenuate above, effuse below; lines of growth sigmoidal; no umbilicus. Type *L. sinuosum*.

aculeatum, Billings, 1866, Catal. Sil. Foss. Antic., p. 55, Anticosti Gr.

acutulum, Dawson, 1868, Acad. Geol., p. 309, Carboniferous.

approximatum, Walcott, 1885, Monogr. U. S. Geo. Sur., vol. 8, p. 191, Devonian.

attenuatum, Stevens, 1858, (Chemnitzia attenuata,) Am. Jour. Sci. and Arts, 2d ser., vol. 25, p. 259, Coal Meas.

attenuatum, Hall, 1859, Pal. N. Y., vol. 3, p. 296. The name was preoccupied.

See *L. emaceratum*.

attenuatum var. *semicostatum*, see *L. semicostatum*.

bellatulum, see *Isonema bellatulum*.

bellona, Hall, 1876, Illust. Devonian Foss., pl. 14, and Pal. N. Y., vol. 5, pt. 2, p. 46, Ham. Gr.

bellum, Walcott, 1885, Monogr. U. S. Geo. Sur., vol. 8, p. 258, Subcarboniferous.

boydi, see *Murchisonia boydi*.

breviculum, Hall, 1879, Pal. N. Y., vol. 5, pt. 2, p. 132, Ham. Gr.



FIG. 680.—*Lepetopsis levettii*.

cara, Dawson, 1883, Rep. on Redpath
 Museum, No. 2, p. 11, Subcarboniferous.
 carinatum, see *Macrochilina carinata*.
 cerithiiforme, Meek & Worthen, 1860,
 Proc. Acad. Nat. Sci., p. 465, and Geo.
 Sur. Ill., vol. 2, p. 379, Up. Coal Meas.
 coaptum, Hall, 1876, Illust. Devonian
 Foss., pl. 13, and Pal. N. Y., vol. 5, pt.
 2, p. 44, Ham. Gr.
 compactum, Hall, 1859, Pal. N. Y., vol. 3,
 p. 297, Low. Held. Gr.
 cotteranum, Billings, 1861, Can. Jour., vol.
 6, p. 360, Corniferous limestone.
crassum, Webster, 1888, Am. Nat., p. 446.
 Not defined so as to be recognized.
 danvillense, Stevens, 1858, Am. Jour. Sci.,
 vol. 25, p. 259, Coal Meas.
 delphicola, Hall, 1862, 15th Rep. N. Y.
 Mus. Nat. Hist., p. 52, and Pal. N. Y.,
 vol. 5, pt. 2, p. 47, Ham. Gr.
 emaceratum, Hall, 1877, 1st Ed. Am. Pal.
 Foss., p. 244, Low. Held. Gr. Proposed
 instead of *L. attenuatum*. Hall, 1859, in
 Pal. N. Y., vol. 3, p. 296, which was
 preoccupied.
 eurekense, Walcott, 1885, Monogr. U. S.
 Geo. Sur., vol. 8, p. 190, Devonian.
 fasciatum, King, 1850, Permian Foss., p.
 209, Permian Gr.
 fitchi, Hall, 1859, Pal. N. Y., vol. 3, p.
 296, Low. Held. Gr.
gigantea, Webster, 1888, Am. Nat., p. 445.
 Not properly defined.
 halli, Norwood & Pratten, 1855, Jour.
 Acad. Nat. Sci., 2d series, vol. 3, p. 77,
 Coal Meas.
 hamiltoniæ, Hall, 1862, 15th
 Rep. N. Y. Mus. Nat. Hist., p. 33, and Pal. N.
 Y., vol. 5, pt. 2, p. 45,
 Ham. Gr.
 hydraulicum, Hall & Whit-
 field, 1872, 24th Rep.
 N. Y. Mus. Nat. Hist., p.
 193, and Pal. N. Y., vol.
 5, pt. 2, p. 44, Ham. Gr.
inornata, see *Polyphemop-
 sis inornata*.
 kani, Meek, 1865, Am. Jour. Sci. and
 Arts, 2d ser., vol. 40, p. 33, Low.
 Held. Gr.
 læviusculum, Hall, 1879, Pal. N. Y., vol.
 5, pt. 2, p. 131, Ham. Gr.
 laxum, Hall, 1879, Pal. N. Y., vol. 5, pt.
 2, p. 49, Chemung Gr.
 leda, Hall, 1868, 20th Rep. N. Y. Mus.
 Nat. Hist., p. 398, Niagara Gr.
 magnum, Whitfield, 1878, Ann. Rep. Geo.
 Sur. Wis., p. 83, and Geo. Wis., vol. 4,
 p. 317, Niagara Gr.
 macclintochi, Houghton, 1857, Jour. Roy.
 Soc. Dub., vol. 1, Devonian.
 minutum, Stevens, 1858, Am. Jour. Sci.,
 2d series, vol. 25, p. 260, Coal Meas.
 moloch, Clarke, 1885, Bull. U. S. Geo. Sur.,
 No. 16, p. 30, Genesee shales.
 multicostatum, Meek & Worthen, 1861,
 Proc. Acad. Nat. Sci., p. 128, and Geo.
 Sur. Ill., vol. 2, p. 378, Coal Meas.



FIG. 681.—*Loxonema hamiltoniæ*.

murrayanum, Salter, 1859, Can. Org. Rem.,
 Decade 1, p. 31, Black Riv. Gr.
newberryi, see *Soleniscus newberryi*.
nexile, Sowerby. Not an American species.
nitidula, see *Polyphemopsis nitidula*.
 nobile, Walcott, 1885, Monogr. U. S. Geo.
 Sur., vol. 8, p. 190, Devonian.
 nodosum, Stevens, 1858, Am. Jour. Sci.,
 2d ser., vol. 25, p. 260, Coal Meas.
 noe, Clarke, 1885, Bull. U. S. Geo. Sur.,
 No. 16, p. 55, Portage Gr.
 obtusum, Hall, 1859, Pal. N. Y., vol. 3, p.
 297, Low. Held. Gr.
 oligospiratum, Winchell, 1863, Proc. Acad.
 Nat. Sci., p. 22, Marshall Gr.
owenense, Webster, 1888, Am. Nat., p. 446.
 Not defined so as to be recognized.
 parvum, Cox, 1857, (*Chemnitzia parva*,)
 Geo. Sur. Ky., vol. 3, p. 567, Coal Meas.
 parvulum, Whitfield, 1882, Ann. N. Y.
 Acad. Sci., vol. 2, p. 204, Up. Held. Gr.
 peoriense, Worthen, 1884, Bull. No. 2, Ill.
 St. Mus. Nat. Hist., p. 7, and Geo. Sur.
 Ill., vol. 8, p. 139, Coal Meas.
 pexatum, Hall, 1861, 14th Rep. N. Y. Mus.
 Nat. Hist., p. 104, and Pal. N. Y., vol.
 5, pt. 2, p. 42, Up. Held. Gr.
 pexatum var. *obsoletum*, Hall, 1876, Il-
 lust. Devonian Foss., pl. 13, and Pal.
 N. Y., vol. 5, pt. 2, p. 43, Up. Held. Gr.
 planogratum, Hall, 1839, Pal. N. Y., vol.
 3, p. 298, Low. Held. Gr.
 plicatum, Whitfield, 1882, Ann. N. Y.
 Acad. Sci., vol. 2, p. 231, Coal Meas.
 politum, Stevens, 1858, Am. Jour. Sci., 2d
 series, vol. 25, p. 260, Coal Meas.
 postrenum, Hall, 1879, Pal. N. Y., vol. 5,
 pt. 2, p. 132, Chemung Gr.
 quadricarinatum, Worthen, 1884, Bull.
 No. 2, Ill. St. Mus. Nat. Hist., p. 7, and
 Geo. Sur. Ill., vol. 8, p. 140, Coal
 Meas.
 rectistriatum, Hall, 1879, Pal. N. Y., vol.
 5, pt. 2, p. 130, Ham. Gr.
 regulare, Cox, 1857, Geo. Sur. Ky., vol. 3,
 p. 566, Coal Meas.
 robustum, Hall, 1862, 15th Rep. N. Y.
 Mus. Nat. Hist., p. 52, and Pal. N. Y.,
 vol. 5, pt. 2, p. 40, Schoharie grit.
 rossi, Houghton, 1857, Jour. Roy. Soc.
 Dub., vol. 1, Devonian.
 rugosum, Meek & Worthen, 1860, Proc.
 Acad. Nat. Sci., p. 465, and Geo. Sur.
 Ill., vol. 2, p. 378, Up. Coal Meas.
 scitulum, Meek & Worthen, 1860, Proc.
 Acad. Nat. Sci., p. 464, and Geo. Sur.
 Ill., vol. 2, p. 372, Low. Coal Meas.
 semicostatum, Meek, 1871, (*L. attenua-
 tum* var. *semicostatum*.) Proc. Acad. Nat.
 Sci., p. 174, and Geo. Sur. Ill., vol. 5,
 p. 596, Coal Meas.
 sicula, Hall, 1879, Pal. N. Y., vol. 5, pt.
 2, p. 43, Up. Held. Gr.
 solidum, Hall, 1862, 15th Rep. N. Y. Mus.
 Nat. Hist., p. 51, and Pal. N. Y., vol. 5,
 pt. 2, p. 41, Schoharie grit.
 styliola, Hall, 1876, Illust. Devon. Foss.,
 pl. 14, and Pal. N. Y., vol. 5, pt. 2, p.
 48, Chemung Gr.

subtenuatum, Hall, 1862, 15th Rep. N. Y. Mus. Nat. Hist., p. 52, and Pal. N. Y., vol. 5, pt. 2, p. 40, Schoharie grit.
subulata, see Murchisonia subulata.
 swallowanum, Shumard, 1859, (Chemnitzia swallowana.) Trans. St. Louis Acad. Sci., vol. 1, p. 399, Permian.
 tenuicarinatum, Stevens, 1858, Am. Jour. Sci., 2d series, vol. 25, p. 260, Coal Meas.
 tenuilineatum, Shumard, 1855, (Chemnitzia tenuilineata.) Geo. Rep. Mo., p. 207, Waverly Gr. or Choteau limestone.
 terebra, Hall, 1876, Illust. Devon. Foss., pl. 14, and Pal. N. Y., vol. 5, pt. 2, p. 48, Chemung Gr.
 teres, Hall, 1876, Illust., Devonian Foss., pl. 13, and Pal. N. Y., vol. 5, pt. 2, p. 42, Corniferous Gr.
 turritiforme, Hall, 1860, 13th Rep. N. Y. Mus. Nat. Hist., p. 109, Kinderhook Gr.



FIG. 682.—*Loxoneima yandellanum*.

vincta, see Murchisonia vincta.
 yandellanum, Hall, 1858, Trans. Alb. Inst., vol. 4, p. 28, and Bull. Am. Mus. Nat. Hist., p. 77, Warsaw Gr.

MACLUREA, LeSueur, 1818, (Maclurites.) Jour. Acad. Nat. Sci., vol. 1, p. 312. [Ety. proper name.] Discoidal, few whorled, reversed, upper surface convex, deeply perforate, outer side spirally grooved; operculum sinistrally subspiral, solid, with two internal projections for the attachment of muscles. Type M. magna.

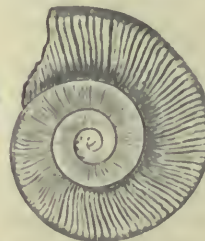
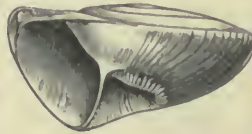


FIG. 683.—*Maclurea crenulata*.

acuminata, Billings, 1865, Pal. Foss., vol. 1, p. 240, Quebec Gr.
 affinis, Billings, 1865, Pal. Foss., vol. 1, p. 238, Quebec Gr.
 annulata, Walcott, 1885, Monogr. U. S. Geo. Sur., vol. 8, p. 81, Chazy Gr.
 atlantica, Billings, 1859, Can. Nat. and Geo., vol. 4, p. 459, Chazy Gr.
 bigsbyi, Hall, 1861, Geo. Rep. Wis., p. 37, and Geo. Wis., vol. 4, p. 222, Trenton Gr.
 carinata, Walcott, 1885, Monogr. U. S. Geo. Sur., vol. 8, p. 82, Trenton Gr.
 crenulata, Billings, 1865, Pal. Foss., vol. 1, p. 236, Quebec Gr.
 cuneata, Whitfield, 1878, Ann. Rep. Geo. Sur. Wis., p. 75, and Geo. Wis., vol. 4, p. 246, Trenton Gr.

emmonsi, Billings, 1865, Pal. Foss., vol. 1, p. 242, Quebec Gr.
labiata, see Raphistoma labiata.
 logani, Salter, 1851, Rep. British Assoc., p. 63, Black Riv. Gr.
 magna, LeSueur, 1818, Jour. Acad. Nat. Sci., vol. 1, p. 312, and Pal. N. Y., vol. 1, p. 26, Chazy Gr.
 matutina, Hall, 1847, Pal. N. Y., vol. 1, p. 10, Calciferous Gr.
 minima, Hall & Whitfield, 1877, U. S. Geo. Expl., 40th parallel, vol. 4, p. 235, Chazy Gr.
 oceana, Billings, 1865, Pal. Foss., vol. 1, p. 237, Quebec Gr.
 ponderosa, Billings, 1865, Pal. Foss., vol. 1, p. 239, Quebec Gr.
 psyche, Billings, 1865, Pal. Foss., vol. 1, p. 244, Quebec Gr.
 rotundata, Billings, 1865, Pal. Foss., vol. 1, p. 245, Quebec Gr.
 speciosa, Billings, 1865, Pal. Foss., vol. 1, p. 240, Quebec Gr.
 sordida, Hall, 1847, Pal. N. Y., vol. 1, p. 10, Calciferous Gr.
striata, see Scalites striatus.
striata, Troost, 1840. Not defined.
 subannulata, Walcott, 1885, Monogr. U. S. Geo. Sur., vol. 8, p. 82, Trenton Gr.
 subrotunda, Whitfield, 1878, Ann. Rep. Geo. Sur. Wis., p. 75, and Geo. Wis., vol. 4, p. 246, Trenton Gr.
 sylpha, Billings, 1865, Pal. Foss., vol. 1, p. 244, Quebec Gr.
 transitionis, Billings, 1865, Pal. Foss., vol. 1, p. 241, Quebec Gr.

wadsworthi, Whitfield, 1884, Bull. Am. Mus. Nat. Hist., vol. 1, p. 139, Up. Taconic.
Macrochilus, Phillips, 1841, Pal. Foss., Cornwall, etc., p. 103. This name was preoccupied by Hope, in 1838, for a genus of Coleopterous insects. Bayle has

proposed *Macrochilina*, to which all the species are referred.
altonense, see *Macrochilina worthenanus*.
altonense, see *Macrochilina altonensis*.
anguliferum, see *Macrochilina angulifera*.
 attenuatum, Hall, syn. for *Soleniscus fusiformis*.
cooperense, see *Macrochilina cooperensis*.
fusiforme, see *Soleniscus fusiformis*.
gracile, see *Macrochilina gracilis*.
hallanum, see *Soleniscus hallanus*.
hamiltonix, see *Macrochilina hamiltonia*.
hebe, see *Macrochilina hebe*.
hildrethi, see *Macrochilina hildrethi*.
humile, see *Macrochilina humilis*.
inhabile, syn. for *Macrochilina primitivum*.
intercalare, see *Macrochilina intercalaris*.

kansasense, see *Macrochilina kansasensis*.
klipparti, see *Soleniscus klipparti*.
macrostomum, see *Macrochilina macrostomum*.
mediale, see *Macrochilina medialis*.
missouriense, see *Macrochilina missouriensis*.
newberryi, see *Soleniscus newberryi*.
paludinaeformis, see *Soleniscus paludini-formis*.
pingue, see *Macrochilina pinguis*.
ponderosum, see *Macrochilina ponderosum*.
primævum, see *Macrochilina primævum*.
primigenium, see *Macrochilina primigenium*.
priscum, see *Macrochilina prisca*.
pulchellum, syn. for *Macrochilina intercalaris*.
spiratum, see *Macrochilina spirata*.
subcorpulentum, see *Macrochilina subcorpulenta*.
terranovicum, see *Macrochilina terranovica*.
texanum, see *Soleniscus texanus*.
ventricosum, see *Soleniscus ventricosus*.
MACROCHILINA, Bayle, 1880, *Journal de Conchyliologie*, 3me. ser., t. 19. Proposed instead of *Macrocheilus* of Phillips, which was preoccupied by Hope. [Ety. diminutive of *Macrocheilus*.] Subglobose, elongate; apex pointed; whorls convex, smooth, last one large; aperture subovate; columella imperforate; outer lip thin, without notch or sinus; inner lip thin above and thickened below. Type *M. acuta*
altonensis, Worthen, 1873, (*Macrocheilus altonense*.) *Geo. Sur. Ill.*, vol. 5, p. 593, Coal Meas.
angulifera, White, 1874, (*Macrocheilus anguliferum*.) *Rep. Invertebrate Foss.*, p. 22, and *Geo. Sur. 100th Mer.*, vol. 4, p. 160, Carboniferous.
carinata, Stevens, 1858, (*Loxonema carinatum*.) *Am. Jour. Sci.*, vol. 25, p. 259, Coal Meas.
cooperensis, Swallow, 1863, (*Macrocheilus cooperense*.) *Trans. St. Louis Acad. Sci.*, vol. 2, p. 100, Kaskaskia Gr.
gracilis, Cox, 1857, (*Macrocheilus gracile*.) *Geo. Sur. Ky.*, vol. 3, p. 570, Coal Meas.
hamiltoniæ, Hall, 1862, (*Macrocheilus hamiltoniæ*.) 15th Rep. N. Y. Mus. Nat. Hist., p. 49 and Pal. N. Y., vol. 5, pt. 2, p. 33, Ham. Gr.
hebe, Hall, 1862, (*Macrocheilus hebe*.) 15th Rep. N. Y. Mus. Nat. Hist., p. 48, and Pal. N. Y., vol. 5, pt. 2, p. 32, Ham. Gr.
hildrethi, Conrad, 1842, (*Plectostylus hildrethi*.) *Jour. Acad. Nat. Sci.*, vol. 8, p. 275, Coal Meas.
humilis, Keyes, 1888, (*Macrocheilus humile*.) *Proc. Acad. Nat. Sci. Phil.* pl. xii, fig. 1, Coal Meas.
intercalaris, Meek & Worthen, 1860, (*Macrocheilus intercalare*.) *Proc. Acad. Nat. Sci.*, p. 467, and *Geo. Sur. Ill.*, vol. 2, p. 371, Up. Coal Meas.

kansasensis, Swallow, 1858, (*Macrocheilus kansasense*.) *Trans. St. Louis Acad. Sci.*, vol. 1, p. 201, Coal Meas.
littonana, Hall, 1858, (*Natica littonana*.) *Trans. Alb. Inst.*, vol. 4, p. 30, and *Bull. Am. Mus. Nat. Hist.*, p. 72, Warsaw Gr.
macrostoma, Hall, 1862, (*Macrocheilus macrostomum*.) 15th Rep. N. Y. Mus. Nat. Hist., p. 49, and Pal. N. Y., vol. 5, pt. 2, p. 33, Ham. Gr.
medialis, Meek & Worthen, 1860, (*Macrocheilus mediale*.) *Proc. Acad. Nat. Sci.*, p. 466, and *Geo. Sur. Ill.*, vol. 2, p. 370, Up. Coal Meas.
missouriensis, Swallow, 1858, (*Macrocheilus missouriense*.) *Trans. St. Louis Acad. Sci.*, vol. 1, p. 201, Coal Meas.
pinguis, Winchell, 1863, (*Macrocheilus pingue*.) *Proc. Acad. Nat. Sci.*, p. 21, Marshall Gr.
ponderosa, Swallow, 1858, (*Macrocheilus ponderosum*.) *Trans. St. Louis Acad. Sci.*, vol. 1, p. 202, Coal Meas.
primæva, Hall, 1876, (*Macrocheilus primævum*.) *Illust.*, *Devonian Foss.*, pl. 12, and Pal. N. Y., vol. 5, pt. 2, p. 35, Schoharie grit.
primigenia, Conrad, 1835, (*Stylifer primigenia*.) *Trans. Geo. Soc. Penn.*, vol. 1, p. 267, Coal Meas.
prisca, Whitfield, 1882, (*Macrocheilus priscum*.) *Ann. N. Y. Acad. Sci.*, vol. 2, p. 204, Up. Held. Gr.
spirata, McCoy, 1850, (*Macrocheilus spiratum*.) *Brit. Pal. Rocks*, p. 549, Coal Meas.
subcorpulenta, Whitfield, 1882, (*Macrocheilus subcorpulentum*.) *Ann. N. Y. Acad. Sci.*, vol. 2, p. 224, Kaskaskia Gr.
terranovica, Dawson, 1883, (*Macrocheilus terranovicum*.) *Rep. on Redpath Museum*, No. 2, p. 14, Carboniferous.
worthenanus, n. sp. *St. Louis Gr.* Proposed instead of *Macrocheilus altonense* in *Geo. Sur. Ill.*, vol. 8, p. 143, which name was preoccupied.
ΜΕΤΟΠΟΜΑ, Phillips, 1836, *Geo. of Yorkshire*, pt. 2, p. 223. [Ety. *metopon*, front: *tome*, incision.] Patelliform, truncated under the apex, at the posterior side; horseshoe-shaped muscular scar, with the open end directed from the truncated side. Type *M. oblonga*.
alceste, Billings, 1862, *Pal. Foss.*, vol. 1, p. 153, Hud. Riv. Gr.
alta, Whitfield, 1889, *Bull. Am. Mus. Nat. Hist.*, vol. 2, p. 44, Calciferous Gr.
analoga, Walcott, 1885, *Monogr. U. S. Geo. Sur.*, vol. 8, p. 84, Trenton Gr.
angusta, Billings, 1862, *Pal. Foss.*, vol. 1, p. 88, Quebec Gr.
anomala, Billings, 1862, *Pal. Foss.*, vol. 1, p. 89, Quebec Gr.



FIG. 684. — *Macrochilina littonana*.

barabuensis, Whitfield, 1878, Ann. Rep. Geo. Sur. Wis., p. 60, and Geo. Wis., vol. 4, p. 195, Low. Magnesian Gr.
billingsi, Walcott, 1883, 35th Rep. N. Y. Mus. Nat. Hist., p. 212, Trenton Gr.



FIG. 685.—*Metoptoma canadensis*. a, Upper side; b, side view; c, under side.

canadensis, Billings, 1865, Pal. Foss., vol. 1, p. 394, (*Chiton canadensis*), Black Riv. Gr.
cornutiformis, Walcott, 1879, Desc. New Spec. Foss., p. 1, Calciferous Gr.
devonica, Walcott, 1885, Monogr. U. S. Geo. Sur., vol. 8, p. 195, Devonian.
dubia, Hall, 1847, Pal. N. Y., vol. 1, p. 23, Chazy Gr.
erato, see *Tryblidium erato*.
estella, Billings, 1862, Pal. Foss., vol. 1, p. 153, Hud. Riv. Gr.
eubule, see *Tryblidium eubule*.
hyrie, see *Tryblidium hyrie*.
instabilis, Billings, 1865, Pal. Foss., vol. 1, p. 251, Quebec Gr.
melissa, Billings, 1862, Pal. Foss., vol. 1, p. 86, Quebec Gr.
montrealensis, Billings, 1865, Pal. Foss., vol. 1, p. 394, Chazy Gr.
niobe, see *Tryblidium niobe*.
nycteis, see *Tryblidium nycteis*.
orithyia, Billings, 1862, Pal. Foss., vol. 1, p. 38, Calcif. Gr.
orphyne, Billings, 1862, Pal. Foss., vol. 1, p. 88, Quebec Gr.
peroccidens, Walcott, 1885, Monogr. U. S. Geo. Sur., vol. 8, p. 260, Subcarb.
perovalis, Whitfield, 1878, Ann. Rep. Geo. Sur. Wis., p. 74, and Geo. Wis., vol. 4, p. 211, Trenton Gr.
phillipsi, Walcott, 1885, Monogr. U. S. Geo. Sur., vol. 8, p. 83, Trenton Gr.
quebecensis, Billings, 1865, Pal. Foss., vol. 1, p. 308, Quebec Gr.
recurva, Whitfield, 1878, Ann. Rep. Geo. Sur. Wis., p. 61, and Geo. Wis., vol. 4, p. 196, Low. Mag. Gr.
retrorsa, Whitfield, 1880, Ann. Rep. Geo. Sur. Wis., p. 54, and Geo. Wis., vol. 4, p. 197, Low. Mag. Gr.
rugosa, see *Stenotheca rugosa*.
similis, Whitfield, 1878, Ann. Rep. Geo. Sur. Wis., p. 61, and Geo. Wis., vol. 4, p. 196, Low. Mag. Gr.
simplex, see *Tryblidium simplex*.
superba, Billings, 1865, Pal. Foss., vol. 1, p. 172, Black Riv. Gr.
trentonensis, Billings, 1862, Pal. Foss., vol. 1, p. 40, Trenton Gr.
undata, Winchell, 1865, Proc. Acad. Nat. Sci. Phil., p. 131, Kinderhook Gr.
umbella, Meek & Worthen, 1866, Proc. Acad. Nat. Sci. Phil., p. 267, and Geo. Sur. Ill., vol. 3, p. 506, Burlington Gr.

venilia, Billings, 1862, Pal. Foss., vol. 1, p. 88, Quebec Gr.

MICROKERAS, Hall, 1845, Am. Jour. Sci., vol. 48, p. 294. [Ety. *mikros*, small; *keras*, horn.] General form like *Cyrtolites*, but distinguished by its minute size, smooth surface, and less angular dorsal margin. Type *M. inornatum*.
inornatum, Hall, 1845, Am. Jour. Sci., vol. 48, p. 294, and Ohio Pal., vol. 1, p. 147, Hud. Riv. Gr.
minutissimum, Ulrich, 1879, Jour. Cin. Soc. Nat. Hist., vol. 2, p. 13, Hud. Riv. Gr.

MICRONOMA, Meek & Worthen, 1866, Proc. Acad. Nat. Sci., p. 269. [Ety. *mikros*, small; *domus*, house.] Shell small, subtrochiform; volutions seven or more, flattened on a line with the slope of the shell; suture deep; aperture oblique; surface ornamented with nodular ridges. Type *M. conica*.
conica, Meek & Worthen, 1866, Proc. Acad. Nat. Sci. Phil., p. 269, and Geo. Sur. Ill., vol. 5, p. 598, Low. Coal Meas.

MURCHISONIA, D'Archiac & Verneuil, 1841, Bull. Soc. Geo. Fr., vol. 12, p. 154, and Phillips Pal. Foss. Cornwall, etc., p. 101. [Ety. proper name.] Shell elongated, many whorled; whorls variously sculptured and zoned; outer lip deeply notched; aperture slightly channeled in front. Type *M. bilineata*.
abbreviata, Hall, 1847, Pal. N. Y., vol. 1, p. 32. The name was preoccupied by DeKoninck in 1841. See *M. subabbreviata*.

aciculata, Hall, 1860, Can. Nat. and Geo., vol. 5, p. 154, Up. Silurian.

acrea, Billings, 1865, Pal. Foss., vol. 1, p. 232, Quebec Gr.

ada, Billings, 1865, Pal. Foss., vol. 1, p. 346, Calciferous Gr.

adelina, Billings, 1865, Pal. Foss., vol. 1, p. 232, Quebec Gr.

agilis, Billings, 1865, Pal. Foss., vol. 1, p. 235, Quebec Gr.

alexandra, Billings, 1865, Pal. Foss., vol. 1, p. 172, Black Riv. Gr.

angulata, Phillips, 1836, (*Rostellaria angulata*) Geo. of Yorkshire, p. 230, Devonian. Very doubtfully identified in America.

angustata, Hall, 1847, Pal. N. Y., vol. 1, p. 41, Birdseye Gr.

anna, Billings, 1859, Can. Nat. and Geol., vol. 4, p. 358, Calciferous Gr.

archimedeae, McChesney, 1861, Desc. New Pal. Foss., p. 89, Coal Meas.

arenaria, Billings, 1859, Can. Nat. and Geo., vol. 4, p. 359, Calciferous Gr.

arisaigensis, Hall, 1860, Can. Nat. and Geo., vol. 5, p. 154, Silurian.



FIG. 686.—*Murchisonia bilineata*.

artemesia, Billings, 1865, Pal. Foss., vol. 1, p. 345, Calciferous Gr.
 aspera, Billings, 1859, Can. Nat. and Geo., vol. 4, p. 458, Chazy Gr.
 attenuata, Hall, 1858, Trans. Alb. Inst., vol. 4, p. 27, and Bull. Am. Mus. Nat. Hist., p. 88, Warsaw Gr.
 augustina, Billings, 1865, Pal. Foss., vol. 1, p. 234, Quebec Gr.
 bellicincta, Hall, 1847, Pal. N. Y., vol. 1, p. 179, Trenton and Hud. Riv. Grs.
 bicincta, Hall, 1847, Pal. N. Y., vol. 1, p. 177. Preoccupied by McCoy in 1844. See *M. milleri*.
 bilirata, Hall, 1859, Pal. N. Y., vol. 3, p. 299, Low. Held. Gr.
 billingsana, n. s., Guelph Gr. Proposed instead of *M. hercyna* in Pal. Foss., vol. 1, p. 157, which was preoccupied.
 bivittata, Hall, 1852, Pal. N. Y., vol. 2, p. 345, Guelph Gr.
 bowdeni, Safford, 1869, Geo. of Tenn., p. 288, Nashville Gr.
 boydi, Hall, 1843, (*Loxonema boydi*) Geo. Rep. 4th Dist. N. Y., p. 138, and Pal. N. Y., vol. 2, p. 346, Guelph Gr.
 boylii, Nicholson, 1875, Quar. Jour. Geo. Soc. Lond., vol. 31, p. 547, Guelph Gr.
 calcifera, Whitfield, 1889, (*Lophospira calcifera*) Bull. Am. Mus. Nat. Hist., vol. 2, p. 55, Calciferous Gr.
 carinifera, Shumard, 1863, Trans. St. Louis Acad. Sci., vol. 2, p. 106, Calciferous Gr.
 cassandra, Billings, 1865, Pal. Foss., vol. 1, p. 189, Quebec Gr.
 cassina, Whitfield, 1886, (*Lophospira cassina*) Bull. Am. Mus. Nat. Hist., vol. 1, p. 312, Birdseye Gr.
 catharina, Billings, 1865, Pal. Foss., vol. 1, p. 231, Quebec Gr.
 chamberlini, Whitfield, 1878, Ann. Rep. Geo. Sur. Wis., p. 84, and Geo. Wis., vol. 4, p. 317, Niagara Gr.
 confusa, Whitfield, 1889, Bull. Am. Mus. Nat. Hist., vol. 2, p. 54, Calciferous Gr.
 cicelia, Billings, 1865, Pal. Foss., vol. 1, p. 233, Quebec Gr.
 conoidea, Hall, 1852, Pal. N. Y., vol. 2, p. 13, Medina Gr.
 conradi, Hall, 1867, 20th Rep. N. Y. Mus. Nat. Hist., p. 396, Niagara Gr.
 constricta, Whiteaves, 1884, Pal. Foss., vol. 3, p. 25, Guelph Gr.
 copii, White, 1882, Rep. Invert. Foss. New Mex., p. xxx, Coal Meas.
 decurta, Hall, 1877, 1st Ed. of Am. Pal. Foss., p. 244, syn. for *M. subabbreviata*.
 desiderata, Hall, 1862, 15th Rep. N. Y. Mus. Nat. Hist., p. 50, and Pal. N. Y., vol. 5, pt. 2, p. 89, Up. Held. Gr.
 egregia, Billings, 1874, Pal. Foss., vol. 2, p. 58, Up. Held. Gr.
 elegantula, see *Pleurotomaria elegantula*.
 estella, Billings, 1862, Pal. Foss., vol. 1, p. 157, Guelph Gr.

extenuata, Hall, 1859, Pal. N. Y., vol. 3, p. 298, Low. Held. Gr.
 funata, Billings, 1866, Catal. Sil. Foss. Antic., p. 55, Anticosti Gr.
 gigantea, Billings, 1857, Rep. of Progr. Geo. Sur. Can., p. 298, Mid. Sil.
 gracilens, Whitfield, 1889, Bull. Am. Mus. Nat. Hist., vol. 2, p. 53, Calciferous Gr.
 gracilis, Hall, 1847, Pal. N. Y., vol. 1, p. 181, Trenton and Hud. Riv. Gr.
 gypsea, Dawson, 1868, Acad. Geol., p. 310, Carboniferous.
 hebe, Billings, 1874, Pal. Foss., vol. 2, p. 57, Gaspé limestone No. 8, Devonian.
 helicteres, Salter, 1859, Can. Org. Rem., Decade 1, p. 21, Black Riv. and Trenton Grs.
 hercyna, Billings, 1862, Pal. Foss., vol. 1, p. 158. The name was preoccupied by Roemer in 1843. See *M. billingsana*.
 hermione, Billings, 1862, Pal. Foss., vol. 1, p. 33, Chazy or Black Riv. Gr.
 hesperlerensis, Whiteaves, 1884, Pal. Foss., vol. 3, p. 24, Guelph Gr.
 hyale, Billings, 1862, Pal. Foss., vol. 1, p. 33, Chazy or Black Riv. Gr.
 infrequens, Billings, 1859, Can. Nat. and Geo., vol. 4, p. 457, Chazy Gr.
 inornata, Meek & Worthen, 1866, Proc. Acad. Nat. Sci., p. 274, and Geo. Sur. Ill., vol. 5, p. 599, Coal Meas.
 insculpta, Hall, 1858, Trans. Alb. Inst., vol. 4, p. 26, and Bull. Am. Mus. Nat. Hist. p. 85, Warsaw Gr.
 intercedens, Hall, 1879, Pal. N. Y., vol. 5, pt. 2, p. 92, Up. Held. Gr.
 jessica, Billings, 1865, Pal. Foss., vol. 1, p. 189, Quebec Gr.
 kansanensis, Swallow, 1858, Trans. St. Louis Acad. Sci., vol. 1, p. 195, Coal Meas.
 keokuk, Worthen, (in press.) Geo. Sur. Ill., vol. 8, p. 141, Keokuk Gr.
 laphami, Hall, 1861, Rep. of Progr. Wis., p. 36, Niagara Gr.
 latifasciata, Etheridge, 1878, Quar. Jour. Geo. Soc., vol. 34, p. 600, Up. Sil.
 lasallensis, Worthen, (in press.) Geo. Sur. Ill., vol. 8, p. 141, Up. Coal Meas.
 leda, Hall, 1861, 14th Rep. N. Y. Mus. Nat. Hist., p. 103, and Pal. N. Y., vol. 5, pt. 2, p. 91, Up. Held. Gr.
 limitaris, Hall, 1860, 13th Rep. N. Y. Mus. Nat. Hist., p. 108, Kinderhook Gr.
 linearis, Billings, 1859, Can. Nat. and Geo., vol. 4, p. 359, Calciferous Gr.
 logani, Hall, 1852, Pal. N. Y., vol. 2, p. 346, Guelph Gr.
 longispira, Hall, 1852, Pal. N. Y., vol. 2, p. 345, Guelph Gr.
 macrospira, Hall, 1852, Pal. N. Y., vol. 2, p. 346, Guelph Gr.



FIG. 687.—
Murchisonia
gracilis.

- maia, Hall, 1861, 14th Rep. N. Y. Mus. Nat. Hist., p. 103, and Pal. N. Y., vol. 5, pt. 2, p. 91, Up. Held. Gr.
- major, Hall, 1851, Geo. Lake Sup. Land Dist., vol. 2, p. 209, Trenton Gr.
- marcouana, Geinitz, 1866, Carb. und Dyas in Neb., p. 11, Coal Meas.
- melaniformis, Shumard, 1855, Geo. Rep. Mo., p. 208, Calciferous Gr.
- micula, Hall, 1877, 1st Ed. Am. Pal. Foss., p. 244, and Pal. N. Y., vol. 5, pt. 2, p. 93, Ham. Gr. Proposed instead of *M. turricula*, Hall, 1862, which was preoccupied.
- milleri, Hall, 1877, 1st Ed. Am. Pal. Foss., p. 244, Trenton and Hud. Riv. Grs. Proposed instead of *M. bicincta*, Hall, 1847, Pal. N. Y., vol. 1, p. 177, which was preoccupied.
- minima, Swallow, 1858, Trans. St. Louis Acad. Sci., vol. 1, p. 203, Middle Coal Meas.
- minuta, Hall, 1859, Pal. N. Y., vol. 3, p. 298, Low. Held. Gr.
- missisquoi, Billings, 1865, Pal. Foss., vol. 1, p. 307, Quebec Gr.
- modesta, Billings, 1857, Rep. of Progr. Geo. Sur. Can., p. 299, Hud. Riv. Gr.
- mucro, Winchell, 1866, Rep. Low. Peninsula Mich., p. 96, Ham. Gr.
- multigruma, S. A. Miller, 1878, Jour. Cin. Soc. Nat. Hist., vol. 1, p. 104, Hud. Riv. Gr.
- multivolvis, Billings, 1857, Rep. Progr. Geo. Sur. Can., p. 299, Hud. Riv. Gr.
- mylitta, Billings, 1862, Pal. Foss., vol. 1, p. 157, Guelph Gr.
- nebraskensis, Geinitz, 1866, Carb. und Dyas in Neb., p. 12, and Pal. E. Neb., p. 234, Coal Meas.
- neglecta, Winchell, 1863, Proc. Acad. Nat. Sci., p. 20, Marshall Gr.
- obelisca, Whitfield, 1886, Bull. Am. Mus. Nat. Hist., vol. 1, p. 317, Birdseye Gr.
- obsoleta, Meek, 1871, Proc. Acad. Nat. Sci., p. 175, Coal Meas.
- obtusa, Hall, 1852, Pal. N. Y., vol. 2, p. 333, Coralline limestone.
- ozarkensis, Shumard, 1863, Trans. St. Louis Acad. Sci., vol. 2, p. 106, Calciferous Gr.
- papillosa, Billings, 1857, Rep. of Progr. Geo. Sur. Can., p. 301, Mid. Sil.
- perangulata, Hall, 1847, Pal. N. Y., vol. 1, p. 41, Black Riv. and Trenton Grs.
- perversa, Swallow, 1858, Trans. St. Louis Acad. Sci., vol. 1, p. 195, Up. Coal Meas.
- petilla, Hall & Whitfield, 1872, 24th Rep. N. Y. Mus. Nat. Hist., p. 186, Niagara Gr.
- placida, Billings, 1865, Pal. Foss., vol. 1, p. 235, Quebec Gr.
- procris, Billings, 1862, Pal. Foss., vol. 1, p. 34, Black Riv. Gr.
- prava, Whitfield, 1886, Bull. Am. Mus. Nat. Hist., vol. 1, p. 316, Birdseye Gr.
- prolixa, White & Whitfield, 1862, Proc. Bost. Soc. Nat. Hist., vol. 8, p. 303, Kinderhook Gr.
- quadricincta, Winchell, 1863, Proc. Acad. Nat. Sci., p. 19, Marshall Gr.
- rugosa, Billings, 1857, Rep. of Progr. Geo. Sur. Can. p. 299, Hud. Riv. Gr.
- serrulata, Salter, 1859, Can. Org. Rem., Decade 1, p. 20, Black Riv. and Trenton Grs.
- shumardana, Winchell, 1863, Proc. Acad. Nat. Sci. Phil., p. 20, Marshall Gr.
- simulatrix, Billings, 1865, Pal. Foss., vol. 1, p. 232, Quebec Gr.
- soluta, Whiteaves, 1884, Pal. Foss., vol. 3, p. 28, Guelph Gr.
- sororcula, Billings, 1865, Pal. Foss., vol. 1, p. 233, Quebec Gr.
- subabbreviata, D'Orbigny, 1850, Prodr. d. Paleont. t. 1, p. 8, Chazy Gr. Proposed instead of *M. abbreviata*, Hall, 1847, Pal. N. Y., vol. 1, p. 32, which was preoccupied.
- subfusiformis*, see *Fusispira subfusiformis*.
- subtæniata*, see *Orthonema subtæniatum*.
- subulata, Conrad, 1842, (Loxonema subulatum,) Jour. Acad. Nat. Sci., vol. 8, p. 273, and Pal. N. Y., vol. 2, p. 91, Clinton Gr.
- summerensis, Safford, 1869, Geo. of Tenn., p. 288, Nashville Gr.
- sylvia, Billings, 1865, Pal. Foss., vol. 1, p. 190, Quebec Gr.
- tebrea, White, 1879, Bull. U. S. Geo. Sur. Terr., vol. 5, No. 2, p. 219, and Cont. to Pal., No. 6, p. 139, Carboniferous.
- tebrealis, Hall, 1852, Pal. N. Y., vol. 2, p. 334, Coralline limestone.
- tebriiformis, Hall, 1858, Trans. Alb. Inst., vol. 4, p. 28, and Bull. Am. Mus. Nat. Hist., p. 86, Warsaw Gr.
- tertiformis, Billings, 1857, Rep. of Progr. Geo. Sur. Can., p. 298, Hud. Riv. Gr.
- texana, Shumard, 1860, Trans. St. Louis Acad. Sci., vol. 1, p. 626, Coal Meas.
- tricarinata, Hall, 1847, Pal. N. Y., vol. 1, p. 178, Trenton Gr.
- tricingulata, Dawson, 1868, Acad. Geol., p. 310, Carboniferous.
- tropidophora, Whiteaves, 1884, Pal. Foss., vol. 3, p. 29, Guelph Gr.
- turricula, Billings, 1857, Rep. of Progr. Geo. Sur. Can., p. 301, Mid. Sil.
- turricula*, Hall. The name was preoccupied. See *M. micula*.
- turritella, Hall, 1858, Trans. Alb. Inst., vol. 4, p. 27, and Bull. Am. Mus. Nat. Hist., p. 88, Warsaw Gr.
- turritiformis, Hall, 1852, Pal. N. Y., vol. 2, p. 347, Guelph Gr.
- uniangulata, Hall, 1847, Pal. N. Y., vol. 1, p. 179, Trenton and Hud. Riv. Grs.
- uniangulata var. abbreviata, Hall, 1847, Pal. N. Y., vol. 1, p. 304, Hud. Riv. Gr.
- varians, Billings, 1857, Rep. of Progr. Geo. Sur. Can., p. 300, Hud. Riv. Gr.
- varicosa, Hall, 1847, Pal. N. Y., vol. 1, p. 42, Birdseye Gr.
- ventricosa, Hall, 1847, Pal. N. Y., vol. 1, p. 41, Black Riv. and Trenton Grs.
- vermicula, Hall, 1858, Trans. Alb. Inst., vol. 4, p. 27, and Bull. Am. Mus. Nat. Hist., p. 87, Warsaw Gr.

vesta, Billings, 1862, Pal. Foss., vol. 1, p. 32, Calciferous Gr.

vineta, Hall, 1858, (*Loxonema vineta*.) Trans. Alb. Inst., vol. 4, p. 28, and Bull. Am. Mus. Nat. Hist., p. 88, Warsaw Gr.

vitellia, Billings, 1862, Pal. Foss., vol. 1, p. 156, Guelph Gr.

vittata, see *Fusispira vittata*.

worthenana, S. A. Miller, 1882, Jour. Cin. Soc. Nat. Hist., vol. 5, p. 225, Niagara Gr.

xanthippe, Billings, 1862, Pal. Foss., vol. 1, p. 155, Guelph Gr.

Natica, Adanson, 1757, Histoire Naturelle du Senegal, p. 172. [Ety. *nato*, to swim with a fluctuating motion.] This genus is unknown in Palæozoic rocks.

altonensis, see *Naticopsis altonensis*.

carleyana, see *Naticopsis carleyana*.

chesterensis, see *Naticopsis chesterensis*.

littonana, see *Macrochilina littonana*.

magister, syn. for *Naticopsis ventricosa*.

shumardi, see *Naticopsis shumardi*.

ventricosa, see *Naticopsis ventricosa*.

NATICOPSIS, McCoy, 1844, Synop. Carb. Foss. Ireland, p. 33. [Ety. from resemblance to the genus *Natica*.] Subglobose, solid, imperforate; whorls few, convex, rapidly expanding, last one large; spire short; aperture subovate, straighter on the inner side, rounded below; columella callous, flattened, longitudinal impression for the operculum; lip sharp, entire; surface smooth in part or marked with oblique striae. Type *N. phillipsi*.

aequistriata, Meek, 1871, Proc. Acad. Nat. Sci., p. 76, and Ohio Pal., vol. 1, p. 216, Up. Held Gr.

altonensis, McChesney, 1865, (*Natica altonensis*.) Desc. New. Pal. Foss., and Geo. Sur. Ill., vol. 5, p. 595, Coal Meas.

carleyana, Hall, 1858, (*Natica carleyana*.) Trans. Alb. Inst., vol. 4, p. 31, and Bull. Am. Mus. Nat. Hist., p. 71, Warsaw Gr.

chesterensis, Swallow, 1863, Trans. St. Louis Acad. Sci., vol. 2, p. 100, Kaskaskia Gr.

comperta, Hall, 1879, Pal. N. Y., vol. 5, pt. 2, pl. 29, Up. Held Gr.

cretacea, Hall & Whitfield, 1873, 23d Rep. N. Y. Mus. Nat. Hist., p. 240, Up. Held Gr.

depressa, Winchell, 1863, Proc. Acad. Nat. Sci., p. 22, Marshall Gr.

dispassa, Dawson, 1868, Acad. Geol., p. 309, Carbonif.

gigantea, Hall & Whitfield, 1873, 23d Rep. N. Y. Mus. Nat. Hist., p. 238, Che-mung Gr.

hollidayi, see *Trachydomia hollidayi*.

howi, Hartt, 1868, Acad. Geol., p. 309, Carboniferous.

humilis, see *Isonema humile*.

lævis, Meek, 1871, Proc. Acad. Nat. Sci., p. 76, and Ohio Pal., vol. 1, p. 215, Up. Held Gr.

littonana var. *genevievensis*, Meek & Worthen, 1866, Proc. Acad. Nat. Sci., p. 268, Kaskaskia Gr.

madisonensis, Worthen, 1884, Bull. No. 2, Ill. St. Mus. Nat. Hist., p. 9, and Geo. Sur. Ill., vol. 8, p. 144, St. Louis Gr.

magister, syn. for *N. ventricosa*.

monilifera, White, 1880, 12th Rep. U. S. Geo. Sur. Terr., p. 168, Up. Coal Meas.

nana, Meek & Worthen, 1860, (*Platystoma nana*.) Proc. Acad. Nat. Sci., p. 463, and Geo. Sur. Ill., vol. 2, p. 365, Up. Coal Meas.

nodosa, see *Trachydomia nodosa*.

ortoni, Whitfield, 1882, Ann. N. Y. Acad. Sci., vol. 2, p. 230, Coal Meas.

pricii, Shumard, 1858, Trans. St. Louis Acad. Sci., vol. 1, p. 202, Up. Coal Meas.

remex, White, 1876, Geo. Uinta Mountains, p. 109, and Cont. to Pal., No. 6, p. 139, Low. Aubrey Gr.

shumardi, McChesney, 1860, (*Natica shumardi*.) Desc. New. Pal. Foss., p. 62, Coal Meas.

subovata, Worthen, 1873, Geo. Sur. Ill., vol. 5, p. 595, Coal Meas.

ventricosa, Norwood & Pratten, 1854, (*Natica ventricosa*.) Jour. Acad. Nat. Sci., 2d ser., vol. 3, p. 76, Coal Meas.

wheeleri, Swallow, 1860, (*Littorina wheeleri*.) Trans. St. Louis Acad. Sci., vol. 1, p. 658, and Geo. Sur. Ill., vol. 5, p. 595, Coal Meas.

ziczac, Whitfield, 1882, Ann. N. Y. Acad. Sci., vol. 2, p. 223, Kaskaskia Gr.

OMPHALOTROCHUS, Meek, 1864, Geo. California, vol. 1, p. 15. [Ety. *omphalus*, umbilicus; *Trochus*, a genus.] Distinguished from *Euomphalus* by having a more prominent spire, in having its whorls flattened or broadly concave around the outer side, and flattened, with an outward slope; it is a more ponderous shell, with a more oblique outline to its lip, in consequence of which it projects much farther forward on the upper than on the lower side of the aperture. Type *O. whitneyi*.

whitneyi, Meek, 1864, Pal. of California, vol. 1, p. 15, Carboniferous.

OPHILETA, Vanuxem, 1842, Geo. Rep. N. Y., p. 36. [Ety. *ophis*, snake.] Discoidal spire sunk above; umbilicus perfectly open, exposing the whorls on one plane; whorls slender, numerous, truncate, and biangular exteriorly; aperture having a sinus below and a notch above. Type *O. complanata*.

abdita, Billings, 1865, Pal. Foss., vol. 1, p. 189, Quebec Gr.

(?) *bella*, Billings, 1865, Pal. Foss., vol. 1, p. 310, Quebec Gr.

compacta, Salter, 1859, Can. Org. Rem., Decade 1, p. 16, syn. for *O. complanata*.



FIG. 688.—*Naticopsis lævis*.

complanata, Vanuxem, 1842, Geo. Rep. N. Y., p. 36, and Pal. N. Y., vol. 1, p. 11, Calciferous Gr.
 complanata var. nana, Meek, 1870, Hayden's U. S. Geo. Sur. Terr., p. 295, and Geo. 4th Parallel, vol. 4, p. 17, Calciferous Gr.
 disjuncta, Billings, 1865, Pal. Foss., vol. 1, p. 344, Calciferous Gr.
 levata, Vanuxem, 1842, Geo. Rep. N. Y., p. 36, Calciferous Gr.

FIG. 689.—*Ophileta nerine*.

nerine, Billings, 1865, Pal. Foss., vol. 1, p. 245, Quebec Gr.
 ottawensis, Billings, 1860, Can. Nat. and Geol., vol. 5, p. 167, Trenton Gr.
 owenana, Meek & Worthen, 1868, Geo. Sur. Ill., vol. 3, p. 313, Galena Gr.
 primordialis, Winchell, 1864, (Straparolus primordialis,) Am. Jour. Sci. and Arts, 2d ser., vol. 37, p. 228, and Geo. Wis., vol. 4, p. 173, Potsdam Gr.
 profunda, Billings, 1865, Pal. Foss., vol. 1, p. 188, Quebec Gr.
 uninangulata, Hall, 1847, (Euomphalus uninangulatus,) Pal. N. Y., vol. 1, p. 9, Calciferous Gr.

ORMATHICINUS, S. A. Miller, 1880, Jour. Cin. Soc. Nat. Hist., vol. 2, p. 222. [Ety. *ormathos*, string of beads; *ichnos*, track.] Supposed to be the trail of a Gasteropod, and consisting of a continuous beaded track or trail. Type *O. moniliformis*.

moniliformis, S. A. Miller, 1880, Jour. Cin. Soc. Nat. Hist., vol. 2, p. 222, Utica Slate Gr.

ORTHOPEMA, Meek & Worthen, 1861, Proc. Acad. Nat. Sci., Phil., p. 146. [Ety. *orthos*, straight; *nema*, thread.] elongate, many whorled, ornamented with revolving carinae, crossed by nearly straight lines of growth; body whorl angular, not much enlarged or produced below; aperture angular above, slightly effuse below; peristome incomplete; outer lip simple, nearly straight; axis imperforate. Type *O. salteri*.

carbonarium, Worthen, 1884, Bull. No. 2, Ill. St. Mus. Nat. Hist., p. 7, and Geo. Sur. Ill., vol. 8, p. 145, Coal Meas.

FIG. 690.
Orthopema newberryi.

conicum, Meek & Worthen, 1866, Proc. Acad. Nat. Sci. Phil., p. 270, and Geo. Sur. Ill., vol. 5, p. 590, Coal Meas.
 newberryi, Meek, 1871, Proc. Acad. Nat. Sci. Phil., p. 81, and Ohio Pal., vol. 1, p. 217, Up. Held. Gr.

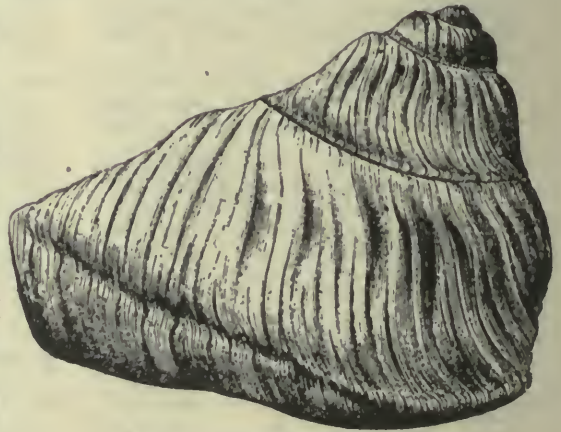
salteri, Meek & Worthen, 1860, (Eunema (?) salteri,) Proc. Acad. Nat. Sci. Phil., p.

464, and Geo. Sur. Ill., vol. 2, p. 381, Low. Coal Meas.

subtenuatum, Geinitz, 1866, (Murchisonia subtenuata,) Carb. und Dyas in Neb., p. 12, and Pal. E. Neb., p. 228, Coal Meas.
Orthonychia, Hall, 1843, syn. for *Platyceras*.
 ORTHOSTOMA, Conrad, 1838, Ann. Rep. N. Y., p. 119. [Ety. *orthos*, straight; *stoma*, mouth.] Shell spiral, spire plain, convex, terminal volution, ending in a straight tube. Type *O. commune*.

FIG. 691.—*Orthostoma commune*.

commune, Conrad, 1838, Ann. Rep. N. Y., p. 119, figured in 1841, Ann. Rep. pl. 2, fig. 16, Birdseye Gr.
 PALAEOCMEA, Hall & Whitfield, 1873, 23d Rep. N. Y. Mus. Nat. Hist., p. 242. [Ety. *palaaios*, ancient; *Acmaea*, an existing genus of shells.] Conical, more or less elevated; apex subcentral, erect or slightly curved; peristome entire, not sinuate; surface marked concentrically. Type *P. typica*.

FIG. 692.—*Palaeotrochus kearneyi*.

irvingi, Whitfield, 1878, Ann. Rep. Geo. Sur. Wis., p. 51, and Geo. Wis., vol. 4, p. 173, Potsdam Gr.
 typica, Hall & Whitfield, 1873, 23d Rep. N. Y. Mus. Nat. Hist., p. 242, Potsdam Gr.
 PALAEOTROCHUS, Hall, 1879, Pal. N. Y., vol. 5, pt. 2, p. 133. [Ety. *palaaios*, ancient; *Trochus*, a genus.] Conical, trochiform; spire elevated; volution moderately

- convex; aperture transverse. Type *P. kearneyi*.
 kearneyi, Hall, 1862, (Pleurotomaria kearneyi,) 14th Rep. N. Y. Mus. Nat. Hist., p. 105, Up. Held. Gr.
 præcursor, Clarke, 1885, Bull. U. S. Geo. Sur. No. 16, p. 55, Portage Gr.
Patella, Linnæus, 1758, Syst. Nat. 10th Ed. [Ety. *patella*, dish.] Not a Palæozoic genus.
levettei, see *Lepetopsis levettei*.
Phanerolinus, Sowerby, 1844, Min. Conch., vol. 7, p. 29. [Ety. *phaneros*, aperture; *teino*, extended. Syn. for *Eccyliomphalus*.
paradoxus, see *Eccyliomphalus paradoxus*.
Phragmolites, syn. for *Cyrtolites*.
compressus, see *Cyrtolites compressus*.



FIG. 693.—*Phragmostoma cymbula*. View of aperture; L, lamina; S, septum.

- PHRAGMOSTOMA, Hall, 1861, 14th Rep. N. Y. Mus. Nat. Hist., p. 94. [Ety. *phragmos*, a partition; *stoma*, the mouth; from the septum within the aperture, which distinguishes this genus from *Carinarnopsis* and *Bellerophon*.] Type *P. cymbula*.
cunulæ, Hall, 1861, 14th Rep. N. Y. Mus. Nat. Hist., p. 94, Hud. Riv. Gr.
cymbula, Hall, 1861, 14th Rep. N. Y. Mus. Nat. Hist., p. 94, Hud. Riv. Gr.
natator, see *Bellerophon natator*.
Physa, Dapernaud, 1801, Hist. Nat. d. Moll. Not a Palæozoic genus.
prisca, Walcott, 1885, Monogr. U. S. Geo. Sur., vol. 8, p. 262, Subcarboniferous.
Pileopsis conoides, *P. naticoides*, *P. rotundata*, and *P. spiralis*, Castelneau, 1843, Syst. Sil. Not recognized.
tubifer, syn. for *Platyceras dumosum*.
vetustus, Sowerby. Not American.
Planorbis, Guettard, 1756, Mem. Acad. Sci. Paris. Not a Palæozoic genus.
trilobatus, see *Bucania trilobata*.
 PLATYCERAS, Conrad, 1840, Ann. Rep. N. Y., p. 205. [Ety. *platys*, broad; *keras*, horn.] Depressed subglobose, subovoid, or obliquely subconical; spire small; volutions none, or very few, without columella; aperture more or less expanded, often campanulate, and sometimes with lip reflexed; peristome entire or sinuous; surface striated, cancellated, lamellose, or spiniferous. Type *P. dumosum*.
acutirostre, Hall, 1858, (Capulus acutirostris,) Trans. Alb. Inst., vol. 4, p. 31, and Geo. Sur. Iowa, p. 665, Warsaw Gr.
agreste, Hall, 1859, Pal. N. Y., vol. 3, p. 338, Low. Held. Gr.
ammon, Hall, 1862, 15th Rep. N. Y. Mus. Nat. Hist., p. 37, and Pal. N. Y., vol. 5, pt. 2, p. 20, Up. Held. Gr.

- angulatum*, Hall, 1852, (Acroculia angulata,) Pal. N. Y., vol. 2, p. 289, Clinton and Niagara Grs.
arctistoma, Ulrich, 1886, Cont. to Am. Pal., p. 30, Up. Held. Gr.
arcuatum, Hall, 1859, Pal. N. Y., vol. 3, p. 336, Low. Held. Gr.
argo, Hall, 1862, 15th Rep. N. Y. Mus. Nat. Hist., p. 39, and Pal. N. Y., vol. 5, pt. 2, p. 19, Up. Held. Gr.
attenuatum, Hall, 1862, 15th Rep. N. Y. Mus. Nat. Hist., p. 30, and Pal. N. Y., vol. 5, pt. 2, p. 6, Ham. Gr.
attenuatum, see *P. dumosum* var. *attenuatum*.
articulatum, Hall, 1876, Illust. Devonian Foss., pl. 3, Ham. Gr.
billingsi, Hall, 1859, Pal. N. Y., vol. 3, p. 315, Low. Held. Gr.
biseriale, Hall, 1860, Supp. to Geo. Iowa, vol. 1, pt. 2, p. 90, Burlington Gr.
bisinuatum, Hall, 1859, Pal. N. Y., vol. 3, p. 318, Low. Held. Gr.
bisulcatum, Hall, 1859, Pal. N. Y., vol. 3, p. 327, Low. Held. Gr.
bivolve, White & Whitfield, 1862, Proc. Bost. Soc. Nat. Hist., vol. 8, p. 302, Kinderhook Gr.
bucculentum, Hall, 1862, 15th Rep. N. Y. Mus. Nat. Hist., p. 33, and Pal. N. Y., vol. 5, pt. 2, p. 10, Ham. Gr.
calantica, Hall, 1859, Pal. N. Y., vol. 3, p. 328, Low. Held. Gr.
callosum, Hall, 1859, Pal. N. Y., vol. 3, p. 478, Oriskany sandstone.
campanulatum, Winchell & Marcy, 1865, Mem. Bost. Soc. Nat. Hist., p. 99, Niagara Gr.
capax, Keyes, 1888, Proc. Am. Phil. Soc., (author's copy, p. 13.), Burlington Gr.
capulus, Hall, 1860, Supp. Geo. Iowa, p. 91, Burlington Gr.
carinatum, Hall, 1862, 15th Rep. N. Y. Mus. Nat. Hist., p. 33, and Pal. N. Y., vol. 5, pt. 2, p. 5, Up. Held. Gr.
chesterense, Meek & Worthen, 1866, Proc. Acad. Nat. Sci., p. 265, Kaskaskia Gr.
cirriforme, Conrad, 1841, Ann. Rep. N. Y. Not clearly defined.
clavatum, Hall, 1859, Pal. N. Y., vol. 3, p. 337, Low. Held. Gr.
concavum, Hall, 1862, 15th Rep. N. Y. Mus. Nat. Hist., p. 30, and Pal. N. Y., vol. 5, pt. 2, p. 3, Up. Held. Gr.
conicum, Hall, 1862, 15th Rep. N. Y. Mus. Nat. Hist., p. 31, and Pal. N. Y., vol. 5, pt. 2, p. 3, Ham. Gr.
conradi, Walcott, 1885, Monogr. U. S. Geo. Sur., vol. 8, p. 182, Devonian.
cornuforme, Winchell, 1863, Proc. Acad. Nat. Sci., p. 18, Marshall Gr.
crassum, Hall, 1862, 15th Rep. N. Y. Mus. Nat. Hist., p. 36, and Pal. N. Y., vol. 5, pt. 2, p. 18, Up. Held. Gr.
curvirostrum, Hall, 1859, Pal. N. Y., vol. 3, p. 338, Low. Held. Gr.
cymbium, Hall, 1862, 15th Rep. N. Y. Mus. Nat. Hist., p. 35, and Pal. N. Y., vol. 5, pt. 2, p. 12, Up. Held. Gr.

cyrtolites, McChesney, 1859, Pal. Foss., p. 71, Coal Meas.
 dentalium, Hall, 1862, 15th Rep. N. Y. Mus. Nat. Hist., p. 29, and Pal. N. Y., vol. 5, pt. 2, p. 2, Up. Held. Gr.
 dilatatum, Hall, 1859, Pal. N. Y., vol. 3, p. 322, Low. Held. Gr.
 dumosum, Conrad, 1840, Ann. Rep. N. Y., p. 205, and Pal. N. Y., vol. 5, pt. 2, p. 14, Up. Held. Gr.

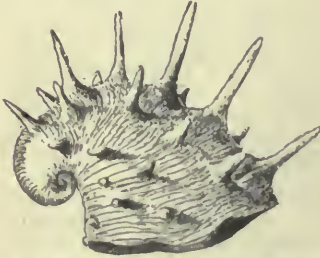


FIG. 694.—*Platyceras dumosum*.

dumosum var. *attenuatum*, Meek, 1871, Proc. Acad. Nat. Sci., p. 75, and Ohio Pal., vol. 1, p. 212, Up. Held. Gr.
 dumosum var. *rarispinum*, Hall, 1862, 15th Rep. N. Y. Mus. Nat. Hist., p. 38, and Pal. N. Y., vol. 5, pt. 2, p. 16, Up. Held. Gr.
 echinatum, Hall, 1862, 15th Rep. N. Y. Mus. Nat. Hist., p. 38, and Pal. N. Y., vol. 5, pt. 2, p. 13, Ham. Gr.
 elongatum, Hall, 1859, Pal. N. Y., vol. 3, p. 335, Low. Held. Gr.
 equilaterale, Hall, 1860, Supp. to vol. 1, pt. 2, Iowa Rep., p. 89, and Geo. Sur. Ill., vol. 5, p. 518, Keokuk Gr.
 erectum, Hall, 1843, (*Acroculia erecta*) Geo. 4th Dist. N. Y., p. 174, and Pal. N. Y., vol. 5, pt. 2, p. 5, Cornif. & Ham. Grs.
expansum, see *Strophostylus expansus*.
 fissurellum, Hall, 1860, Supp. to Geo. Rep. Iowa, vol. 1, pt. 2, p. 90, and Geo. Sur. Ill., vol. 5, p. 519, Keokuk Gr.
 fluctuosum, Ulrich, 1886, Cont. to Am. Pal., p. 31, Up. Held. Gr.
 formosum, Keyes, 1888, Proc. Am. Phil. Soc., (author's copy, p. 14,) Kinderhook Gr.
 fornicatum, Hall, 1862, 15th Rep. N. Y. Mus. Nat. Hist., p. 35, and Pal. N. Y., vol. 5, pt. 2, p. 11, Up. Held. Gr.
 fornicatum var. *contractum*, Hall, 1876, Illust. Devonian Foss., pl. 5, Up. Held. Gr.
 gebhardi, Conrad, 1840, Ann. Rep. N. Y., p. 206, and Pal. N. Y., vol. 3, p. 312, Low. Held. and Oriskany Grs.
 gibbosum, Hall, 1859, Pal. N. Y., vol. 3, p. 322, Low. Held. Gr.
 haliotoides, Meek & Worthen, 1866, Proc. Acad. Nat. Sci. Phil., p. 264, and Geo. Sur. Ill., vol. 3, p. 458, Kinderhook Gr.
 herzeri, Winchell, 1870, Proc. Am. Phil. Soc., p. 256, Marshall Gr.
 incile, Hall, 1859, Pal. N. Y., vol. 3, p. 332, Low. Held. Gr.
 infundibulum, Meek & Worthen, 1866, Proc. Acad. Nat. Sci. Phil., p. 266, and Geo. Sur. Ill., vol. 5, p. 517, Keokuk Gr.
 intermedium, Hall, 1859, Pal. N. Y., vol. 3, p. 321, Low. Held. Gr.
 lacinosum, Ringuenberg, 1886, Bull. Buf. Soc. Nat. Sci., vol. 5, p. 14, Niagara Gr.
 lævigatum, Meek & Worthen, 1866, Proc. Acad. Nat. Sci., p. 263, Kaskaskia Gr.
 lamellosum, Hall, 1859, Pal. N. Y., vol. 3, p. 330, Low. Held. Gr.
 latum, Keyes, 1888, Proc. Am. Phil. Soc., (author's copy, p. 14,) Burlington Gr.
 lodiense, Meek, 1871, Proc. Acad. Nat. Sci. Phil., p. 170, and Ohio Pal., vol. 2, p. 313, Waverly Gr.
 magnificentum, Hall, 1859, Pal. N. Y., vol. 3, p. 476, Oriskany sandstone.
 membranaceum, Ringuenberg, 1886, Bull. Buf. Soc. Nat. Sci., vol. 5, p. 15, Niagara Gr.
 minutissimum, Walcott, 1879, Desc. New Spec. Foss., p. 1, Calciferous Gr.
 multisinatum, Hall, 1859, Pal. N. Y., vol. 3, p. 319, Low. Held. Gr.
 multispinosum, Meek, 1871, Proc. Acad. Nat. Sci. Phil., p. 73, and Ohio Pal., vol. 1, p. 210, Cornif. Gr.
 naticoides, Etheridge, 1878, Quar. Jour. Geo. Soc., vol. 34, p. 603, Up. Sil.
 nebraskense, Meek, 1872, Pal. E. Neb., p. 227, Coal Meas.
 newberryi, Hall, 1859, Pal. N. Y., vol. 3, p. 333, Low. Held. Gr.
 niagarensis, Hall, 1852, (*Acroculia niagarensis*) Pal. N. Y., vol. 2, p. 288, Niagara Gr.
 nodosum, Conrad, 1841, Ann. Rep. N. Y., p. 56, and Pal. N. Y., vol. 3, p. 473, Oriskany sandstone.
 obesum, Hall, 1859, Pal. N. Y., vol. 3, p. 329, Low. Held. Gr.
 obliquum, Keyes, 1888, Proc. Am. Phil. Soc., (author's copy, p. 13,) Burlington Gr.
 occidentes, Walcott, 1885, Monogr. U. S. Geo. Sur., vol. 8, p. 254, Subcarboniferous.
 ovale, Stevens, 1858, (*Acroculia ovalis*) Am. Jour. Sci., vol. 25, p. 261, Subcarboniferous.
 pabulocrinus, Owen, 1862, (*Pileopsis pabulocrinus*) Geo. Sur. Indiana, p. 364, Keokuk Gr.
 paralium, White & Whitfield, 1862, Proc. Bost. Soc. Nat. Hist., vol. 8, p. 302, Kinderhook Gr.
 patulum, Hall, 1859, Pal. N. Y., vol. 3, p. 477, Oriskany sandstone.
 pentalobus, Hall, 1859, Pal. N. Y., vol. 3, p. 319, Low. Held. Gr.
 perlatum, Hall, 1859, Pal. N. Y., vol. 3, p. 328, Low. Held. Gr.
 perplexum, Hall, 1876, Illust. Devonian Foss., pl. 2, Up. Held. Gr.

perplicatum, Hall, 1859, Pal. N. Y., vol. 3, p. 325, Low. Held. Gr.
 pileiforme, Hall, 1859, Pal. N. Y., vol. 3, p. 327, Low. Held. Gr.
 piso, Walcott, 1885, Monogr. U. S. Geo. Sur., vol. 8, p. 254, Subcarboniferous.
 platystoma, Hall, 1859, Pal. N. Y., vol. 3, p. 326, Low. Held. Gr.
 platystoma var. alveatum, Hall, 1859, Pal. N. Y., vol. 3, p. 326, Low. Held. Gr.
 plicatile, Hall, 1859, Pal. N. Y., vol. 3, p. 325, Low. Held. Gr.
 plicatum, Conrad, 1840, (Calceola plicata,) Ann. Rep. N. Y., p. 207, and Pal. N. Y., vol. 3, p. 334, Low. Held. Gr.
 primævum, Billings, 1871, Can. Nat. and Geol., vol. 6, p. 220, Georgia Gr.
 primordiale, Hall, 1863, 16th Rep. N. Y. Mus. Nat. Hist., p. 136, Potsdam Gr.
 proclive, Ringueberg, 1886, Bull. Buf. Soc. Nat. Sci., vol. 5, p. 14, Niagara Gr.
 pyramidatum, Hall, 1859, Pal. N. Y., vol. 3, p. 336, Low. Held. Gr.
 quincyense, McChesney, 1861, New Pal. Foss., p. 90, and Geo. Sur. Ill., vol. 3, p. 510, Burlington Gr.
 quinquesinuatum, Ulrich, 1886, Cont. to Am. Pal., p. 29, Up. Held. Gr.
 reflexum, Hall, 1859, Pal. N. Y., vol. 3, p. 477, Oriskany sandstone.
 retrorsum, Hall, 1859, Pal. N. Y., vol. 3, p. 320, Low. Held. Gr.
 retrorsum var. abnorme, Hall, 1859, Pal. N. Y., vol. 3, p. 321, Low. Held. Gr.
 reversum, Hall, 1860, Supp. to Geo. Rep. Iowa, vol. 1, pt. 2, p. 91, Burlington Gr.
 rictum, Hall, 1862, 15th Rep. N. Y. Mus. Nat. Hist., p. 35, and Pal. N. Y., vol. 5, pt. 2, p. 13, Ham. and Up. Held. Gr.
 robustum, Hall, 1859, Pal. N. Y., vol. 3, p. 313, Low. Held. Gr.
 senex, Winchell & Marcy, 1865, (Porcellia senex,) Mem. Bost. Soc. Nat. Hist., p. 111, Niagara Gr.
 serratum, Ulrich, 1886, Cont. to Am. Pal., p. 30, Up. Held. Gr.
 sinuatum, Hall, 1859, Pal. N. Y., vol. 3, p. 314, Low. Held. Gr.
 spinigerum, Worthen, 1873, Geo. Sur. Ill., vol. 5, p. 594, Coal Meas.
 spirale, Hall, 1859, Pal. N. Y., vol. 3, p. 331, Low. Held. Gr.
 squalodens, Whitfield, 1882, Ann. N. Y. Acad. Sci., vol. 2, p. 202, Up. Held. Gr.
 subnodosum, Hall, 1859, Pal. N. Y., vol. 3, p. 474, Oriskany sandstone.
 subplicatum, Meek & Worthen, 1866, Proc. Acad. Nat. Sci. Phil., p. 265, and Geo. Sur. Ill., vol. 3, p. 457, Kinderhook Gr.



FIG. 695.—*Platyceras reversum*.

subrectum, Hall, 1859, 12th Rep. N. Y., Mus. Nat. Hist., p. 18, and Pal. N. Y., vol. 5, pt. 2, p. 1, Up. Held. Gr.
 subrectum, Hall, 1860, Supp. to Iowa Rep. The name being preoccupied, Meek & Worthen proposed *P. infundibulum*.
 subsinuosum, Worthen, 1882, Bull. No. 1, Ill. St. Mus. Nat. Hist., p. 38, Low. Held. Gr. Proposed instead of *P. subundatum*, M. & W., which was preoccupied.
 subundatum, Conrad, 1841, Ann. Rep. N. Y., p. 56, Up. Held. Gr.
 subundatum, Meek & Worthen, 1868, Geo. Sur. Ill., vol. 3, p. 457. The name was preoccupied. See *P. subsinuatum*.
 sulcatum, Conrad, 1841, Ann. Rep. N. Y., p. 56, Oriskany sandstone.
 sulcopicatum, Hall, 1859, Pal. N. Y., vol. 3, p. 324, Low. Held. Gr.
 symmetricum, Hall, 1862, 15th Rep. N. Y. Mus. Nat. Hist., p. 34, and Pal. N. Y., vol. 5, pt. 2, p. 9, Ham. and Up. Held. Grs.
 tenuiliratum, Hall, 1859, Pal. N. Y., vol. 3, p. 317, Low. Held. Gr.
 thetiforme, Walcott, 1885, Monogr. U. S. Geo. Sur., vol. 8, p. 184, Devonian.
 thetis, Hall, 1862, 15th Rep. N. Y. Mus. Nat. Hist., p. 32, and Pal. N. Y., vol. 5, pt. 2, p. 8, Up. Held. and Ham. Grs.
 thetis var. subspinosum, Hall, 1876, Illust. Devonian Foss., pl. 3, Ham. Gr.
 tortum, Meek, 1871, Proc. Acad. Nat. Sci., p. 171, and Ohio Pal., vol. 2, p. 345, Coal Meas.
 tortuosum, Hall, 1859, Pal. N. Y., vol. 3, p. 472, Oriskany sandstone.
 tribulosum, White, 1880, 12th Rep. U. S. Geo. Sur. Terr., p. 168, Burlington Gr.
 trigonale, Stevens, 1858, (Acroculia trigonalis,) Am. Jour. Sci. and Arts, vol. 25, p. 260, Carboniferous.
 trilobatum, Hall, 1859, Pal. N. Y., vol. 3, p. 316, Low. Held. Gr.
 tubiforme, Hall, 1859, Pal. N. Y., vol. 3, p. 332, Low. Held. Gr.
 unicum, Meek & Worthen, 1866, Proc. Acad. Nat. Sci., p. 264, and Geo. Sur. Ill., vol. 5, p. 516, Keokuk Gr.
 undatum, Hall, 1876, Illust. Devonian Foss., pl. 7, and Pal. N. Y., vol. 5, pt. 2, p. 17, Up. Held. Gr.
 undulatum, Walcott, 1885, Monogr. U. S. Geo. Sur., vol. 8, p. 184, Devonian.
 undulostriatum, Hall, 1859, Pal. N. Y., vol. 3, p. 336, Low. Held. Gr.
 unguiforme, Hall, 1859, Pal. N. Y., vol. 3, p. 322, Low. Held. Gr.
 uniseriale, Nicholson, 1874, Rep. Pal. Ont., p. 116, Up. Held. Gr.
 unisulcatum, Hall, 1859, Pal. N. Y., vol. 3, p. 316, Low. Held. Gr.
 ventricosum, Conrad, 1840, Ann. Rep. N. Y., p. 206, and Pal. N. Y., vol. 3, p. 311, Low. Held. Gr.
 vomerium, Winchell, 1863, Proc. Acad. Nat. Sci., p. 19, Marshall Gr.

PLATYSCHISMA, McCoy, 1844, Syn. Carb. Foss. Ireland, p. 38. [Ety. *platys*, wide; *schisma*, slit.] Obtusely conical, ventricose; spire short, obtuse, few whorls; aperture very oblique, large, lunate, deeply indented by the preceding whorl, rounded anteally, narrow retrally, with a very wide, shallow sinus in the middle part of the outer lip not forming a definite band, sometimes obsolete; no trace of inner lip; pillar thin, a little reflected; surface smooth or only marked by the retrally waved lines of growth; umbilicus small, round, open. Type *P. helicites*.

ambiguum, Walcott, 1885, Monogr. U. S. Geo. Sur., vol. 8, p. 188, Devonian.



FIG. 696.—*Platyschisma dubium*.

dubium, Dawson, 1868, Acad. Geol., p. 309, Carboniferous.

mccoysi, Walcott, 1885, Monogr., U. S. Geo. Sur., vol. 8, p. 188, Devonian.

PLATYSTOMA, Conrad, 1842, Jour. Acad. Nat. Sci.,

vol. 8, p. 275. [Ety. *platys*, broad; *stoma*, mouth.] Spire short; aperture large, dilated; labrum joining the body whorl. This name was preoccupied for a shell by Klein in 1753, for an insect by Meigen in 1803, and for a fish by Agassiz in 1829. The genus has been named *Platycerina*. Type *P. ventricosum*.

affine, Billings, 1874, Pal. Foss., vol. 2, p. 60, Gaspe limestone, No. 8, Devonian.

aplatum, Hall, 1876, Illust. Devonian Foss., pl. 11, and Pal. N. Y., vol. 5, pt. 2, p. 26, Schoharie grit

arenosum, Conrad, 1842, Jour. Acad. Nat. Sci., vol. 8, p. 276, and Pal. N. Y., vol. 3, p. 302, Low. Held. Gr.

belial, Clarke, 1885, Bull. U. S. Geo. Sur., No. 16, p. 30, Genesee shales.

defiguratum, Hall, 1876, Illust. Devonian Foss., pl. 9, and Pal. N. Y., vol. 5, pt. 2, p. 24, Ham. Gr.

depressum, Hall, 1859, Pal. N. Y., vol. 3, p. 301, Low. Held. Gr.

euomphaloides, Hall, 1876, Illust. Devonian Foss., pl. 9, and Pal. N. Y., vol. 5, pt. 2, p. 25, Ham. Gr.

hemisphericum, Hall, 1843, (*Euomphalus hemisphericus*.) Geo. Rep. 4th Dist. N. Y., p. 109, and Pal. N. Y., vol. 2, p. 288, Niagara Gr.

grayvillense, Worthen, 1882, Bull. No. 1. Ill. St. Mus. Nat. Hist., p. 38, Coal Meas. Proposed instead of *P. tumidum*, M. & W., which was preoccupied.

inornatum, Walcott, 1885, Monogr. U. S. Geo. Sur., vol. 8, p. 255, Subcarboniferous.

lichas, see *Callonema lichas*.

lineatum, Conrad, 1842, Jour. Acad. Nat. Sci., vol. 8, p. 276, and Pal. N. Y., vol. 5, pt. 2, p. 21, Up. Held. and Ham. Grs.

lineatum var. *amplum*, Hall, 1876, Illust. Devonian Foss., pl. 9, and Pal. Foss. N. Y., vol. 5, pt. 2, p. 23, Ham. Gr.

lineatum var. *callosum*, Hall, 1876, Illust. Devonian Foss., pl. 9, and Pal. Foss. N. Y., vol. 5, pt. 2, p. 23, Ham. Gr.

lineatum var. *sinuosum*, Hall, 1876, Illust. Devonian Foss., pl. 11, and Pal. Foss. N. Y., vol. 5, pt. 2, p. 24, Ham. Gr.

minutissimum, Clarke, 1885, Bull. U. S. Geo. Sur., No. 16, p. 55, Portage Gr.

nana, see *Naticopsis nana*.

niagarensis, Hall, 1852, Pal. N. Y., vol. 2, p. 287, Niagara Gr.

peoriense, McCheyney, 1860, Desc. New Pal. Foss., Up. Coal Meas.

plebeium, Hall, 1876, 28th Rep. N. Y. Mus. Nat. Hist., p. 175, Niagara Gr.

pleurotoma, Hall, 1876, Illust. Devonian Foss., pl. 10, and Pal. N. Y., vol. 5, pt. 2, p. 30, Up. Held. Gr.

plicatum, Whiteaves, 1887, Cont. to Can. Pal., vol. 1, p. 118, Ham. Gr.

shumardi, Verneuil, 1846, (*Turbo shumardi*.) Bull. d. l. Soc. Geol. d. France, and Pal. N. Y., vol. 5, pt. 2, p. 135, Ham. Gr.

strophium, Hall, 1862, 15th Rep. N. Y. Mus. Nat. Hist., p. 41, and Pal. N. Y., vol. 5, pt. 2, p. 25, Cornif. Gr.

subangulatum, Hall, 1859, Pal. N. Y., vol. 3, p. 301, Low. Held. Gr.

trigonostoma, Meek, 1871, Proc. Acad. Nat. Sci., p. 169, and Ohio Pal., vol. 1, p. 185, Niagara Gr.

tumidum, Meek & Worthen, 1860, Proc. Acad. Nat. Sci., p. 463, Up. Coal Meas.

turbinatum, Hall, 1861, 14th Rep. N. Y. Mus. Nat. Hist., p. 106, and Pal. N. Y., vol. 5, pt. 2, p. 27, Up. Held. Gr.

turbinatum var. *cochleatum*, Hall, 1876, Illust. Devonian Foss., pl. 10, and Pal. N. Y., vol. 5, pt. 2, p. 28, Up. Held. Gr.

unisulcatum, Conrad, 1842, (*Pleurotomaria unisulcata*.) Jour. Acad. Nat. Sci., vol. 8, p. 271, and Pal. N. Y., vol. 5, pt. 2, p. 27, Up. Held. Gr.

ventricosum, Conrad, 1842, Jour. Acad. Nat. Sci., vol. 8, p. 275, and Pal. N. Y., vol. 3, p. 300, Low. Held. Gr.

Plectostylus, Conrad, 1842, Jour. Acad. Nat. Sci., p. 275. The name was preoccupied.

hildrethi, see *Macrochilina hildrethi*.



FIG. 697.—*Platystoma niagarensis*.



Fig. 698.—*Platystoma trigonostoma*.

PLEURONOTUS, Hall, 1879, Pal. N. Y., vol. 5, pt. 2, p. 138. [Ety. *pleura*, side; *notos*, back.] Distinguished from *Euomphalus* by the broadly expanded aperture, sinuate on the upper margin, making a deep retral angle, which meets a peripheral band. Type *P. decewi*.

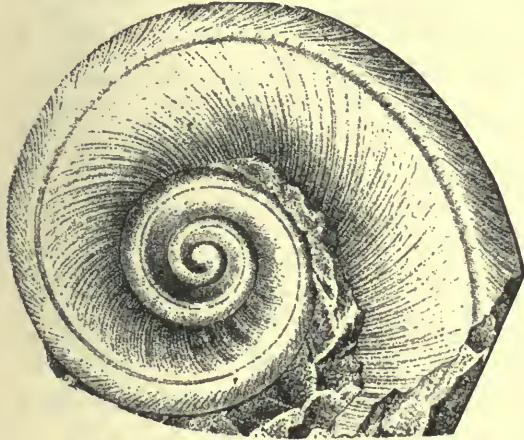


Fig. 699.—*Pleuronotus decewi*.

decewi, Billings, 1861, (*Euomphalus decewi*.) Can. Jour., p. 358, Up. Held. Gr.

PLEUROTOMARIA, DeFrance, 1824, Tableau d. Corps. Organises Fossiles, p. 114, and Dict. Sci. Nat., t. 41, p. 381. [Ety. *pleura*, side; *to-me*, cut or notch.] Shell trochiform, more or less conical, pearly within, variable in thickness, with or without an umbilicus; volutions angular, flattened, or rounded; surface ornamented with striae, nodes, granulations, or carinae; aperture subquadrate, semioval, suborbicular, or subrhombic; inner lip thin; fissure of outer lip narrow and deep; revolving band corresponding in depth with the sinus. Type *P. anglica*.



FIG. 700.—*Pleurotomaria anglica*.

abrupta, Billings, 1859, Can. Nat. and Geo., vol. 4, p. 354, Calciferous Gr.
acadica, Dawson, 1883, Rep. on Redpath Mus., p. 11, Subcarboniferous.
adamsi, Worthen, 1884, Bull. No. 2, Ill. St. Mus. Nat. Hist., p. 5, and Geo. Sur. Ill., vol. 8, p. 137, Coal Meas.
adjutor, Hall, 1879, Pal. N. Y., vol. 5, pt. 2, p. 80, Up. Held Gr.
advena, Winchell, 1864, Am. Jour. Sci. and Arts, 2d series, vol. 37, p. 228, Potsdam Gr.
agarista, Billings, 1865, Pal. Foss., vol. 1, p. 230, Quebec Gr.

agave, Billings, 1865, Pal. Foss., vol. 1, p. 170, Trenton Gr.
ambigua, Hall, 1847, Pal. N. Y., vol. 1, p. 176, Trenton Gr.
americana, Billings, 1860, Can. Nat. and Geo., vol. 5, p. 164, Trenton Gr.
amphitrite, Billings, 1862, Pal. Foss., vol. 1, p. 32, Chazy or Black Riv. Gr.
angulata, Conrad, 1843, Proc. Acad. Nat. Sci. Phil. This name was preoccupied by Sowerby.
antiquata, Hall, 1847, Pal. N. Y., vol. 1, p. 31, Chazy Gr.
aperta, see *Raphistoma apertum*.
apicalis, Hall, 1876, Illust. Devonian Foss., pl. 20, and Pal. N. Y., vol. 5, pt. 2, p. 88, Chemung Gr.
arabella, Billings, 1865, Pal. Foss., vol. 1, p. 343, Calciferous Gr.
arachne, Billings, 1862, Pal. Foss., vol. 1, p. 31, Black Riv. Gr.
arata, Hall, 1862, 15th Rep. N. Y. Mus. Nat. Hist., p. 42, and Pal. N. Y., vol. 5, pt. 2, p. 64, Schoharie grit.
arata var. *clausa*, Hall, 1879, Pal. N. Y., vol. 5, pt. 2, p. 65, Up. Held. Gr.
axion, Hall, 1867, 20th Rep. N. Y. Mus. Nat. Hist., p. 394, Niagara Gr.
beckwithana, McChesney, 1860, Desc. New Pal. Foss., p. 61, Coal Meas.
beckmanensis, Whitfield, 1889, Bull. Am. Mus. Nat. Hist., vol. 2, p. 53, Calciferous Gr.
biangulata, Hall, 1847, Pal. N. Y., vol. 1, p. 31, Chazy Gr.
bicarinata, McChesney, 1860. Preoccupied. See *P. turbiniformis*.
bilix, see *Cyclonema bilix*.
bispiralis, Hall, 1852, Pal. N. Y., vol. 2, p. 348, Guelph Gr.
bonharborensis, Cox, 1857, Geo. Sur. Ky., vol. 3, p. 567, Coal Meas.
brazoensis, Shumard, 1860, Trans. St. Louis Acad. Sci., vol. 1, p. 624, and Geo. Sur. Ill., vol. 2, p. 354, Low. Coal Meas.
broadheadi, White, 1880, 12th Rep. U. S. Geo. Sur. Terr., p. 169, Coal Meas.
calcifera, Billings, 1859, Can. Nat. and Geo., vol. 4, p. 352, Calciferous Gr.
calphurnia, Billings, 1865, Pal. Foss., vol. 1, p. 230, Up. Taconic, Quebec Gr.
calyx, Billings, 1859, Can. Nat. and Geo., vol. 4, p. 454, Chazy Gr.
canadensis, Billings, 1865, Pal. Foss., vol. 1, p. 342, Calciferous Gr.
capillaria, Conrad, 1842, Jour. Acad. Nat. Sci., vol. 8, p. 271, and Pal. N. Y., vol. 5, pt. 2, p. 77, Ham. Gr.
carbonaria, Norwood & Pratten, 1854, Jour. Acad. Nat. Sci., 2d series, vol. 3, p. 75, Coal Meas.
casii, Meek & Worthen, 1868, Geo. Sur. Ill., vol. 3, p. 359, Niagara Gr.
cavumbilicata, Winchell, 1866, Rep. Low. Penin. Mich., p. 96, Ham. Gr.

- chesterensis, Meek & Worthen, 1860, Proc. Acad. Nat. Sci., p. 460, and Geo. Sur. Ill., vol. 2, p. 303, Kaskaskia Gr.
- chesterensis*, Swallow, 1863, Trans. St. Louis Acad. Sci. The name was preoccupied, but it is probably a synonym.
- circe*, Billings, 1857, Rep. of Progr. Geo. Sur. Can., p. 303, Hud. Riv. Gr.
- clipeiformis*, Spencer, 1884, Bull. No. 1, Mus. Univ. St. Mo., p. 57, Niagara Gr.
- concava*, see *Eetrochus concavus*.
- coniformis*, Worthen, 1882, Bull. No. 1, Ill. St. Mus. Nat. Hist., p. 38, Coal Meas. Proposed instead of *P. conoides*, M. & W.
- conoides*, Meek & Worthen, 1866, Proc. Acad. Nat. Sci., p. 271. Preoccupied by Deshayes in 1831. See *P. coniformis*.
- conulus*, Hall, 1858, Trans. Alb. Inst., vol. 4, p. 26, and Bull. Am. Mus. Nat. Hist., p. 84, Warsaw Gr.
- cooperensis*, n. s. Kaskaskia Gr. Proposed instead of *P. trochiformis*, Swallow, Trans. St. Louis Acad. Sci., vol. 2, p. 99, that was preoccupied.
- coronula*, Hall, syn. for *P. sphaerulata*.
- coxana*, Meek & Worthen, 1866, Proc. Acad. Nat. Sci., p. 272, and Geo. Sur. Ill., vol. 5, p. 600, Coal Meas.
- coxana*, Worthen, 1884. The name was preoccupied. See *P. iowensis*.
- crevieri*, Billings, 1859, Can. Nat. and Geol., vol. 4, p. 456, Chazy Gr.
- cryptata*, Billings, 1866, Catal. Sil. Foss. Antic., p. 54, Anticosti Gr.
- cyclonemoides*, Meek & Worthen, 1868, Geo. Sur. Ill., vol. 3, p. 360, Niagara Gr.
- cyclostoma*, Whiteaves, 1884, Pal. Foss., vol. 3, p. 23, Guelph Gr.
- deiopea*, Billings, 1862, Pal. Foss., vol. 1, p. 155, Guelph Gr.
- delia*, Billings, 1874, Pal. Foss., vol. 2, p. 61, Gaspé limestone No. 8, Devonian.
- delicatula*, Hall, 1876, Illust. Devonian Foss. pl. 19, and Pal. N. Y., vol. 5, pt. 2, p. 70, Up. Held. Gr.
- delphinuloides*, Goldfuss, as identified by d'Archiac & Verneuil. Not American.
- depauperata*, Hall, 1862, Geo. Rep. Wis., p. 55, Hud. Riv. Gr.
- depressa*, Cox, 1857, Geo. Sur. Ky., vol. 3, Coal Meas. The name was preoccupied by Passy in 1832, by Phillips in 1836, and by DeKoninck in 1841. See *P. kentuckiensis*.
- disjuncta*, Hall, 1876, Illust. Devonian Foss. pl. 20, and Pal. N. Y., vol. 5, pt. 2, p. 84, Ham. Gr.
- dispersa*, Dawson, 1868, Acad. Geol., p. 310, Carboniferous.
- docens*, Billings, 1859, Can. Nat. and Geol., vol. 4, p. 452, Chazy Gr.
- doris*, see *Cyclonema doris*.
- dryope*, Billings, 1865, Pal. Foss., vol. 1, p. 170, Black Riv. Gr.
- durhamensis*, Whiteaves, 1884, Pal. Foss., vol. 3, p. 24, Guelph Gr.
- elegantula*, Hall, 1858, (Murchisonia elegantula,) Trans. Alb. Inst., vol. 4, p. 27, and Bull. Am. Mus. Nat. Hist., p. 84, Warsaw Gr.
- ella*, Hall, 1876, Illust. Devonian Foss., pl. 19, and Pal. N. Y., vol. 5, pt. 2, p. 72, Ham. Gr.
- elora*, Billings, 1862, Pal. Foss., vol. 1, p. 154, Guelph Gr.
- emmetensis*, Winchell, 1866, Rep. Low. Penin. Mich., p. 96, Ham. Gr.
- estella*, Hall & Whitfield, 1872, 24th Rep. N. Y. Mus. Nat. Hist., p. 195, Ham. Gr.
- etna*, Billings, 1865, Pal. Foss., vol. 1, p. 226, Quebec Gr.
- eugenia*, Billings, 1862, Pal. Foss., vol. 1, p. 30, Black Riv. Gr.
- euomphaloides*, Hall, 1862, 15th Rep. N. Y. Mus. Nat. Hist., p. 18, Ham. Gr.
- exigua*, Winchell, 1862, Proc. Acad. Nat. Sci., p. 424, Marshall Gr.
- filitexta*, Hall, 1876, Illust. Devonian Foss., pl. 19, and Pal. N. Y., vol. 5, pt. 2, p. 73, Ham. Gr.
- galtensis*, Billings, 1862, Pal. Foss., vol. 1, p. 154, Guelph Gr.
- giffordi*, Worthen, 1884, Bull. No. 2, Ill. St. Mus. Nat. Hist., p. 5, and Geo. Sur. Ill., vol. 8, p. 135, Coal Meas.
- glandula*, Shumard, 1860, Trans. St. Louis Acad. Sci., vol. 1, p. 626, Coal Meas.
- gonopleura*, Winchell & Marcy, 1865, Bost. Soc. Nat. Hist., p. 98, Niagara Gr.
- granulostriata*, Meek & Worthen, 1860, Proc. Acad. Nat. Sci., p. 459, and Geo. Sur. Ill., vol. 2, p. 356, Low. Coal Meas.
- grayvillensis*, Norwood & Pratten, 1854, Jour. Acad. Nat. Sci., 2d series, vol. 3, p. 75, Coal Meas.
- gregaria*, Billings, 1859, Can. Nat. and Geol., vol. 4, p. 355, Calciferous Gr.
- gurleyi*, Meek, 1871, Proc. Acad. Nat. Sci., p. 177, Coal Meas.
- halii*, see *Trochonema halii*.
- hallana*, Shumard, 1859, Trans. St. Louis Acad. Sci., vol. 1, p. 399, Permian Gr.
- halli*, see *Raphistoma halli*.
- harpya*, Billings, 1865, Pal. Foss., vol. 1, p. 227, Quebec Gr.
- haydenana*, Geinitz, 1866, Carb. und Dyas in Neb., p. 11, and Pal. E. Neb., p. 231, Coal Meas.
- hebe*, Hall, 1861, 14th Rep. N. Y. Mus. Nat. Hist., p. 105, and Pal. N. Y., vol. 5, pt. 2, p. 68, Up. Held. Gr.
- helena*, Billings, 1860, Can. Nat. and Geol., vol. 5, p. 165, Hud. Riv. Gr.
- hickmanensis*, Winchell, 1869, Geo. of Tenn. and Proc. Am. Phil. Soc. vol., 12, p. 257, Waverly Gr.
- hortensia*, Billings, 1865, Pal. Foss., vol. 1, p. 227, Quebec Gr.
- hoiyi*, Hall, 1861, Rep. of Progr. Wis. Sur., p. 35, Niagara Gr.
- humerosa*, Meek & Hayden, 1858, Proc. Acad. Nat. Sci. Phil., p. 262, and Pal. Up. Mo., p. 46, Coal Meas.

- humilis, Hall, 1858, Trans. Alb. Inst., vol. 4, p. 21, and Bull. Am. Mus. Nat. Hist., p. 82, Warsaw Gr.
- humilis, Winchell, 1862. This name was preoccupied.
- huronensis, Winchell, 1862, Proc. Acad. Nat. Sci. Phil., vol. 6, 2d ser., p. 425, Portage Gr.
- hyale, Billings, 1865, Pal. Foss., vol. 1, p. 228, Quebec Gr.
- idia, Hall, 1861, Rep. of Progr. Wis. Sur., p. 35, Niagara Gr.
- ignobilis, Dawson, 1868, Acad. Geol., p. 310, Carboniferous.
- illinoisensis, Worthen, 1884, Bull. No. 2, Ill. St. Mus. Nat. Hist., p. 4, and Geo. Sur. Ill., vol. 8, p. 135, Coal Meas.
- imitator, see Callonema imitator.
- immatura, Billings, 1859, Can. Nat. and Geo., vol. 4, p. 454, Chazy Gr.
- indenta, Hall, 1847, Pal. N. Y., vol. 1, p. 176, Trenton Gr.
- inexpectans, Hall & Whitfield, 1875, Ohio Pal., vol. 2, p. 117, Clinton Gr.
- inornata, Meek, 1872, Pal. E. Neb. p. 232, Coal Meas.
- insolita, Hall, 1876, Illust. Devonian Foss., pl. 20, and Pal. N. Y., vol. 5, pt. 2, p. 81, Ham. Gr.
- iowensis, Worthen, (in press,) Geo. Sur. Ill., vol. 8, p. 133, Keokuk Gr.
- isaaci, Hall & Whitfield, 1873, 23d Rep. N. Y. Mus. Nat. Hist., p. 238, Chemung Gr.
- itys, Hall, 1876, Illust. Devonian Foss., pl. 20, and Pal. N. Y., vol. 5, pt. 2, p. 76, Ham. Gr.
- itys var. tenuispira, Hall, 1879, Pal. N. Y., vol. 5, pt. 2, p. 87, Ham. Gr.
- kearneyi, see Palæotrochus kearneyi.
- kentuckiensis, n. s. Coal Meas. Proposed instead of *P. depressa* in Geo. Sur. Ky., vol. 3, p. 569, which was preoccupied.
- labrosa, Hall, 1859, Pal. N. Y., vol. 3, p. 339, Low. Held. Gr.
- laphami, Whitfield, 1878, Ann. Rep. Geo. Sur. Wis., p. 84, and Geo. Wis., vol. 4, p. 296, Niagara Gr.
- lapicida, see Raphistoma lapicidum.
- laurentina, Billings, 1859, Can. Nat. and Geo., vol. 4, p. 354, Calcif. Gr.
- leavenworthana, see Cyclonema leavenworthanum.
- lenticularis, see Raphistoma lenticulare.
- lineata, Hall, 1843, (Turbo lineatus,) Geo. Rep. 4th Dist. N. Y. Preoccupied. See *P. itys*.
- litorea, Hall, 1852, Pal. N. Y., vol. 2, p. 12, Medina sandstone.
- lonensis, Walcott, 1885, Monogr. U. S. Geo. Sur., vol. 8, p. 80, Trenton Gr.
- lucina, Hall, 1862, 15th Rep. N. Y. Mus. Nat. Hist., p. 42, and Pal. N. Y., vol. 5, pt. 2, p. 67, Up. Held. and Ham. Grs.
- lucina var. perfasciata, Hall, 1876, Illust. Devonian Foss., pl. 20, and Pal. N. Y., vol. 5, pt. 2, p. 83, Ham. Gr.
- lydia, Billings, 1874, Pal. Foss., vol. 2, p. 62, Gaspé limestone, No. 8, Devonian.
- marcouana, Geinitz, 1866, Carb. und Dyas in Neb., p. 10, and Pal. E. Neb., p. 233, Coal Meas.
- meehana, Hall, 1858, Trans. Alb. Inst., vol. 4, p. 22, and Bull. Am. Mus. Nat. Hist., p. 82, Warsaw Gr.
- meta, Meek & Worthen, 1865, Proc. Acad. Nat. Sci., p. 252, Keokuk Gr.
- micula, Hall, 1862, Geo. Rep. Wis., p. 55, Hud. Riv. Gr.
- miseria, Billings, 1859, Can. Nat. and Geo., vol. 4, p. 354, Calcif. Gr.
- mississippiensis, White & Whitfield, 1862, Proc. Bost. Soc. Nat. Hist., vol. 8, p. 302, Kinderhook Gr.
- missisquoi, Billings, 1865, Pal. Foss., vol. 1, p. 191, Quebec Gr.
- missouriensis, Swallow, 1860, (Trochus missouriensis,) Trans. St. Louis Acad. Sci., vol. 1, p. 657, Coal Meas.
- mitigata, Hall, 1860, 13th Rep. N. Y. Mus. Nat. Hist., p. 108, Kinderhook Gr.
- modesta, Keyes, 1888, Proc. Acad. Nat. Sci. Phil., pl. xii, figs. 2a, 2b, Coal Meas.
- mohawkensis, n. sp. Birdseye limestone. Proposed instead of *P. nodulosa*, in Pal. N. Y., vol. 1, p. 44, which was preoccupied.
- montezuma, Worthen, 1883, Geo. Sur. Ill., vol. 7, p. 324, Burlington Gr.
- muralis, Owen, 1852, Geo. Sur. Wis., Iowa, and Minn., p. 581, Trenton Gr.
- nasoni, Hall, 1861, Geo. Rep. Wis., p. 34, and Geo. Wis., vol. 4, p. 215, Trenton Gr.
- nauvoensis, Worthen, 1884, Bull. No. 2, Ill. St. Mus. Nat. Hist., p. 5, and Geo. Sur. Ill., vol. 8, p. 137, Keokuk Gr.
- nevadensis, Walcott, 1885, Monogr. U. S. Geo. Sur., vol. 8, p. 259, Subcarboniferous.
- newportensis, White, 1880, 12th Rep. U. S. Geo. Sur. Terr., p. 169, Coal Meas.
- niota, Hall, 1861, Geo. Rep. Wis., p. 33, Trenton Gr.
- nitela, Hall, 1879, Pal. N. Y., vol. 5, pt. 2, p. 85, Up. Held. Gr.
- nodomarginata, McChesney, 1860, Desc. New. Pal. Foss., p. 70, and Trans. Chi. Acad. Sci., p. 47, Ham. Gr.
- nodulosa, Hall, 1847, Pal. N. Y., vol. 1, p. 44. The name was preoccupied by Sandberger in 1842, and by King in 1844. See *P. mohawkensis*.
- nodulostriata, Hall, 1858, Trans. Alb. Inst., vol. 4, p. 21, and Bull. Am. Mus. Nat. Hist., p. 80, Warsaw Gr.
- normani, Billings, 1865, Pal. Foss., vol. 1, p. 228, Quebec Gr.
- nucleolata, Hall, 1847, Pal. N. Y., vol. 1, p. 42, Birdseye Gr.
- numeria, Billings, 1865, Pal. Foss., vol. 1, p. 229, Quebec Gr.
- obsoleta, Hall, 1847, Pal. N. Y., vol. 1, p. 44, Birdseye Gr.
- obtusispira, Shumard, 1859, Trans. St. Louis Acad. Sci., vol. 1, p. 401, Coal Meas.
- occidens, Hall, 1867, 20th Rep. N. Y. Mus. Nat. Hist., pp. 342, 364, Niagara Gr.

parvispira, Winchell, 1862, Rep. Low. Peninsula Mich., p. 96, Ham. Gr.
 pauper, Billings, 1859, Can. Nat. and Geol., vol. 4, p. 457, Chazy Gr.
pauper, syn. for *Trochonema hali*.
percarinata, see *Cyclonema percarinatum*.
perhumerosa, Meek, 1872, Pal. E. Neb., p. 232, Coal Meas.
perizomata, White, 1882, Rep. Invert. Foss. New Mex., p. xxxi, Coal Meas.
perlata, Hall, 1852, Pal. N. Y., vol. 2, p. 349, Guelph Gr.
perornata, Shumard, 1859, Trans. St. Louis Acad. Sci., vol. 1, p. 401, Coal Meas.
pervetusta, Conrad, 1838, (*Cyclostoma pervetusta*) Ann. Rep. N. Y., p. 65, Medina sandstone.
piasensis, Hall, 1858, Trans. Alb. Inst., vol. 4, p. 22, and Bull. Am. Mus. Nat. Hist., p. 83, Warsaw Gr.
planidorsalis, Hall, 1876, Illust. Devonian Foss., pl. 20, and Pal. N. Y., vol. 5, pt. 2, p. 82, Ham. Gr.
plena, Hall, 1876, Illust. Devonian Foss., pl. 17, and Pal. N. Y., vol. 5, pt. 2, p. 66, Ham. Gr.
postumia, Billings, 1862, Pal. Foss., vol. 1, p. 91, Quebec Gr.
poulsoni, Conrad, 1842, Jour. Acad. Nat. Sci., vol. 8, p. 270, Onondaga Gr.
pratteni, Meek & Worthen, 1860, Proc. Acad. Nat. Sci., p. 459, and Geo. Sur. Ill., vol. 2, p. 357, Low. Coal Meas.
princessa, Billings, 1874, Pal. Foss. vol. 2, p. 59, Up. Held. Gr.
progne, Billings, 1860, Can. Nat. and Geol., vol. 5, p. 163, Black Riv. and Trenton Grs.
proutana, Shumard, 1859, Trans. St. Louis Acad. Sci., vol. 1, p. 401, Coal Meas.
quadracarinata, Hall, 1847, Pal. N. Y., vol. 1, p. 43, Birdseye Gr.
quadrilix, Hall, 1879, Pal. N. Y., vol. 5, pt. 2, p. 86, Up. Held. Gr.
quebecensis, Billings, 1865, Pal. Foss., vol. 1, p. 190, Quebec Gr.
quinquesulcata, Winchell, 1865, Proc. Acad. Nat. Sci., p. 131, Marshall Gr.
racinensis, Whitfield, 1878, Ann. Rep. Geo. Sur. Wis., p. 84, and Geo. Wis., vol. 4, p. 296, Niagara Gr.
ramsayi, Billings, 1859, Can. Nat. and Geol., vol. 4, p. 351, Calciferous Gr.

rota, Winchell, 1863, Proc. Acad. Nat. Sci., p. 19, Marshall Gr.
rotalia, Hall, 1862, 15th Rep. N. Y. Mus. Nat. Hist., p. 46, and Pal. N. Y., vol. 5, pt. 2, p. 71, Ham. Gr.
rotuloides, see *Raphistoma rotuloides*.
rotunda, Hall, 1843, (*Euomphalus* (?) *rotundus*) Geo. Rep. 4th Dist. N. Y., p. 172, and Illust. Devon. Foss., pl. 18, Corniferous Gr.
rotundata, Hall, see *P. subglobosa*.
rotundispira, Billings, 1865, Pal. Foss., vol. 1, p. 191, Quebec Gr.
rugulata, Hall, 1860, 13th Rep. N. Y. Mus. Nat. Hist., p. 108, and Pal. N. Y., vol. 5, pt. 2, p. 75, Ham. Gr.
scitula, Meek & Worthen, 1860, Proc. Acad. Nat. Sci. Phil., p. 461, and Geo. Sur. Ill., vol. 2, p. 353, Low. Coal Meas.
selecta, Billings, 1865, Pal. Foss., vol. 1, p. 224, Quebec Gr.
semele, Hall, 1861, Geo. Rep. Wis., p. 36, Hud. Riv. Gr.
shumardi, Meek & Worthen, 1860, Proc. Acad. Nat. Sci. Phil., p. 462, and Geo. Sur. Ill., vol. 2, p. 260, Keokuk Gr.
sigaretoides, Winchell & Marcy, 1865, Bost. Soc. Nat. Hist., vol. 1, p. 98, Niagara Gr.
sinistrorsa, Swallow, 1858, Trans. St. Louis Acad. Sci., vol. 1, p. 203, Coal Meas.
solarioides, Hall, 1852, Pal. N. Y., vol. 2, p. 348, Guelph Gr.
speciosa, Meek & Worthen, 1860, Proc. Acad. Nat. Sci. Phil., p. 459, and Geo. Sur. Ill., vol. 2, p. 352, Low. Coal Meas.
spherulata, Conrad, 1842, Jour. Acad. Nat. Sci., vol. 8, p. 272, Coal Meas.
spironema, Meek & Worthen, 1866, Proc. Acad. Nat. Sci. Phil., p. 272, and Geo. Sur. Ill., vol. 5, p. 601, Coal Meas.
sponsa, Billings, 1865, Pal. Foss., vol. 1, p. 226, Quebec Gr.
stella, Winchell, 1862, Proc. Acad. Nat. Sci., p. 424, Marshall Gr.
subangulata, see *Cyclonema subangulatum*.
subconica, Hall, 1847, Pal. N. Y., vol. 1, p. 174, Black Riv., Trenton, and Hud. Riv. Grs.
subconstricta, Meek & Worthen, 1860, Proc. Acad. Nat. Sci. Phil., p. 458, and Geo. Sur. Ill., vol. 2, p. 351, Low. Coal Meas.
subdecussata, Geinitz, 1866, Carb. und Dyas in Neb., p. 10, and Pal. E. Neb., p. 233, Coal Meas.
subdepressa, Hall, 1852, Pal. N. Y., vol. 2, p. 333, Coralline limestone.
subglobosa, Hall, 1877, 1st Ed. Am. Pal. Foss., p. 245, Warsaw Gr. Proposed instead of *P. rotundata*, Hall, 1858, which was preoccupied.
subscalaris, Meek & Worthen, 1860, Proc. Acad. Nat. Sci. Phil., p. 460, and Geo. Sur. Ill., vol. 2, p. 360, Low. Coal Meas.
subsinuata, Meek & Worthen, 1860, Proc. Acad. Nat. Sci. Phil., p. 460, and Geo. Sur. Ill., vol. 2, p. 358, Low. Coal Meas.

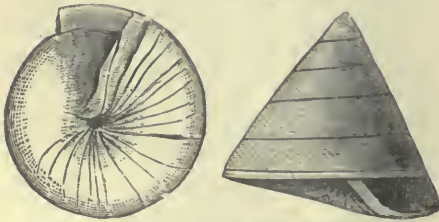


FIG. 701.—*Pleurotomaria ramsayi*.

regulata, Hall, 1860, 13th Rep., p. 108, Ham. Gr.
riddelli, Shumard, 1860, Trans. St. Louis Acad. Sci., vol. 1, p. 625, Coal Meas.

subtilstriata, see *Raphistoma subtilstriatum*.

subturbinata, Meek & Hayden, 1858, Proc. Acad. Nat. Sci. Phil., p. 264, and Pal. Up. Mo., p. 47, Coal Meas.

sulcomarginata, Conrad, 1842, Jour. Acad. Nat. Sci., vol. 8, p. 272, and Pal. N. Y., vol. 5, pt. 2, p. 69, Ham. Gr.

supracingulata, Billings, 1857, Rep. of Progr., Geo. Sur. Can., p. 302, Trenton Gr.

swallovana, Hall, 1858, Trans. Alb. Inst., vol. 4, p. 24, and Bull. Am. Mus. Nat. Hist., p. 80, Warsaw Gr.

sybillina, Billings, 1866, Catal. Sil. Foss. Antic., p. 54, Anticosti Gr.

tabulata, Conrad, 1835, (*Turbo tabulata*), Trans. Geo. Soc. Penn., vol. 1, p. 267, Coal Meas.

taggarti, Meek, 1874, 7th Rep. Hayden's U. S. Geo. Sur. Terr., p. 271, and Cont. to Pal., No. 6, p. 140, Coal Meas.

tectoria, Winchell, 1863, Proc. Acad. Nat. Sci., p. 19, Marshall Gr.

tenuicincta, Meek & Worthen, 1860, Proc. Acad. Nat. Sci., p. 459, and Geo. Sur. Ill., vol. 2, p. 355, Up. Coal Meas.

tenuimarginata, Hall, syn. for *Eotrochus concavus*.

tenuistriata, Shumard, 1860, Trans. St. Louis Acad. Sci., vol. 1, p. 625, Coal Meas.

textiliger, Meek, 1871, Proc. Acad. Nat. Sci., p. 176, and Ohio Pal., vol. 2, p. 314, Waverly Gr.

thalia, see *Cyclonema thalia*.

trilineata, Hall, 1858, Trans. Alb. Inst., vol. 4, p. 25, and Bull. Am. Mus. Nat. Hist., p. 80, Warsaw Gr.

trilix, Hall, 1862, 15th Rep. N. Y. Mus. Nat. Hist., p. 45, and Pal. N. Y., vol. 5, pt. 2, p. 79, Ham. Gr.

trochiformis, Swallow, 1863. The name was preoccupied by Portlock in 1843. See *P. cooperensis*.

tropidophora, Meek, 1872, Am. Jour. Sci. and Arts, 3d series, vol. 4, p. 278, and Ohio Pal., vol. 1, p. 154, Hud. Riv. Gr.

turbiniiformis, Meek & Worthen, 1860, Proc. Acad. Nat. Sci., p. 461, and Geo. Sur. Ill., vol. 2, p. 359, Up. Coal Meas.

turgida, see *Holopea turgida*.

umbilicata, see *Trochomena umbilicatum*.

unisolcata, Conrad, 1842, Jour. Phil. Acad. Sci., vol. 8, p. 271, Up. Held. Gr.

vadosa, Hall, 1860, 13th Rep. N. Y. Mus. Nat. Hist., p. 108, Kinderhook Gr.

vagrans, Billings, 1862, Pal. Foss., vol. 1, p. 90, Quebec Gr.

valeria, Billings, 1865, Pal. Foss., vol. 1, p. 169, and vol. 3, p. 23, Guelph Gr.

valvatiformis, Meek & Worthen, 1866, Proc. Acad. Nat. Sci. Phil., p. 273, and Geo. Sur. Ill., vol. 5, p. 602, Coal Meas.

viola, Billings, 1865, Pal. Foss., vol. 1, p. 169, Guelph Gr.

virgo, Billings, 1865, Pal. Foss., vol. 1, p. 224, Quebec Gr.

virguncula, Billings, 1865, Pal. Foss., vol. 1, p. 225, Quebec Gr.

vitruvia, Billings, 1865, Pal. Foss., vol. 1, p. 171, Black Riv. Gr.

voltumna, Billings, 1874, Pal. Foss., vol. 2, p. 61, Gaspé limestone No. 8, Devonian.

whitii, Winchell, 1862, Proc. Acad. Nat. Sci., p. 423, Marshall Gr.

worthei, Hall, 1858, Trans. Alb. Inst., vol. 4, p. 23, and Geo. Sur. Iowa, p. 664, Warsaw Gr.

POLYPHEMOPSIS, Portlock, 1843, Geol. Londonderry, p. 415. [Ety. *Polyphemus*, a genus of shells; *opsis*, appearance.] Subfusiform; spire elongated; whorls flattened, last one produced below and forming half the length of the shell; outer lip thin, nearly straight; inner lip wanting; columella without folds, slightly twisted and truncated at the connection with the outer lip; aperture narrow, subovate, effuse or slightly notched at the base of the columella; surface smooth, or only with obscure lines of growth. Type *P. elongata*.

chrysalis, Meek & Worthen, 1866, Proc. Acad. Nat. Sci. Phil., p. 267, and Geo. Sur. Ill., vol. 5, p. 596, Coal Meas.

keokuk, Worthen, (in press.) Geo. Sur. Ill., vol. 8, p. 144, Keokuk Gr.

inornata, Meek & Worthen, 1860, (*Loxonema inornatum*), Proc. Acad. Nat. Sci. Phil., p. 463, and Geo. Sur. Ill., vol. 2, p. 374, Up. Coal Meas.

louisvillæ, Hall & Whitfield, 1872, 24th Rep. N. Y. Mus. Nat. Hist., p. 193, Up. Held. Gr.

melanoides, Whitfield, 1882, Ann. N. Y. Acad. Sci., vol. 2, p. 225, Kaskaskia Gr.

nitidula, Meek & Worthen, 1860, (*Loxonema nitidula*), Proc. Acad. Nat. Sci. Phil., p. 465, and Geo. Sur. Ill., vol. 2, p. 374, Up. Coal Meas.

peracuta, Meek & Worthen, 1860, (*Eulima* (?) *peracuta*), Proc. Acad. Nat. Sci. Phil., p. 466, and Geo. Sur. Ill., vol. 2, p. 375, Up. Coal Meas.

teretiformis, Hall, 1877, 1st Ed. Am. Pal. Foss., p. 245, Warsaw Gr. Proposed instead of *P. elongata*, Hall, 1858, which was preoccupied.

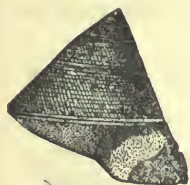


FIG. 702.—*Pleurotomaria turbiniiformis*.

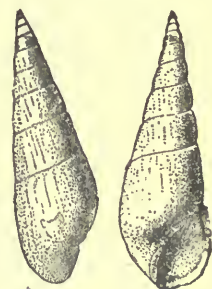


FIG. 703.—*Polyphemopsis nitidula*.

PORCELLIA, Leveille, 1835, Mem. Soc. Geol. France, vol. 2, p. 39. [Ety. proper name.] Discoid, depressed; whorls very slightly embracing, exposed in a very wide umbilicus, slightly deeper on one side than the other, from a trifling obliquity of the first one or two turns; a narrow band extends along the middle of the exterior, ending in a narrow slit in the lip; surface often nodular and ornamented with rough striæ. Type *P. puzosi*.

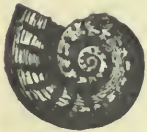


FIG. 704.—*Porcellia puzosi*.

crassinoda, White & Whitfield, 1862, Proc. Bost. Soc. Nat. Hist., vol. 8, p. 303, Kinderhook Gr.
hertzeri, Hall, 1876, Illust. Devonian Foss., pl. 16, and Pal. N. Y., vol. 5, pt. 2, p. 126, Up. Held Gr.

nais, Hall, 1862, (*Gyroceras nais*), 15th Rep. N. Y. Mus. Nat. Hist., p. 68, and Pal. N. Y., vol. 5, pt. 2, p. 127, Chemung Gr.
nodosa, Hall, 1860, Supp. to vol. 1, pt. 2, Iowa Geo. Sur., p. 92, Kinderhook Gr.
obliquinodus, White, 1862, Proc. Bost. Soc. Nat. Hist., vol. 9, p. 21, Marshall Gr.
peoriensis, Worthen, 1884, Bull. No. 2, Ill. St. Mus. Nat. Hist., p. 6, and Geo. Sur. Ill., vol. 8, p. 138, Coal Meas.
rectinoda, Winchell, 1863, Proc. Acad. Nat. Sci., p. 18, Marshall Gr.
rotatoria, Hall, see *Goniatites plebeiformis*.
scioto, Hall & Whitfield, 1873, 23d Rep. N. Y. Mus. Nat. Hist., p. 240, Up. Held. Gr.
senex, see *Platyceras senex*.

PSEUDOPHORUS, Meek, 1873, Ohio Pal., vol. 1, p. 221. [Ety. *pseudos*, false; *Phorus*, a genus. Shell depressed, subtrochiform; umbilicus broad, shallow, eccentric; volutions two or three; suture obscure; aperture transversely rhombic, three times as wide as high, acutely angular at the outer and inner extremities; upper side of lip oblique and extended forward; surface bearing lines of growth directed obliquely backward. Type *P. antiquus*.



FIG. 705.—*Pseudophorus antiquus*.

antiquus, Meek, 1871, (*Trochita antiqua*), Proc. Acad. Nat. Sci. Phil., p. 82, and Ohio Pal., vol. 1, p. 221, Up. Held. Gr.

PUPA, Humphrey, 1797, Museum Caloni-anum, and Lamarck Syst. Anim. sans Vert., p. 88. [Ety. *Pupa*, chrysalis shell.] Shell rimate or perforate, cylindrical or oblong; aperture rounded, often toothed, margins distant, mostly united by a callous lamina. Type *P. uva*.



FIG. 706. *Pupa uva*.

bigshyi, Dawson, 1880, Am. Jour. Sci. and Arts, 3d ser., vol. 20, p. 410, Coal Meas.
vermilionensis, Bradley, 1872, Am. Jour. Sci., 3d series, vol. 4, p. 87, Coal Meas.
vetusta, Dawson, 1860, Quar. Jour. Geo. Soc., vol. 16, p. 268, and Acad. Geol., p. 383, Coal Meas.
vetusta var. *tenuistriata*, Dawson, 1880, Am. Jour. Sci. and Arts, 3d ser., vol. 20, p. 406, Coal Meas.
RAPHISTOMA, Hall, 1847, Pal. N. Y., vol. 1, p. 28. [Ety. *raphe*, seam or suture; *stoma*, mouth.] Depressed, often discoid; spire flat or nearly so; sutures close; whorls acute-angular externally and often with an angular edge to the moderate umbilicus. Type *R. striatum*.
acutum, Hall & Whitfield, 1877, U. S. Geo. Expl. 40th parallel, vol. 4, p. 235, Chazy Gr.
affinis, Foerste, 1885, Bull. Sci. Lab. Denison Univ., p. 95. Not properly defined.
angulatum, Emmons, 1856, (*Straparollus angulatus*), Am. Geol. p. 157, Calciferous Gr.
apertum, Salter, 1859, Can. Org. Rem., Decade 1, p. 12, Black Riv. and Trenton Gr.
compressum, Whitfield, 1886, Bull. Am. Mus. Nat. Hist., vol. 1, p. 309, Birds-eye Gr.

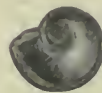


FIG. 707.—*Raphistoma halli*.

halli, S. A. Miller, 1874, (*Pleurotomaria halli*), Cin. Quar. Jour. Sci., vol. 1, p. 318, Hud. Riv. Gr.

labiatum, Emmons, 1842, (*Maclurea labiata*), Geo. Rep. N. Y., p. 312, Calciferous and Birdseye Gr.
lapidica, Salter, 1859, Can. Org. Rem., Decade 1, p. 12, Black Riv. and Trenton Gr.

lenticulare, Emmons, 1842, (*Pleurotomaria lenticularis*), Geo. Rep. N. Y., p. 392, and Pal. N. Y., vol. 1, p. 172, Trenton and Hud. Riv. Gr.



FIG. 708.—*Raphistoma lenticulare*.

niagarensis, Whitfield, 1878, Ann. Rep. Geo. Sur. Wis., p. 82, and Geo. Wis., vol. 4, p. 295, Niagara Gr.
planistria, Hall, 1847, Pal. N. Y., vol. 1, p. 30, Chazy Gr.
planistria var. *parvum*, Hall, 1847, Pal. N. Y., vol. 1, p. 30, Chazy Gr.

prævium, Whitfield, 1889, Bull. Am. Mus. Nat. Hist., vol. 2, p. 52, Calciferous Gr.
 rotuliforme, Meek, 1870, Proc. Acad. Nat. Sci., p. 61, and U. S. Geo. Sur. 40th Parallel, vol. 4, p. 18, Calciferous Gr.
 rotuloides, Hall, 1847, (Pleurotomaria rotuloides,) Pal. N. Y., vol. 1, p. 173, Trenton Gr.
 stamineum, Hall, 1847, Pal. N. Y., vol. 1, p. 29, Chazy Gr.
 striatum, Emmons, 1842, (Maclurea striata,) Geo. Rep. N. Y., p. 312, and Pal. N. Y., vol. 1, p. 28, Chazy Gr.

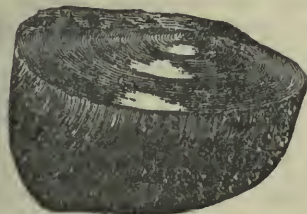


FIG. 709.—Raphistoma striatum.

subplanum, Shumard, 1863, Trans. St. Louis Acad. Sci., vol. 2, p. 106, Calciferous Gr.
 subtilstriatum, Hall, 1847, (Pleurotomaria subtilstriata,) Pal. N. Y., vol. 1, p. 172, Trenton Gr.
 trochiscum, Meek, 1870, (Euomphalus trochiscus,) Proc. Acad. Nat. Sci., p. 61, and Geo. Sur. W. 100th Mer., vol. 4, p. 77, Calciferous or Trenton Gr.

ROTELLA, Lamarck, 1822, Hist. Nat. Anim. sans Vert., vol. 7, p. 6. [Ety. diminutive of *rota*, a wheel.] Lenticular, polished; spire depressed; base callous, lingual teeth 13; uncini, numerous, subequal. Type *R. vestiaria*.
 verruculifera, White, 1882, Rep. Invert. Foss., New Mexico, p. xxxi, Coal Meas.



FIG. 710.—Rotella vestiaria.

SCÆVOGYRA, Whitfield, 1878, Ann. Rep. Geo. Sur. Wis., p. 61, and Geo. Wis., vol. 4, p. 198. [Ety. *scævus*, toward the left; *gurus*, circle.] Sinistral, spire elevated, volutions rounded; umbilicus open, broad, no callus; peristome entire, uniting with the volution on the inner side and spreading externally. Type *S. swezeyi*.
 elevata, Whitfield, 1878, Ann. Rep. Geo. Sur. Wis., p. 62, and Geo. Wis., vol. 4, p. 199, Low. Mag. Gr.
 obliqua, Whitfield, 1878, Ann. Rep. Geo. Sur. Wis., p. 63, and Geo. Wis., vol. 4, p. 199, Low. Mag. Gr.
 swezeyi, Whitfield, 1878, Ann. Rep. Geo. Sur. Wis., p. 62, and Geo. Wis., vol. 4, p. 198, Low. Mag. Gr.

SCALITES, Emmons, 1842, Geo. Rep. N. Y., p. 312. [Ety. *scala*, staircase.] Turbinate, whorls flat above, turrated, pro-

duced below; no umbilicus; form elongate. Type *S. angulatus*.

angulatus, Emmons, 1842, Geo. Rep. N. Y., p. 312, and Pal. N. Y., vol. 1, p. 27, Chazy Gr.

SCOLIOSTOMA, Braun, 1838, Neues Jahr. Min. Geo. Geol. Petref., p. 298. [Ety. *skolios*, curved; *stoma*, mouth.] Small, upper part pupiform; aperture extended, curved outward. Type *S. dannenbergi*.



FIG. 711.—Scalites angulatus.

americana, Walcott, 1885, Monogr. U. S. Geo. Sur., vol. 8, p. 195, Low. Devonian.

Solarium, Lamarck, 1801, Syst. An. sans Vert. Not Palæozoic.

leai, one of Troost's catalogue names.

SOLENISCUS, Meek & Worthen, 1860, Proc. Acad. Nat. Sci. Phil., p. 467. [Ety. *soleniskos*, little channel or gutter.] Fusiform, pointed; whorls nearly flat, last one contracted and produced below into a straight canal; surface smooth or obscurely marked by lines of growth; aperture narrow; outer lip thin, entire; inner lip thickened and bearing a more or less distinct revolving fold; columella straight, imperforate. Type *S. typicus*.

brevis, White, 1882, Rep. Invert. Foss., New Mex., p. xxvii, Coal Meas.

fusiformis, Hall, 1858, (Macrocheilus fusiforme,) Geol. of Iowa, p. 718, Coal Meas.

hallanus, Geinitz, 1866, (Macrocheilus hallanus,) Carb. und Dyas in Neb. p. 6, Coal Meas.



FIG. 712.—Soleniscus klipparti.

helicoides, Sowerby, 1829, (Ampullaria helicoides,) Min. Conch., vol. 6, p. 40, Coal Meas.

klipparti, Meek, 1872, (Macrocheilus klipparti,) Proc. Acad. Nat. Sci., vol. 24, p. 328, and Ohio Pal., vol. 2, p. 346, Low. Coal Meas.

newberryi, Stevens, 1858, (Loxonema newberryi,) Am. Jour. Sci. and Arts, 2d ser., vol. 25, p. 259, and Geo. Sur. Ill., vol. 5, p. 594, Coal Meas.

paludiniiformis, Hall, 1858, (Macrocheilus paludiniiformis,) Geo.

of Iowa, p. 719, Coal Meas.
planus, White, syn. for *S. newberryi*.

texanus, Shumard, 1859, (*Macrocheilus texanus*), Trans. St. Louis Acad. Sci., vol. 1, p. 402, Coal Meas.



FIG. 713.—*Soleniscus typicus*.

typicus, Meek & Worthen, 1860, Proc. Acad. Nat. Sci. Phil., p. 467, and Geo. Sur. Ill., vol. 2, p. 384, Up. Coal Meas.

ventricosus, Hall, 1858, (*Macrocheilus ventricosus*), Geo. Sur. Iowa, p. 718, Coal Meas.

STRAPAROLLINA, Billings, 1865, Pal. Foss., vol. 1, p. 223. [Ety. from the resemblance to shells of the genus *Straparollus*.] Shell turbinate, with round or obscurely angulated whorls; aperture nearly circular, sometimes with a notch in the inner lower angle of the lip. Type *S. pelagica*.

asperostriata, Billings, 1860, (*Straparollus asperostriatus*), Can. Nat. and Geol., vol. 5, p. 162, Black Riv. Gr.

circe, Billings, 1860, (*Straparollus circe*), Can. Nat. and Geol., vol. 5, p. 161, Black Riv. Gr.

eurydice, Billings, 1860, (*Straparollus eurydice*), Can. Nat. and Geol., vol. 5, p. 162, Black Riv. Gr.

pelagica, Billings, 1865, Pal. Foss., vol. 1, p. 223, Quebec Gr.

remota, Billings, 1874, Pal. Foss., vol. 2, p. 70, Up. Taconic.



FIG. 714.—*Straparollina pelagica*.

STRAPAROLLUS, Montfort, 1810, Conch. Syst., vol. 2, p. 174. [Ety. *strabos*, turned about.] Discoid, depressed conic, smooth or transversely striated; whorls rounded; umbilicus wide, exposing the whorls; mouth indented by the penultimate whorl; peritreme simple, thin, most so on the left side. Type *S. dionysii*.

ammon, White and Whitfield, 1862, Proc. Bost. Soc. Nat. Hist., vol. 8, p. 307, Marshall Gr.

angulatus, see *Raphistoma angulatum*.

asperostriatus, see *Straparollina asperostriata*.

barrisi, Winchell, 1863, Proc. Acad. Nat. Sci. Phil., p. 20, Marshall Gr.

canadensis, Billings, 1861, Can. Jour., vol. 6, p. 359, Up. Held. Gr.

circe, see *Straparollina circe*.

clymenioides, Hall, 1862, (*Euomphalus clymenioides*), 15th Rep. N. Y. Mus. Nat. Hist., p. 54, and Pal. N. Y., vol. 5, pt. 2, p. 62, Up. Held. Gr.

cornudanus, Shumard, 1859, Trans. St. Louis Acad. Sci., vol. 1, p. 400, Coal Meas.

crenulatus, Whiteaves, 1884, Pal. Foss., vol. 3, p. 21, Guelph Gr.

cyclostomus, Hall, 1858, (*Euomphalus cyclostomus*), Geo. Sur. Iowa, p. 516, Ham. Gr.

daphne, Billings, 1862, Pal. Foss., vol. 1, p. 160, Guelph Gr.

eurydice, see *Straparollina eurydice*.

hecale, Hall, 1876, (*Euomphalus hecale*), Illust. Devon. Foss., pl. 16, Chemung Gr.

hecale var. *corpulens*, Hall, 1876, (*Euomphalus hecale* var. *corpulens*), Illust. Dev. Foss., pl. 27, Chemung Gr.

hippolyta, Billings, 1862, Pal. Foss., vol. 1, p. 160, Guelph Gr.

inops, Hall, 1876, (*Euomphalus inops*), Illust. Devonian Foss., pl. 16, Up. Held. Gr.

labiatus, see *Raphistoma labiatum*.

lens, Hall, 1860, (*Euomphalus lens*) 13th Rep. N. Y. Mus. Nat. Hist., p. 109, Kinderhook Gr.



FIG. 715.—*Straparollus hippolyta*.

macromphalus, Winchell, 1863, Proc. Acad. Nat. Sci. Phil., p. 20, Marshall Gr.

magnificus, Shumard, 1863, Trans. St. Louis Acad. Sci., vol. 2, p. 110, Carboniferous. Too poorly defined for recognition.

minnesotensis, see *Euomphalus minnesotensis*.

mopsis, Hall, 1867, 20th Rep. N. Y. Mus. Nat. Hist., p. 390, Niagara Gr.

newarkensis, Walcott, 1885, Monogr. U. S. Geo. Sur., vol. 8, p. 187, Devonian.

niagarensis, Hall & Whitfield, 1875, Ohio Pal., vol. 2, p. 144, Niagara Gr.

ophirensis, Hall & Whitfield, 1877, (*Euomphalus ophirensis*), U. S. Geo. 40th Parallel, vol. 4, p. 261, Waverly Gr.

pernodosus, see *Euomphalus pernodosus*. planispira, Hall, 1858, (*Euomphalus planispira*), Trans. Alb. Inst., vol. 4, p. 20, and Bull. Am. Mus. Nat. Hist., p. 70, Warsaw Gr.

primordialis, see *Ophileta primordialis*.

quadrivolvis, Hall, 1858, (*Euomphalus quadrivolvis*), Trans. Alb. Inst., vol. 4, p. 19, and Bull. Am. Mus. Nat. Hist., p. 71, Warsaw Gr.

rudis, Hall, 1876, (*Euomphalus rudis*), Illust. Dev. Foss., pl. 16, and Pal. N. Y., vol. 5, pt. 2, p. 58, Hain. Gr.

sanctisabae, Roemer, 1852, (*Euomphalus sanctisabae*), Kreid. von Texas, p. 91, Silurian.

similis, Meek & Worthen, 1861, Proc. Acad. Nat. Sci. Phil., p. 145, and Geo. Sur. Ill., vol. 2, p. 285, St. Louis Gr.

similis var. *planus*, Meek & Worthen, 1861, Proc. Acad. Nat. Sci. Phil., p. 146, and Geo. Sur. Ill., vol. 2, p. 286, St. Louis Gr.

sinuatus, Hall, 1859, (*Euomphalus sinuatus*), Pal. N. Y., vol. 3, p. 340, Low. Held. Gr.

spergenensis, Hall, 1858, (*Euomphalus spergenensis*), Trans. Alb. Inst., vol. 4, p. 19, and Bull. Am. Mus. Nat. Hist., p. 69, Warsaw Gr.

spergenensis var. *planorbiformis*, Hall, 1858, (*Euomphalus spergenensis* var.

planorbiformis, Trans. Alb. Inst., vol. 4, p. 20, and Bull. Am. Mus. Nat. Hist., p. 70, Warsaw Gr.

spirorbis, Hall, 1859, (Euomphalus spirorbis,) 13th Rep. N. Y. Mus. Nat. Hist., p. 109, Kinderhook Gr.

subplanus, Hall, 1852, (Euomphalus subplanus,) Stans. Ex. to Gt. Salt Lake, p. 414, Coal Meas.

subquadratus, see Euomphalus subquadratus.

subrugosus, see Euomphalus subrugosus.

subumbilicatus, Worthen, (in press) Geo. Sur. Ill., vol. 8, p. 142, Kaskaskia Gr.

umbilicatus, Meek & Worthen, 1860, (Euomphalus umbilicatus,) Proc. Acad. Nat. Sci. Phil., p. 462, and Geo. Sur. Ill., vol. 2, p. 362, Coal Meas.

utahensis, Hall & Whitfield, 1877, U. S. Geo. Expl., 40th parallel, vol. 4, p. 259, Waverly Gr.

valvatiformis, Shumard, 1863, Trans. St. Louis Acad. Sci., vol. 2, p. 105, Calciferous Gr.

varsoviensis, Worthen (in press) Geo. Sur. Ill., vol. 8, p. 142, Keokuk Gr.

whitneyi, see Omphalotrochus whitneyi.

STREPTAXIS, Gray, 1837, Mag. Nat. Hist., p. 484, [Ety. *streptos*, twisted; *axis*, axis.] Shell ovate or oblong; when young, sub-hemispherical, deeply umbilicated, with rapidly enlarging whorls; at length the penultimate whorl is bent toward the right and dorsal side of the axis and the umbilicules become compressed and often nearly closed; the mouth lunate; the edge slightly thickened and reflexed, and often with a single tooth on the outer side of the inner or hinder lip. Type *S. comboides*. Not a Paleozoic genus.

whitfieldi, Meek, 1871, Proc. Acad. Nat. Sci. Phil., p. 173, and Geo. Sur. Ill., vol. 5, p. 596, Coal Meas.

STROPHITES, Dawson, 1880, Am. Jour. Sci. and Arts, 3d ser., vol. 20, p. 413. [Ety. from the genus *Strophia*.] Shell resembling the modern *Strophia*, conical; apex obtuse; whorls four or more; surface covered with sharp vertical ridges, separated by spaces three times as wide. Type *S. grandævus*.

grandævus, Dawson, 1880, Am. Jour. Sci. and Arts, 3d ser., vol. 20, p. 413, Devonian.

STROPHOSTYLUS, Hall, 1859, Pal. N. Y., vol. 3, p. 303. [Ety. *strophe*, turning round; *stylos*, column.] Subglobose or ovoid globose; spire small with a large ventricose body whorl; outer lip thin, not reflected; columella twisted or spirally grooved within, not reflected; no umbilicus; aperture somewhat round, ovate or transversely broad oval. Type *S. elegans*.

andrewsi, Hall, 1859, Pal. N. Y., vol. 3, p. 472, Oriskany sandstone.

cancellatus, Meek & Worthen, 1863, Geo. Sur. Ill., vol. 3, p. 404, Oriskany sandstone.



FIG. 716.—*Strophostylus cancellatus*. B, Surface markings enlarged.

cyclostomus, Hall, 1863, Trans. Alb. Inst., vol. 4, p. 218, Niagara Gr.

cyclostomus var. *disjunctus*, Hall, 1879, 28th Rep. N. Y. Mus. Nat. Hist., p. 177, Niagara Gr.

depressus, Hall, 1859, Pal. N. Y., vol. 3, p. 306, Low. Held. Gr.

elegans, Hall, 1859, Pal. N. Y., vol. 3, p. 304, Low. Held. Gr.

expansus, Conrad, 1841, (Platyceras expansum,) Ann. Rep. N. Y., p. 55, and Pal. N. Y., vol. 3, p. 470, Oriskany sandstone.

fitchi, Hall, 1859, Pal. N. Y., vol. 3, p. 306, Low. Held. Gr.

globosus, Hall, 1859, Pal. N. Y., vol. 3, p. 305, Low. Held. Gr.

matheri, Hall, 1859, Pal. N. Y., vol. 3, p. 471, Oriskany sandstone.

obliquus, Nicholson, 1874, Rep. Pal. Ont., p. 119, Up. Held. Gr.

obtusus, Hall, 1859, Pal. N. Y., vol. 3, p. 305, Low. Held. Gr.

ovatus, Nicholson, 1874, Rep. Pal. Ont., p. 118, Up. Held. Gr.

rotundatus, Hall, 1859, Pal. N. Y., vol. 3, p. 307, Low. Held. Gr.

subglobosus, Nicholson, 1874, Rep. Pal. Ont., p. 118, Up. Held. Gr.

transversus, Hall, 1859, Pal. N. Y., vol. 3, p. 470, Oriskany sandstone.

unicus, Hall, 1862, 15th Rep. N. Y. Mus. Nat. Hist., p. 41, and Pal. N. Y., vol. 5, pt. 2, p. 30, Schoharie grit.

varians, Hall, 1876, Illust. Devonian Foss., pl. 11, and Pal. N. Y., vol. 5, pt. 2, p. 31, Up. Held. Gr.

Stylifer, Broderip, 1829, in Sowerby, Gen. Shells.

primigenia, see Macrochilina primigenia.

SUBULITES, Conrad, 1847, Pal. N. Y., vol. 1, p. 182. [Ety. *subula*, an awl.] Subulate, volutions wide, suture oblique; aperture very elongate, narrow, pointed above, but wider below. Type *S. elongatus*.

abbreviatus, Hall, 1850, 3d Rep. N. Y. Mus. Nat. Hist., p. 180, Trenton Gr.

brevis, Winchell & Marcy, 1865, Mem. Bost. Soc. Nat. Hist., vol. 1, p. 100, Niagara Gr.

calciferus, Billings, 1859, Can. Nat. & Geo., vol. 4, p. 360, Calciferous Gr.

compactus, Whiteaves, 1884, Pal. Foss. vol. 3, p. 16, Guelph Gr.



FIG. 717.—*Subulites calciferus*.

daphne, Billings, 1865, Pal. Foss., vol. 1, p. 223, Quebec Gr.



FIG. 718.—*Subulites elongatus*.

elongatus, Emmons, 1842, Geo. Rep. N. Y., p. 392, and Pal. N. Y., vol. 1, p. 182, Trenton Gr.

gracilis, S. A. Miller, 1882, Jour. Cin. Soc. Nat. Hist., vol. 5, p. 116, Niagara Gr. inflatus, Meek & Worthen, 1870, Proc. Acad. Nat. Sci. Phil., p. 47, and Geo. Sur. Ill., vol. 6, p. 495, Galena Gr.

notatus, Billings, 1866, Catal. Sil. Foss. Antic., p. 54, Anticosti Gr.

obesus, Whitfield, 1886, Bull. Am. Mus. Nat. Hist., vol. 1, p. 318, Birdseye Gr.

parvulus, Billings, 1862, Pal. Foss., vol. 1, p. 36, Black Riv. Gr.

psyche, Billings, 1865, Pal. Foss., vol. 1, p. 188, Quebec Gr.

richardsoni, Billings, 1857, Rep. of Progr., Geo. Sur. Can., p. 306, Hud. Riv. Gr.

terebriiformis, Hall & Whitfield, 1875, Ohio Pal., vol. 2, p. 141, Niagara Gr.

ventricosus, Hall, 1852, Pal. N. Y., vol. 2, p. 347, Niagara and Guelph Gr.

TRACHYDOMIA, Meek & Worthen, 1866, Geo. Sur. Ill., vol. 2, p. 364. [Ety. *trachys*, rough; *doma*, house.] In

form like *Naticopsis*, but distinguished by having the surface ornamented with regularly disposed nodes. Type *T. nodosum*.

hollidayi, Meek & Worthen, 1860, (*Naticopsis hollidayi*.) Proc. Acad. Nat. Sci. Phil., p. 463, and Geo. Sur. Ill., vol. 2, p. 367, Low. Coal Meas.

nodosum, Meek & Worthen, 1860, (*Naticopsis nodosa*.) Proc. Acad. Nat. Sci. Phil., p. 463, and Geo. Sur. Ill., vol. 2, p. 366, Low. Coal Meas.

nodulosum, Worthen, 1884, Bull. No. 2, Ill. St. Mus. Nat. Hist., p. 8, and Geo. Sur. Ill., vol. 8, p. 146, Coal Meas.

TREMANOTUS, Hall, 1868, 20th Rep. N. Y. St. Mus. Nat. Hist., p. 347. [Ety. *trema*, hole; *notos*, back.] Distinguished from *Bucania* by a single row of hollow spines upon the back of the last whorl. In casts the spines are usually broken off, and hence Carpenter argues they never had spines. Type *T. chicagoensis*.

alpheus, Hall, 1864, 10th Rep. N. Y. St. Mus. Nat. Hist. Syn. for *T. chicagoensis*.

chicagoensis, McChesney, 1860, (*Bucania chicagoensis*.) New Pal. Foss., p. 69, Niagara Gr.

trigonostoma, Hall & Whitfield, 1875, Ohio Pal., vol. 2, p. 146, Niagara Gr.

TROCHITA, Schumacher, 1817, Essai N. Syst., p. 184. [Ety. *trochus*, wheel.] Not a Palæozoic genus.

antiqua, see *Pseudophorus antiquus*.

carbonaria, Meek, 1866, Proc. Acad. Nat. Sci., p. 270, Kaskaskia Gr. Not recognized.

TROCHONEMA, Salter, 1859, Can. Org. Rem., Decade 1, p. 27. [Ety. *trochus*, a wheel; *nema*, a thread.] Turbinate, thin, of few angular whorls; strong concentric ridges, crossed by oblique lines of growth; umbilicus wide, open; inner lip thin, scarcely reflected; peritreme complete. Type *T. umbilicatum*.

beloitense, Whitfield, 1878, Ann. Rep. Geo. Sur. Wis., p. 74, and Geo. Wis., vol. 4, p. 212, Trenton Gr.

beachi Whitfield, 1878, Ann. Rep. Geo. Sur. Wis., p. 74, and Geo. Wis., vol. 4, p. 213, Trenton Gr.

emaceratum, Hall & Whitfield, 1872, 24th Rep. N. Y. Mus. Nat. Hist., p. 193, Ham. Gr.

exile, Whitfield, 1889, Bull. Am. Mus. Nat. Hist., vol. 2, p. 57, Calciferous Gr.

fatua, Hall, 1867, 20th Rep. N. Y. Mus. Nat. Hist., p. 394, Niagara Gr.

halii, Hall, 1861, (*Pleurotomaria halei*.) Geo. Sur. Wis., p. 34, Niagara Gr.

inornatum, Whiteaves, 1884, Pal. Foss., vol. 3, p. 19, Guelph Gr.

meekeanum, n. sp. Up. Held. Gr. at Marblehead, Ohio. Proposed instead of *T. tricarinarum*, Meek, 1871, Proc. Acad. Nat. Sci., p. 82, and Ohio Pal., vol. 1, p. 218, which was preoccupied.

nana, Foerste, 1885, Bull. Sci. Lab. Denison Univ., p. 94. Not properly defined.
pauper, Hall, syn. for *P. hali*.
pauper var. *ohioense*, Hall & Whitfield, 1875, Ohio Pal., vol. 2, p. 144, Niagara Gr. rectilatera, Hall & Whitfield, 1872, 24th Rep. N. Y. Mus. Nat. Hist., p. 193, Up. Held. Gr.
tricarinatum, Billings, 1859, Can. Nat. & Geo., vol. 4, p. 356, Calciferous Gr.
tricarinata, see *Trochonema meekianum*.



FIG. 719.—*Trochonema umbilicatum*.

umbilicatum, Hall, 1847, (Pleurotomaria umbilicata,) Pal. N. Y., vol. 1, p. 43, Chazy to Hud. Riv. Gr.
yandellanum, Hall & Whitfield, 1872, 24th Rep. N. Y. Mus. Nat. Hist., p. 194, Up. Held. Gr.

Trochus, Adanson, 1757, Voy. Senegal.

[Ety. *trochus*, a hoop.] Not a Palæozoic genus.

huronensis, Castelnau, 1843, Syst. Sil., p. 35. Not recognized.

missouriensis, see *Pleurotomaria missouriensis*.

TRYBLIDIUM, Lindstrom, 1880, Fragmenta Silurica, p. 15. [Ety. *trublion*, a cup.] Patelliform, obovate, acuminate anteriorly, enlarged posteriorly; muscular scars in six disconnected pairs arranged in an oblong circle open toward the front. Type *T. reticulatum*.

acutum, Whitfield, 1889, Bull. Am. Mus. Nat. Hist., vol. 2, p. 45, Calciferous Gr.

canadense, Whiteaves, 1884, Pal. Foss., vol. 3, p. 31, Guelph Gr.

conicum, Whitfield, 1886, Bull. Am. Mus. Nat. Hist., vol. 1, p. 306, Birdseye Gr.

erato, Billings, 1862, (Metoptoma erato,) Pal. Foss., vol. 1, p. 39, Black Riv. Gr.

eubule, Billings, 1862, (Metoptoma eubule,) Pal. Foss., vol. 1, p. 38, Calciferous and Black Riv. Gr.

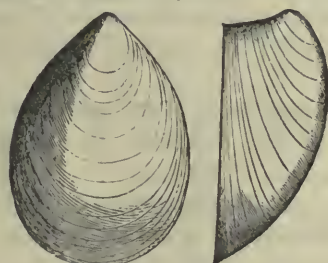


FIG. 720.—*Tryblidium nycteis*.

hyrie, Billings, 1862, (Metoptoma hyrie,) Pal. Foss., vol. 1, p. 87, Quebec Gr.

niobe, Billings, 1862, (Metoptoma niobe,) Pal. Foss., vol. 1, p. 37, Calciferous Gr.

nycteis, Billings, 1862, (Metoptoma nycteis,) Pal. Foss., vol. 1, p. 38, Calciferous Gr.

ovale, Whitfield, 1886, Bull. Am. Mus. Nat. Hist., vol. 1, p. 305, Birdseye Gr.

ovatum, Whitfield, 1886, Bull. Am. Mus. Nat. Hist., vol. 1, p. 305, Birdseye Gr.

pileolum, Whitfield, 1889, Bull. Am. Mus. Nat. Hist., vol. 2, p. 46, Calciferous Gr.

simplex, Billings, 1865, (Metoptoma simplex,) Pal. Foss., vol. 1, p. 346, Calciferous Gr.

TURBO, Klein, 1753, Tent. Meth. Ostr. [Ety. *turbo*, top.] Shell thick, ovate; body whorl rounded, ventricose; spire small, of several convex whorls, pointed; surface spirally grooved or nodulated; aperture large, nearly circular, slightly produced and broadly rounded in front, more or less modified by the preceding whorl; outer and inner lips thin; operculum thick, shelly, rugged without, flattened and spirally sulcated within. Type *T. marmoratus*. Not an American Palæozoic genus. The species left here is, for want of material, to refer them where they belong.

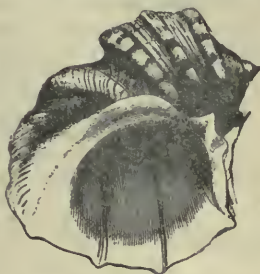


FIG. 721.—*Turbo marmoratus*.

bicarinatus, Troost, 1840. Not defined.
dilucula, see *Holopea dilucula*.

guadalupensis, Shumard, 1859, Trans. St. Louis Acad. Sci., vol. 1, p. 398, Permian Gr.

huronensis, Castelnau, 1843. Not recognized.

lineatus, see *Pleurotomaria lineata*.

obesus, Shumard, 1858, Trans. St. Louis Acad. Sci., vol. 1, p. 202, Up. Coal Meas.

(?) *obscura*, see *Holopea obscura*.

shumardi, see *Pleurotomaria shumardi*.

tabulata, see *Pleurotomaria tabulata*.

tennesseensis, see *Cycloptoma tennesseense*.

texasianus, Shumard, 1859, Trans. St. Louis Acad. Sci., vol. 1, p. 400, Coal Meas.

Turbonilla, Leach, 1826, Risso Eur. Merid. 4. [Ety. di minutive of *Turbo*, a genus.] Not a Palæozoic genus.

swallowana, see *Aclisina swallowana*.

TURRITELLA, Lamarck, 1801, Syst. An. sans Vert., p. 89. Not a Palæozoic genus. Type *T. imbricata*.



FIG. 722.—*Turritella imbricata*.

schohariensis, Castelnau, 1843, Syst. Sil., p. 35. Not recognized.
stevensana, Meek & Worthen, 1866, Geo. Sur. Ill., vol. 2, p. 382, Up. Coal Meas.



FIG. 723.—*Zaptychius carbonarius*.

Type *Z. carbonarius*.

Xenophora, Fischer, 1806, Museum Demidovianum, p. 213. Not an American Palæozoic genus.

antiqua, see *Pseudophorus antiquus*.

ZAPTYSCHIUS, Walcott, 1884, Monogr. U. S. Geo. Sur., vol. 8, p. 263. Shell minute, elongate; aperture large, oblong, nearly vertical; outer lip thin; collumellar lip reflected, plicated; surface marked by slightly oblique vertical striæ.

carbonarius, Walcott, 1884, Monogr. U. S. Geo. Sur., vol. 8, p. 263, Subcarboniferous.



FIG. 724.—*Zonites priscus*.

ZONITES, Montfort, 1810, Conch. Syst., vol. 2, p. 282. [Ety. *zone*, belt.] A coiled shell, closely resembling a *Helix*, having an open umbilicus; the surface is transversely sculptured. Type *Z. algireus*.

priscus, Carpenter, 1867, Quar. Jour. Geo. Soc., vol. 23, p. 331, and *Acadian Geol.*, p. 385, Coal Meas.

CLASS CEPHALOPODA.

[Ety. *kephale*, head; *pous*, foot.]

THE animals of this class are all marine, and they reach a higher state of animal development than any other marine group among the Mollusca. Some of them have a rudimentary, cartilaginous, cephalic skeleton, which indicates superiority over other marine Mollusca. The locomotive organs consist of arms surrounding the head, furnished with sucking cups that take a firm hold on other objects. Many have fins, and all can propel themselves by the forcible expulsion of water from the respiratory chamber. They swim rapidly, creep on the bottom of the sea, and are very predatory in their habits. The body is short, thick, and symmetrical, with branchiæ on both sides.

The Palæozoic fossils of this Class belong to the Order Tetrabranchiata (four-gilled), which is represented in tropical seas by the *Nautilus*. The shells are straight, as in the family *Orthoceratidæ*; curved, as in *Cyrtoceratidæ*; discoid, as in the *Gyroceratidæ* and *Trocholitidæ*; spiral, as in the *Trochoceratidæ*; involute, as in the *Nautilidæ*; or involute and having lobed sutures, as in the *Goniatitidæ*. Internally the shell is divided into numerous chambers by partitions, or septa, the animal inhabiting the last chamber, and retaining connection through the preceding chambers by a tube, or siphuncle, but having no connection with the interior of the several chambers after having cut itself off by the secretion of the shelly septa. The outlines of the septa are called sutures, and in *Goniatites* the elevations of the folded sutures are called saddles, and the intervening depressions lobes.

Each septum began to form at the circumference of the shell, and slowly approached the siphuncle as the animal moved forward in the body chamber. The siphuncle, being a point of muscular attachment, was not vacated by the animal between any two septa until the anterior one had been firmly closed by attachment to the siphuncle, forming a chamber of support.

The fossil shells are very thin in proportion to their size. They are not porous, like those of the Brachiopoda; nor horny, like the Crustacea; nor of the same composition as the Gasteropoda or Lamellibranchiata. Generally the exterior shell is destroyed, even when the associated shells of other classes are well preserved. Sometimes the shell appears as if it had melted and run together, or run down upon the siphuncle. Such molecular change will occur in one part of a specimen while another part is unchanged. The general form of the shell is of family importance. The shape of the siphuncle and the external markings are of generic importance. We recognize the following families:

FAMILY ASCOCERATIDÆ.—Ascoceras.

FAMILY CYRTOCERATIDÆ.—Cyrtoceras, Cyrtocerina, Oncoceras.

FAMILY DISCOSORIDÆ.—Discosorus.

FAMILY ENDOCERATIDÆ.—Cameroceras, Colpoceras, Endoceras.

FAMILY GOMPHOCERATIDÆ.—Gomphoceras.

FAMILY GONIATITIDÆ.—Goniatites.

FAMILY GYROCERATIDÆ.—Gyroceras.

FAMILY LITUITIDÆ.—Lituites.

FAMILY NAUTILIDÆ.—Discites, Nautilus, Pteronutilus, Solenochilus, Temnochilus, Trematodiscus.

FAMILY ORTHOCERATIDÆ.—Actinoceras, Bactrites, Gonioceras, Huronia, Ormoceras, Orthoceras, Trematoceras.

FAMILY PHRAGMOCERATIDÆ.—Phragmoceras, Streptoceras.

FAMILY PILOCERATIDÆ.—Piloceras.

FAMILY TROCHOCERATIDÆ.—Trochoceras.

FAMILY TROCHOLITIDÆ.—Trocholites.

FAMILY UNCERTAIN.—Petalichnus, Særichnites, Teratichnus, Trachomatichnus.

ACTINOCERAS, Bronn, 1837, *Lethaea Geognostica*, p. 97. [Ety. *aktin*, ray; *keras*, horn.] Exterior like *Orthoceras*; siphuncle very large, inflated between the chambers, and connected with a slender central tube by radiating plates. Type *A. bigsbyi*, *A. richardsoni*, and *A. lyoni*. The genus was established before the species were defined.

beaudanti, Castelnau, 1843, *Système Silurien*, p. 31. Not recognized.

beaumonti, Castelnau, 1843, *Système Silurien*, p. 32. Not recognized.

bigsbyi, Stokes, 1840, *Trans. Geo. Soc.*, 2d series, vol. 5, p. 707, Chazy Gr.

blainvillei, Castelnau, 1843, *Système Silurien*, p. 31. Not recognized.

cordieri, Castelnau, 1843, *Système Silurien*, p. 31. Not recognized.

deshayesi, Castelnau, 1843, *Système Silurien*, p. 32. Not recognized.

dufresnoyi, Castelnau, 1843, *Système Silurien*, p. 32. Not recognized.

inops, Dawson, 1868, *Acad. Geol.* p. 314, Carb.

lyoni, Stokes, 1840, *Trans. Geol. Soc.*, vol. 5, p. 707, Black Riv. Gr.

richardsoni, Stokes, 1840, *Trans. Geol. Soc.*, vol. 5, p. 708, Black Riv. Gr.

simmsi, Stokes, 1840, *Trans. Geol. Soc.*, 2d series, vol. 5, p. 708, Sil.

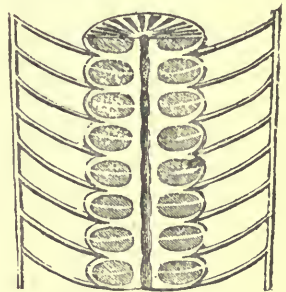


FIG. 725.—*Actinoceras richardsoni*.

richardsoni, Stokes, 1840, *Trans. Geol. Soc.*, 2d series, vol. 5, p. 708, Black Riv. Gr.

simmsi, Stokes, 1840, *Trans. Geol. Soc.*, 2d series, vol. 5, p. 708, Sil.

Ammonites bellicosus, Morton, 1836, Am. Jour. Sci. and Arts, vol. 29, Coal Meas. Not recognized.

colubrellus, see *Goniatites colubrellus*.
hildrethi, see *Goniatites hildrethi*.

ASCOCERAS, Barrande, 1855, Bull. de la Soc. Geol. de France, vol. 12, 2d ser., p. 157. [Ety. *askos*, leather bottle; *keras*, horn.] Chambers behind the living one short and rapidly tapering; living chamber long and constricted near the aperture; aperture somewhat T-shaped. Type A. *bohemicum*.

anticostiense, Billings, 1866, Catal. Sil. Foss. Antic., p. 60, and Pal. Foss., vol. 1, p. 164, fig. 148b, Anticosti Gr.

canadense, Billings, 1857, Rep. of Progr. Geo. Sur. Can., p. 310, Hud. Riv. Gr. This species is made the type of the genus *Billingsites* by Hyatt.

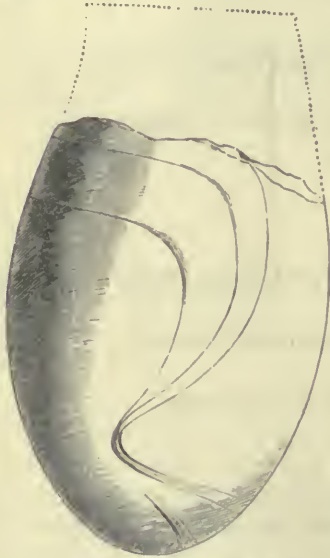


FIG. 726.—*Ascoceras canadense*.

newberryi, Billings, 1862, Pal. Foss., vol. 1, p. 163, Hud. Riv. and Anticosti Grs. southwelli, Worthen, (in press.) Geo. Sur. Ill., vol. 8, p. 151, Niagara Gr.

townsendi, Whiteaves, 1884, Pal. Foss., vol. 3, p. 41, Guelph Gr.

BACTRITES, Sandberger, 1841, Leonh. u. Bronn's Jahrb., p. 240. [Ety. *baktron*, staff.] Shell long, straight, gradually tapering, many-chambered; sutures curve abruptly backward over the siphuncle, forming "the dorsal lobe" similar to that of a *Goniatites*. Type B. *carinatus*.

clavus, Hall, 1879, Pal. N. Y., vol. 5, pt. 2, p. 316, Ham. Gr.

CAMEROCERAS, Conrad, 1842, Jour. Acad. Nat. Sci. Phil., vol. 8, p. 267. [Ety. *kamara*, chamber; *keras*, horn.] Shell straight, and in form like *Endoceras*; siphuncle

marginal, and obliquely annulated at the junction of the septa. Type C. *trentonense*.

trentonense, Conrad, 1842, Jour. Acad. Nat. Sci. Phil., vol. 8, p. 267, and Pal. N. Y., vol. 1, p. 221, Trenton Gr.

COLPOCERAS, Hall, 1850, 3d Rep. N. Y. Mus. Nat. Hist., p. 181.

[Ety. *kolpos*, furrow; *keras*, horn.] Distinguished from *Orthoceras* by the oblique septa, arched upon the dorsal side, and bending down in a deep sinus on the ventral side, and strongly arching toward the mouth. Type C. *virgatum*.

arcuatum, James, a poorly defined siphuncle of an *Endoceras*.

clarkii, Wetherby, 1881, Jour. Cin. Soc. Nat. Hist., vol. 4, p. 77, Trenton Gr.

virgatum, Hall, 1850, 3d Rep. N. Y. Mus. Nat. Hist., p. 182, Birdseye and Black Riv. Grs.

Clymenia, Munster, 1839. [Ety. mythological name.]

complanata, see *Goniatites complanatus*.
erato, see *Goniatites erato*.

Coniites, Schlothheim, 1820, Petrefaktenkunde, etc. [Ety. *konos*, cone, *lithos*, stone.]

capricornulus, Troost, 1840, 5th Geo. Rep. Tenn. Not satisfactorily defined.

Conotubularia, Troost, syn. for *Orthoceras*.

brongniarti, see *Orthoceras brongniarti*.

cuvieri, see *Orthoceras cuvieri*.

defrancii, see *Orthoceras defrancii*.

goldfussi, see *Orthoceras goldfussi*.

Coniites, Cozzens, 1848. Not satisfactorily defined.

angulosum, Cozzens, 1848. Not satisfactorily defined. It may be a plant.

Cryptoceras, D'Orbigny, 1850. [Ety. *kryptos*, concealed; *keras*, horn.] This name was preoccupied by Latreille for a genus of insects, and had been previously used by Barrande for a genus of Cephalopods.

capax, see *Solenochilus capax*.

CYRTOCERAS, Goldfuss, 1832, in De la Beche's Handbuch der Geognosie bearbeitet von v. Deschen, p. 536. [Ety. *kurtos*, curved; *keras*, horn.] Shell long, conical, gently curved, aperture sometimes contracted; siphuncle straight or expanded between the septa, and variable in position, but usually at the outer edge.

absens, see *Gomphoceras absens*.



FIG. 727.—*Colpoceras clarkii*.

acinacellum, Whitfield, 1886, Bull. Am. Mus. Nat. Hist., vol. 1, p. 327, Birdseye Gr.

æmulum, Hall, 1879, Pal. N. Y., vol. 5, pt. 2, p. 371, Up. Held. Gr.

alethes, Billings, 1865, Pal. Foss., vol. 1, p. 193, Quebec Gr.

alternatum, Hall, 1879, Pal. N. Y., vol. 5, pt. 2, p. 365, Marcellus Shale. Proposed instead of *C. undulatum* of Hall.

ammon, Billings, 1861, Can. Jour., vol. 6, p. 361, Corniferous limestone.

amœnum, S. A. Miller, 1878, Jour. Cin. Soc. Nat. Hist., vol. 1, p. 105, Hud. Riv. Gr.

amplicorne, Hall, 1867, 20th Rep. N. Y. Mus. Nat. Hist., p. 358, syn for *C. hercules*.

annulatum, Hall, 1847. This name was preoccupied by Goldfuss in 1832, see *C. subannulatum*.

arcticameratum, Hall, 1852, Pal. N. Y., vol. 2, p. 349, Guelph Gr.

arcuatum, Hall, 1847, Pal. N. Y., vol. 1, p. 196. The name was preoccupied by Steininger in 1830, see *C. subarcuatum*.

aristides, Billings, 1865, Pal. Foss., vol. 1, p. 316, Quebec Gr.

ashmanni, n. sp. Shell small, gently curved; section subelliptical, becoming subcircular near the point, the dorsal side a little less convex, than the ventral; siphuncle near the dorsal side; surface longitudinally furrowed and finely sculptured transversely, the furrows and transverse lines most distinct on the ventral side; there are



FIG. 728.—*Cyrtoceras ashmanni*. The two section views are natural size.

eight chambers in the specimen figured, which is enlarged one-half diameter; body chamber unknown. Collected by Mr. George Ashmann, among the minute fossils at Spergen Hill, Indiana, Warsaw Gr.

and is in the collection of Charles Faber. *beekmanense*, Whitfield, 1889, Bull. Am. Mus. Nat. Hist., vol. 2, p. 57, Calciferous Gr.

bannisteri, see *Trochoceras bannisteri*.

belus, Billings, 1861, Can. Jour., vol. 6, p. 361, Corniferous Gr.

boycei, Whitfield, 1886, Bull. Am. Mus. Nat. Hist., vol. 1, p. 326, Birdseye Gr.

billingsi, Salter, 1859, Can. Org. Rem., Decade 1, p. 33, Chazy or Black Riv. Grs.

bondi, Safford, 1869, Geo. of Tenn., p. 290, Nashville Gr.

brevicornis, Hall, 1867, 20th Rep. N. Y. Mus. Nat. Hist., p. 407, Niagara Gr.

camurum, Hall, 1847, Pal. N. Y., vol. 1, p. 196, Trenton Gr.

cancellatum, Hall, 1852, Pal. N. Y., vol. 2, p. 290. The name was preoccupied by Roemer in 1844. See *C. subcancellatum*.

carrollense, Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 496, Galena Gr.

cessator, Hall & Whitfield, 1877, U. S. Expl. Exped. 40th parallel, vol. 4, p. 278, Coal Meas.

citum, Hall, 1879, Pal. N. Y., vol. 5, p. 372, Up. Held. Gr.

clavatum, see *Gomphoceras clavatum*.

clitus, Billings, 1866, Catal. Sil. Foss. Antic., p. 85, Niagara Gr.

confertissimum, Whitfield, 1886, Bull. Am. Mus. Nat. Hist., vol. 1, p. 327, Birdseye Gr.

conicum, Owen, 1840, Rep. on Min. Lands, p. 70, Up. Magnesian Gr.

conoidale, Wetherby, 1881, Jour. Cin. Soc. Nat. Hist., vol. 4, p. 78, Hud. Riv. Gr.

constrictotriatum, Hall, 1847, Pal. N. Y., vol. 1, p. 195, Trenton Gr.

corniculum, Hall, 1862, Geo. Rep. Wis. The name was preoccupied by Barrende in 1848, and again by Eichwald in 1860, see *C. tenuistriatum*.

corydon, Billings, 1866, Catal. Sil. Foss. Antic., p. 85, Niagara Gr.

cretaceum, Whitfield, 1882, Ann. N. Y. Acad. Sci., vol. 2, p. 209, Up. Held. Gr.

curtum, Meek & Worthen, 1860, Proc. Acad. Nat. Sci. Phil., p. 468, and Geo. Sur. Ill., vol. 2, p. 388, Up. Coal Meas.

Was this name preoccupied by Eichwald?

dactyloides, Dwight, 1884, Am. Jour. Sci. and Arts, 3d ser., vol. 27, p. 255, Calciferous Gr.

dardanus, Hall, 1861, Rep. of Progr. Geo. Sur. of Wis., p. 43, Niagara Gr.

densum, Hall, 1879, Pal. N. Y., vol. 5, pt. 2, p. 363, Ham. Gr.

dictys, Billings, 1865, Pal. Foss., vol. 1, p. 192, Quebec Gr.

dictyum, White, 1876, Proc. Acad. Nat. Sci., p. 33, Devonian.

dilatatum, Meek & Worthen, 1860, Proc. Acad. Nat. Sci. Phil., p. 468, and Geo. Sur. Ill., vol. 2, p. 389, Up. Coal Meas.

dorsatum, Swallow, 1858, Trans. St. Louis Acad. Sci., vol. 1, p. 197, Permian Gr.

eugenium, Hall, 1862, 15th Rep. N. Y. Mus. Nat. Hist., p. 70, and Pal. N. Y., vol. 5, pt. 2, p. 369, Schoharie grit.

eugium, Hall, 1861, Rep. of Progr. Wis., p. 40, Chazy and Black Riv. Grs.

exiguum, Billings, 1860, Can. Nat. and Geo., vol. 5, p. 172, Trenton Gr. This is made the type of the genus *Climoceras* by Hyatt.

faberi, James, 1886, Jour. Cin. Soc. Nat. Hist., vol. 8, p. 246, Hud. Riv. Gr.

falx, Billings, 1857, Rep. of Progr. Geo. Sur. Can., p. 314, and Can. Org. Rem., Decade 1, p. 32, Black Riv. and Trenton Grs.

flosum, Emmons, 1842, Nat. Hist. N. Y., vol. 4, p. 392, Trenton Gr.

formosum, Hall, 1879, Pal. N. Y., vol. 5, pt. 2, p. 362, Ham. Gr.

fosteri, Hall, 1861, Rep. of Progr. Geo. Sur. Wis., p. 41, Niagara Gr.

fragile, Billings, 1866, Catal. Sil. Foss. Antic., p. 59, Anticosti Gr.

gibbosum, Hall, 1876, *Illust. Devonian Foss.*, syn. for *Gomphoceras oviforme giganteum*, McChesney, Jan. 1860, *New Pal. Foss.*, Niagara Gr. In 1861 McChesney referred this species to the genus *Lituites*, and proposed for it the name *Lituites cancellatus*. Prof. Hall, in the meantime, described it as *Lituites occidentalis*. It is now referred to the genus *Nautilus*, and as both the earlier names were preoccupied, McChesney's name *cancellatus* has precedence.

hallanum, D'Orbigny, 1850, *Prodrome de Pal.*, tome 1, p. 1, Trenton Gr. Proposed instead of *C. lamellosum*, Hall, 1847, which was preoccupied. Hyatt founded his genus *Zitteloceras* on this species.

kirbyi, Whitfield, 1889, *Bull. Am. Mus. Nat. Hist.*, vol. 2, p. 57, Calciferous Gr.

lamellosum, Hall, 1847, *Pal. N. Y.*, vol. 1, p. 193. The name was preoccupied by d'Archiac & Verneuil in 1842. See *C. hallanum*.

laterale, Hall, 1867, 20th Rep. N. Y. Mus. *Nat. Hist.*, p. 407, Niagara Gr.

ligarius, Billings, 1865, *Pal. Foss.*, vol. 1 p. 176, Hud. Riv. Gr.

liratum, Hall, 1862, 15th Rep. N. Y. Mus. *Nat. Hist.*, p. 72, Ham. Gr.

loculosum, Hall, 1861, Rep. of Progr. Wis., p. 42, Trenton Gr.

lucillus, Hall, 1867, 20th Rep. N. Y. Mus. *Nat. Hist.*, p. 406, Niagara Gr.

lysander, Billings, 1862, *Pal. Foss.*, vol. 1, p. 161, Hud. Riv. Gr.

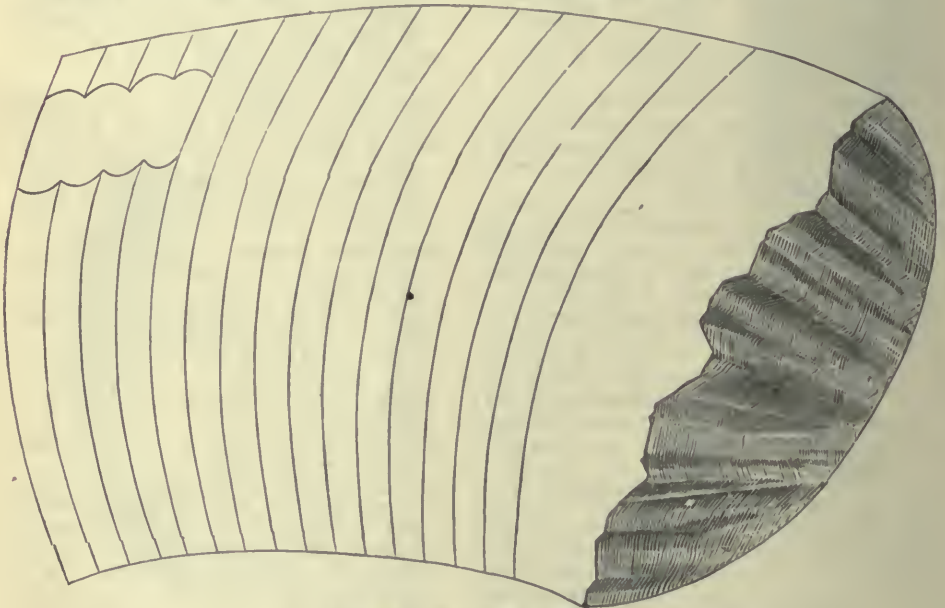


FIG. 729.—*Cyrtoceras magister*.

hector, Hall, 1879, *Pal. N. Y.*, vol. 5, pt. 2, p. 364, Up. Chemung Gr.

hercules, Winchell & Marcy, 1865, (*Lituites hercules*.) *M. m. Bost. Soc. Nat. Hist.*, p. 102, Niagara Gr.

hertzeri, see *Gomphoceras hertzeri*.

huronense, Billings, 1865, *Pal. Foss.*, vol. 1, p. 176, Black Riv. or Trenton Grs.

infundibulum, Whitfield, 1880, *Ann. Rep. Geo. Sur. Wis.*, p. 66, and *Geo. Wis.*, vol. 4, p. 300, Niagara Gr.

irregularare, Wetherby, 1881, *Jour. Cin. Soc. Nat. Hist.*, vol. 4, p. 79, Hud. Riv. Gr.

isidorus, Billings, 1865, *Pal. Foss.*, vol. 1, p. 175, Black Riv. or Trenton Gr.

janus, see *Streptoceras janus*.

jason, see *Gyroceras jason*.

juvenale, Billings, 1865, *Pal. Foss.*, vol. 1, pp. 177, 420, Trenton Gr.

macrostomum, Hall 1847, *Pal. N. Y.*, vol. 1, p. 194, Black Riv. and Trenton Grs.

magister, S. A. Miller, 1875, *Cin. Quar. Jour. of Sci.*, vol. 2, pp. 132, 284, Hud. Riv. Gr.

marginale, Conrad, 1843, *Proc. Acad. Nat. Sci.*, p. 334. The name was preoccupied by Phillips in 1841, and the species is poorly defined.

markoi, Castelnau, 1843, *Système Silurien*, p. 30, Trenton Gr. Not recognized.

massiense, Safford, 1869, *Geo. of Tenn.*, p. 290, Nashville Gr.

matheri, see *Gyroceras matheri*.

maccoyi, Billings, 1859, *Can. Nat. and Geo.*, vol. 4, p. 467 Chazy Gr.

maximum, see *Nautilus maximus*,

mercurius, see *Cyrtoceras mercurius*.

metellus, Billings, 1865, Pal. Foss., vol. 1, p. 191, Quebec Gr.
 metula, Hall, 1862, 15th Rep. N. Y. Mus. Nat. Hist., p. 72, and Illust. Devon. Foss., pl. 46, Up. Held. Gr.
 microscopicum, Dwight, 1884, Am. Jour. Sci. and Arts, 3d ser., vol. 27, p. 256, Calciferous Gr.
 missisquoi, Billings, 1865, Pal. Foss., vol. 1, p. 314, (Orthoceras missisquoi,) Quebec Gr.
 morsum, Hall, 1862, 15th Rep. N. Y. Mus. Nat. Hist., p. 71, and Pal. N. Y., vol. 5, pt. 2, p. 367, Up. Held. Gr.
 multicameratum, Hall, 1847, Pal. N. Y., vol. 1, p. 195, Black Riv. and Trenton Gr.
 myrice, Hall & Whitfield, 1875, Ohio Pal., vol. 2, p. 149, Niagara Gr.
 neleus, Hall, 1861, Rep. of Progr. Wis., p. 40, Chazy and Black Riv. Grs.
 nevadense, Walcott, 1885, Monogr. U. S. Geo. Sur., vol. 8, p. 203, Devonian.
 obscurum, S. A. Miller, changed to magister because obscurum was preoccupied.
 ohioense, Meek, 1871, Proc. Acad. Nat. Sci. Phil., p. 86, and Ohio Pal., vol. 1, p. 229, Up. Held. Gr.
 olenus, Hall, 1877, syn. for Trochoceras orion.
 opinum, Keyes, 1888, Proc. Acad. Nat. Sci. Phil., pl. xii., fig. 5, Ham. Gr.
 orcas, see Oncoceras orcas.
 orestes, Billings, 1865, Pal. Foss., vol. 1, p. 177, Niagara Gr.
 orion, see Trochoceras orion.
 orodes, Billings, 1862, Pal. Foss., vol. 1, p. 162, Guelph Gr.
 planidorsatum, Whitfield, 1880, Ann. Rep. Geo. Sur. Wis., p. 57, and Geo. Wis., vol. 4, p. 231, Trenton Gr.
 postumius, Billings, 1865, Pal. Foss., vol. 1, p. 178, Hud. Riv. Gr.
 pusillum, Hall, 1867, 20th Rep. N. Y. Mus. Nat. Hist., p. 407, Niagara Gr.
 raei, Whitfield, 1889, Bull. Am. Mus. Nat. Hist., vol. 2, p. 58, Calciferous Gr.
 rectum, Whitfield, 1880, Ann. Rep. Geo. Sur. Wis., p. 85, and Geo. Wis., vol. 4, p. 319, Niagara Gr.
 regulare, Billings, 1857, Rep. of Progr. Geo. Sur. Can., p. 314, Black Riv. and Trenton Grs.
 reversum, Spencer, 1884, Bull. No. 1, Mus. Univ. St. Mo., p. 60, Niagara Gr.
 rigidum, Hall, 1867, 20th Rep. N. Y. Mus. Nat. Hist., p. 408, Niagara Gr.
 rockfordense, Winchell, 1865, Proc. Acad. Nat. Sci., p. 132, Kinderhook Gr.
 septoris, see Gomphoceras septore.
 simplex, Billings, 1857, Rep. of Progr. Geo. Sur. Can., p. 313, Black Riv. and Trenton Grs.
 sinuatum, Billings, 1857, Rep. of Progr. Geo. Sur. Can., p. 314, Black Riv. Gr.
 spinosum, see Gyroceras spinosum.
 stonense, Safford, 1869, Geo. of Tenn., p. 290, Trenton Gr.

subannulatum, D'Orbigny, 1850, Prodr. de Pal., t. 1, p. 1, Black Riv. and Trenton Grs. Proposed instead of C. annulatum, Hall, 1847, which was preoccupied.
 subarcuatum, D'Orbigny, 1850, Prodr. de Pal., t. 1, p. 2, Trenton Gr. Proposed instead of C. arcuatum, Hall, 1847, which was preoccupied.
 subcancellatum, Hall, 1877, 1st Ed. Am. Pal. Foss., p. 243, Niagara Gr. Proposed instead of C. cancellatum, Hall, 1852, which was preoccupied.
 subcompressum, Beecher, 1888, Pal. N. Y., vol. 7, p. 35, Clinton Gr.
 subrectum, Hall, 1859, Pal. N. Y., vol. 3, p. 342, Low. Held. Gr.
 subturbatum, Billings, 1857, Rep. of Progr. Geo. Sur. Can., p. 312, Chazy and Black Riv. Grs.
 surgens, Barrande, 1870, Syst. Sil. de Boh., vol. 2, p. viii, pl. 431, Quebec Gr.
 syphax, Billings, 1865, Pal. Foss., vol. 1, p. 194, Quebec Gr. This species is the type of Eremoceras, by Hyatt.
 tenuiseptum, Faber, 1886, Jour. Cin. Soc. Nat. Hist., vol. 9, p. 18, Hud. Riv. Gr.
 tenuistriatum, Hall, 1877, 1st Ed. Am. Pal. Foss., p. 243. Proposed instead of C. corniculum, Hall, 1862, which was preoccupied. Trenton Gr.
 tessellatum, DeKoninck. Not American.
 transversum, see Gyroceras transversum.
 trentonense, Emmons, 1842, (Orthoceras trentonensis,) Geo. Rep. N. Y., p. 396, Trenton Gr.
 trivoli, see Gyroceras trivolve.
 typicum, see Cyrtocera typica.
 undulatum, Hall, 1876, see C. alternatum.
 undulatum, Vanuxem, see Gyroceras undulatum.
 unicorn, Winchell, 1863, Proc. Acad. Nat. Sci., p. 23, Marshall Gr.
 vallandighami, S. A. Miller, 1874, Cin. Quar. Jour. Sci., vol. 1, p. 232, Hud. Riv. Gr.
 vassarinum, Dwight, 1884, Am. Jour. Sci. and Arts., 3d ser., vol. 27, p. 254, Calciferous Gr.



FIG. 730.—Cyrtoceras vallandighami.

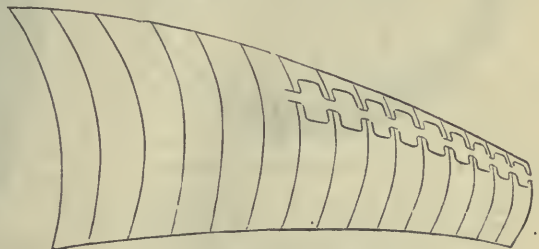


FIG. 731.—Cyrtoceras ventricosum.

ventricosum, S. A. Miller, 1875, Cin. Quar. Jour. Sci., vol. 2, p. 131, Hud. Riv. Gr.

whitneyi, Hall 1861, Rep. of Progr. Wis., p. 39, Hud. Riv. Gr.
 CYRTOCERINA, Billings, 1865, Pal. Foss., vol. 1, p. 178. [Ety. from the termination *inus*, signifying resemblance to *Cyrtoceras*.] In form like a short, rapidly tapering *Cyrtoceras*, and having a large siphuncle on the concave side.



FIG. 732.—*Cyrtocerina typica*. a, Dorsal view, showing cavity of siphuncle; b, outline, side view.

typica, Billings, 1865, Pal. Foss., vol. 1, p. 194, Quebec Gr.
typica, Billings, 1865, Pal. Foss., vol. 1, p. 178, Black Riv. Gr.
Diploceras, Conrad, 1842, Jour. Acad. Nat. Sci., vol. 8, p. 267, [Ety. *diploos*, double; *keras*, horn.] Founded upon the fragment of an *Endoceras*, and very poorly defined.
vanuxemi, see *Endoceras vanuxemi*.
 DISCITES, DeHaan, 1825, Mongr. Ammon., etc., p. 31. [Ety. *diskos*, quoit.] Discoid; umbilicus wide; whorls quadrangular, sides flattened, and dorsum gibbous; longitudinally striated and sometimes lined transversely; siphon above the center; living chamber from one-fourth to three-fourths of a whorl in length; aperture with deep ventral sinus. Type *D. costellatus*.
ammonis, Hall, 1879, Pal. N. Y., vol. 5, pt. 2, p. 425, Up. Held. Gr.
disciformis, Meek & Worthen, 1865, Proc. Acad. Nat. Sci. Phil., p. 261, and Geo. Sur. Ill., vol. 5, p. 522, Keokuk Gr.
hartti, Dawson, 1868, (*Gyroceras hartti*), Acadian Geol., p. 311, Subcarboniferous. Made the type of Hyatt's genus, *Stroboceras*.
highlandensis, Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 531, Coal Meas.
inopinatus, Hall, 1879, Pal. N. Y., vol. 5, pt. 2, p. 426, Up. Held. Gr.



FIG. 733.—*Discites marcellensis*.

marcellensis, Vanuxem, 1842, (*Goniatites marcellensis*), Geo. Sur. 3d Dist. N. Y., p. 146, Marcellus Shale. The type of Hyatt's genus *Centroceras*.
ornatus, syn. for *D. marcellensis*.
toddanus, Gurley, 1883, New Carb. Foss., p. 7. Publication invalid.

tuberculatus, Owen, 1852, Geo. Sur. Wis., Iowa, and Minn., p. 581, Subcarb.
 DISCOSORUS, Hall, 1852, Pal. N. Y., vol. 2, p. 99. [Ety. *diskos*, quoit; *soros*, heap or pile.] Composed of a series of disks, gradually diminishing in size from the body chamber; outer edes rounded; joining surfaces flat. Type *D. conoideus*.
conoideus, Hall, 1852, Pal. N. Y., vol. 2, p. 99, Clinton and Niagara Gr.
 ENDOCERAS, Hall, 1847, Pal. N. Y., vol. 1, p. 58. [Ety. *endos*, within; *keras*, horn.] An elongated conical shell, resembling an *Orthoceras*, and possessed of one or more smooth siphuncles, which do not expand in passing through the chambers. Type *E. annulatum*.
angusticameratum, Hall, 1847, Pal. N. Y., vol. 1, p. 218, Trenton Gr.
annulatum, Hall, 1847, Pal. N. Y., vol. 1, p. 207, Trenton Gr.
approximatum, Hall, 1847, Pal. N. Y., vol. 1, p. 219, Trenton Gr.
arctiventrum, Hall, 1847, Pal. N. Y., vol. 1, p. 217, Trenton Gr.
atlanticum, Barrande, 1870, Syst. Sil. de Boh., vol. 2, p. viii, pl. 430, Quebec Gr.
bristolense, S. A. Miller, 1882, Jour. Cin. Soc. Nat. Hist., vol. 5, p. 85, Hud. Riv. Gr.
distans, Hall, 1847, Pal. N. Y., vol. 1, p. 220, Trenton Gr.
duplicatum, Hall, 1847, Pal. N. Y., vol. 1, p. 219, Trenton Gr.
egani, S. A. Miller, 1882, Jour. Cin. Soc. Nat. Hist., vol. 5, p. 84, Hud. Riv. Gr.

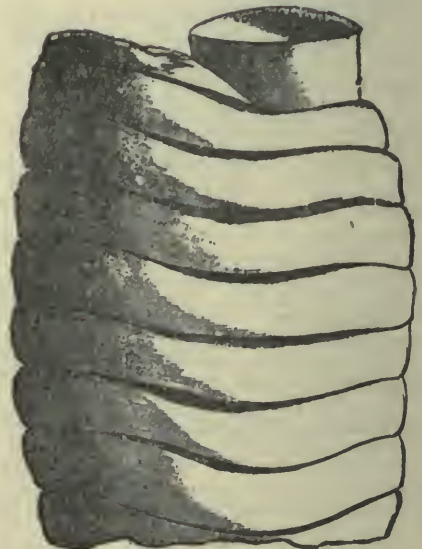


FIG. 734.—*Endoceras longissimum*.

gemellarum, Hall, 1847, Pal. N. Y., vol. 1, p. 60, Black Riv. Gr.
inequabile, S. A. Miller, 1882, Jour. Cin. Soc. Nat. Hist., vol. 5, p. 86, Hud. Riv. Gr.

insulare, Barrande, 1870, Syst. Sil. de Boh., vol. 2, p. viii, pl. 430-431, Quebec Gr.
 lativentrum, Hall, 1850, 3d Rep. N. Y. Mus. Nat. Hist., p. 181, Trenton Gr.
 longissimum, Hall, 1847, Pal. N. Y., vol. 1, p. 59, Black Riv. and Trenton Gr.
 magniventrum, Hall, 1847, Pal. N. Y., vol. 1, p. 218, Trenton Gr.
 marcoui, Barrande, 1869, Syst. Sil. de Boh., 2d ser., 4me, Quebec Gr.
 multitubulatum, Hall, 1847, Pal. N. Y., vol. 1, p. 59, Black Riv. and Trenton Grs.
 The type of Hyatt's genus *Vaginoceras*.
 proteiforme, Hall, 1847, Pal. N. Y., vol. 1, p. 208, Hud. Riv. and Trenton Grs.
 proteiforme var. elongatum, Hall, 1847, Pal. N. Y., vol. 1, p. 216, Trenton Gr.
 proteiforme var. lineolatum, Hall, 1847, Pal. N. Y., vol. 1, p. 211, Trenton Gr.
 proteiforme var. strangulatum, Hall, 1847, Pal. N. Y., vol. 1, p. 212, Trenton Gr.
 proteiforme var. tenuistriatum, Hall, 1847, Pal. N. Y., vol. 1, p. 209, Trenton Gr.
 proteiforme var. tenuitextum, Hall, 1847, Pal. N. Y., vol. 1, p. 210, Trenton Gr.
 rapax, Billings, 1860, (*Orthoceras rapax*.) Can. Nat. and Geol., vol. 5, p. 176, Black Riv. Gr.
 rottermundi, Barrande, 1866, (*Orthoceras rottermundi*.) Syst. Sil. de Boh., 2d ser., 2me, p. xiii, pl. 230, Trenton Gr.
 subannulatum, Whitfield, 1880, Ann. Rep. Geo. Sur. Wis., p. 56, and Geo. Wis., vol. 4, p. 230, Trenton Gr.
 subcentrale, Hall, 1847, Pal. N. Y., vol. 1, p. 59, Black Riv. Gr.
 vanuxemi, Conrad, 1842, (*Diploceras vanuxemi*.) Jour. Acad. Sci., vol. 8, p. 267, Trenton Gr.

Endolobus, Meek & Worthen, 1865, Proc. Acad. Nat. Sci. Phil., p. 259. [Ety. *endos*, within; *lobos*, lobe.] Prof. Meek said (later that this genus is not distinct from *Temnochilus*, and if distinct it would probably be a synonym for Montfort's genus *Bisiphites*.

perampus, see *Temnochilus perampus*.
spectabilis, see *Temnochilus spectabile*.

Glossoceras, Barrande, 1865, Cephalopods of Bohemia, vol. 2, p. 372. [Ety. *glosse*, tongue; *keras*, horn.] Having a slender annulated whorl, and an obscurely

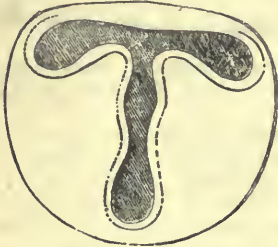


FIG. 735.—Aperture of Gomphoceras.

Y-shaped aperture. It is not known as an American genus.
desideratum, Billings, 1866, Catal. Sil. Foss. Antic., p. 60. Not defined so as to be recognized.

Gomphoceras, Sowerby, 1839, Murch. Sil. Syst. p. 620. [Ety. *gomphos*, club; *keras*,

horn.] Shell fusiform or globular with a tapering apex; aperture contracted in the middle; siphuncle moniliform, subcentral. Type *G. pyriforme*.
 abruptum, Hall, 1879, Pal. N. Y., vol. 5, pt. 2, p. 339, Ham. Gr.
 absens, Hall, 1876, (*Cyrtoceras absens*.) Illust. Devon. Foss., pl. 47, and Pal. N. Y., vol. 5, pt. 2, p. 324, Up. Held. Gr.
 ajax, Hall, 1879, Pal. N. Y., vol. 5, pt. 2, p. 350, Portage Gr.
 amphora, Whitfield, 1882, Ann. N. Y. Acad. Sci., vol. 2, p. 207, Up. Held. Gr.
 beta, Hall, 1862, 15th Rep. N. Y. Mus. Nat. Hist., p. 72, and Pal. N. Y., vol. 5, pt. 2, p. 326, Up. Held. Gr.
 breviposticum, Whitfield, 1882, Geo. Wis., vol. 4, p. 339, Ham. Gr.
 cammarus, Hall, 1879, Pal. N. Y., vol. 5, p. 333, Up. Held. Gr.
 cassinense, Whitfield, 1886, Bull. Am. Mus. Nat. Hist., vol. 1, p. 322, Birdseye Gr.
 cincinnatiense, S. A. Miller, 1884, Jour. Cin. Soc. Nat. Hist., vol. 7, p. 19, Hud. Riv. Gr.
 clavatum, Hall, 1876, (*Cyrtoceras clavatum*.) Illust. Devon. Foss., pl. 47, Up. Held. Gr.
 conradi, Hall, 1860, 13th Rep. N. Y. Mus. Nat. Hist., p. 106, Ham. Gr.
 crenatum, Beecher, 1888, Pal. N. Y., vol. 7, p. 33, Up. Held. Gr.
 cruciferum, Hall, 1879, Pal. N. Y., vol. 5, p. 328, Schoharie grit.
 eos, Hall & Whitfield, 1875, Ohio Pal., vol. 2, p. 100, Hud. Riv. Gr.
 eximium, Hall, 1861, 14th Rep. N. Y. Mus. Nat. Hist., p. 109, and Pal. N. Y., vol. 5, pt. 2, p. 299, Up. Held. Gr.
 faberi, S. A. Miller, 1884, Jour. Cin. Soc. Nat. Hist., vol. 7, p. 19, Hud. Riv. Gr.
 fax, Hall, 1879, Pal. N. Y., vol. 5, p. 321, Schoharie grit.
 fischeri, Hall, 1860, 13th Rep. N. Y. Mus. Nat. Hist., p. 106, and Pal. N. Y., vol. 5, pt. 2, p. 336, Ham. Gr.
 fusiforme, Whitfield, 1882, Geo. Wis., vol. 4, p. 338, Ham. Gr.
 hertzeri, Hall & Whitfield, 1875, (*Cyrtoceras hertzeri*.) Ohio Pal., vol. 2, p. 150, Niagara Gr.

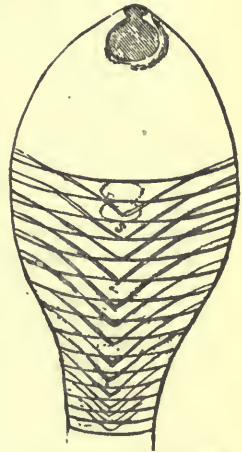


FIG. 736.—Gomphoceras pyriforme.

gompbus, Hall, 1879, Pal. N. Y., vol. 5, p. 334, Up. Held. Gr.

hyatti, Whitfield, 1882, Ann. N. Y. Acad. Sci., vol. 2, p. 206, Up. Held. Gr.

illenus, Hall, 1879, Pal. N. Y., vol. 5, p. 332, Schoharie grit.

impar, Hall, 1879, Pal. N. Y., vol. 5, p. 332, Up. Held. Gr.

lunatum, Hall, 1879, Pal. N. Y., vol. 5, p. 341, Ham. Gr.

manes, Hall, 1879, Pal. N. Y., vol. 5, p. 339, Genesee Slate.

marcyæ, Winchell & Marcy, 1835, Mem. Bost. Soc. Nat. Hist. Syn. for *G. scrinium*.

minimum, Whitfield, 1886, Bull. Am. Mus. Nat. Hist., vol. 1, p. 321, Birds-eye Gr.

minum, Beecher, 1888, Pal. N. Y., vol. 7, p. 34, Ham. Gr.

mitra, Hall, 1879, Pal. N. Y., vol. 5, p. 330, Up. Held. Gr.

nasutum, Beecher, 1888, Pal. N. Y., vol. 7, p. 34, Chemung Gr.

obesum, Billings, 1857, Rep. of Progr. Geo. Sur. Can., p. 311, Utica Gr.

omicron, Winchell, 1866, Rep. Low. Peninsula Mich., p. 97, Ham. Gr.

oviforme, Hall, 1860, 13th Rep. N. Y. Mus. Nat. Hist., p. 105, Ham. Gr.

pingue, Hall, 1879, Pal. N. Y., vol. 5, p. 346, Ham. Gr.

planum, Hall, 1879, Pal. N. Y., vol. 5, p. 352, Ham. Gr.

plenum, Beecher, 1888, Pal. N. Y., vol. 7, p. 33, Up. Held. Gr.

populum, Hall, 1879, Pal. N. Y., vol. 5, p. 340, Ham. Gr.

potens, Hall, 1879, Pal. N. Y., vol. 5, p. 351, Waverly Gr.

powersi, James. Not recognized.

raphanus, Hall, 1879, Pal. N. Y., vol. 5, p. 347, Ham. Gr.

rude, Hall, 1879, Pal. N. Y., vol. 5, p. 327, Ham. Gr.

sacculus, Meek & Worthen, 1866, Proc. Acad. Nat. Sci., p. 258, and Geo. Sur. Ill., vol. 3, p. 445, Ham. Gr.

scioतोense, Whitfield, 1882, Ann. N. Y. Acad. Sci., vol. 2, p. 208, Up. Held. Gr.

scrinium, Hall, 1864, 20th Rep. N. Y. Mus. Nat. Hist., p. 410, Niagara Gr.

septore, Hall, 1867, 20th Rep. N. Y. Mus. Nat. Hist., p. 410, Niagara Gr.

solidum, Hall, 1879, Pal. N. Y., vol. 5, p. 338, Marcellus Shale.

subgracile, Billings, 1857, Rep. of Progr. Geo. Sur. Can., p. 311, Up. Sil.

suboviforme, Walcott, 1885, Monogr. U. S. Geo. Sur., vol. 8, p. 202, Devonian.

tumidum, Hall, 1879, Pal. N. Y., vol. 5, p. 351, Chemung Gr.

turbiniforme, Meek & Worthen, 1866, Proc. Acad. Nat. Sci. Phil., p. 258, and Geo. Sur. Ill., vol. 3, p. 444, Ham. Gr.

GONIATITES, DeHaan, 1825, Monographiæ Ammoniteorum et Goniatiteorum, p. 159. [Ety. *gonia*, an angle; *lithos*, stone. This name, it

seems, should be spelled Goniatites.] Discoid; whorlsembracing, sometimes closing the umbilicus; septa marked by zigzag lines or sutures; when the septa are folded the elevations are called *saddles*; body chamber long, sometimes constituting a whorl, but never expanding but slightly; siphuncle ventral. Type Goniatites sphericus.

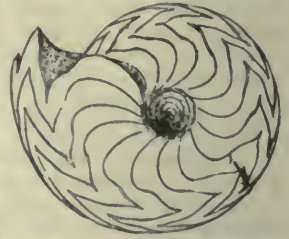


FIG. 737.—Goniatites sphericus.

allii, Winchell, 1862, Am. Jour. Sci., 2d series, vol. 33, p. 363, Marshall Gr.

amplexus, Beecher, 1888, Pal. N. Y., vol. 7, p. 39, Tully limestone.

andrewsi, Winchell, 1870, Proc. Am. Phil. Soc., vol. 12, p. 259, Marshall Gr.

astarte, Clarke, 1835, Bull. U. S. Geo. Sur., No. 16, p. 29, Marcellus Shale.

bicostatus, Hall, 1843, Geo. Rep. 4th Dist. N. Y., p. 245, and Pal. N. Y., vol. 5, pt. 2, p. 450, Portage Gr.

canadensis, Castelnau, 1843, Syst. Sil. p. 34. Probably a syn. for *Bellerophon bilobatus*.

chemungensis, Vanuxem, 1842, Geo. Rep. 3d Dist. N. Y., p. 182, and Pal. N. Y., vol. 5, pt. 2, p. 467, Chemung Gr.

chemungensis var. *æquicostatus*, Hall, 1875, 27th Rep. N. Y. Mus. Nat. Hist., p. 135, Chemung Gr.

choctawensis, Shumard, 1863, Trans. St. Louis Acad. Sci., vol. 2, p. 109, Coal Meas.

colubrellus, Morton, 1836, (*Ammonites colubrellus*), Am. Jour. Sci. and Arts, vol. 29, p. 154, Waverly Gr.

compactus, Meek & Worthen, 1865, Proc. Acad. Nat. Sci. Phil., p. 154, and Geo. Sur. Ill., vol. 5, p. 611, Coal Meas.

complanatus, Hall, 1843, (*Clymenia* (?) *complanatus*.) Geo. Rep. 4th Dist. N. Y., p. 244, and Pal. N. Y., vol. 5, p. 455, Portage Gr.

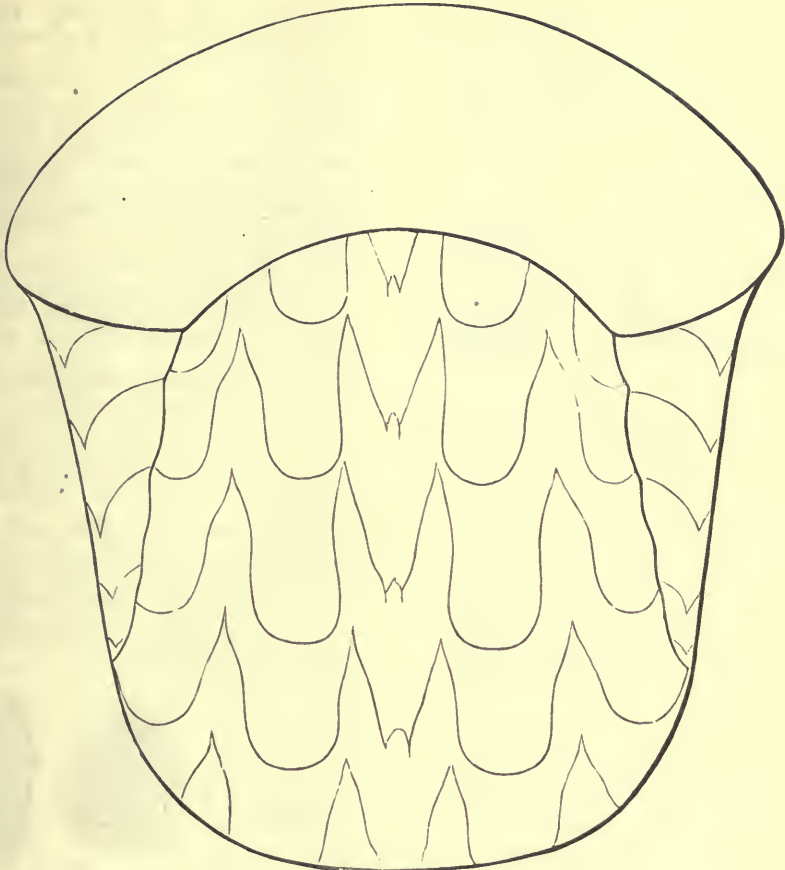
complanatus var. *perlatus*, Hall, 1875, 27th Rep. N. Y. Mus. Nat. Hist., p. 132, Chemung Gr.

desideratus, Walcott, 1885, Monogr. U. S. Geo. Sur., vol. 8, p. 203, Devonian.

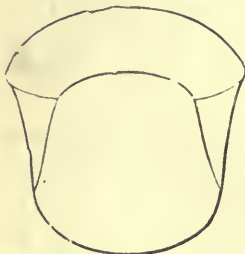
discoideus, Hall, 1860, 13th Rep. N. Y. Mus. Nat. Hist., p. 97, and Illust. Devon. Foss., pl. 71, Ham. Gr. The type of Hyatt's genus *Parodiceras*.

discoideus var. *ohioensis*, Hall, 1874, 27th Rep. N. Y., p. 200, Up. Held. Gr.

entogonus, Gabb, 1861, Proc. Acad. Nat. Sci., p. 372, Carboniferous.

FIG. 738.—*Goniatites globulosus*.

erato, Hall, 1862, (*Clymenia erato*), 15th Rep. N. Y. Mus. Nat. Hist., p. 64, and Illust. Devon. Foss., pl. 70, Ham. Gr. *expansus*, Vanuxem. The name was pre-occupied by Von Buch in 1838. See *G. vanuxemi*.

FIG. 739.—*Goniatites globulosus*. Outline.

globulosus, Meek & Worthen, 1860, Proc. Acad. Nat. Sci. Phil., p. 471, and Geo. Sur. Ill., vol. 2, p. 390, Up. Coal Meas.

globulosus var. *excelsus*, Meek, 1875, Bull. U.S. Geo. Sur. Terr., vol. 1, No. 6, p. 445, Coal Meas.

goniolobus, Meek, 1877, U. S. Geo. Sur. 40th Parallel, vol. 4, p. 98, Carboniferous. *hathawayanus*, McChesney, 1860, Desc. New Pal. Foss., p. 66, Coal Meas.

hildrethi, Morton, 1836, (*Ammonites hildrethi*), Am. Jour. Sci. and Arts, vol. 29, p. 149, Waverly Gr.

holmesi, Swallow, 1860, Trans. St. Louis Acad. Sci., vol. 1, p. 659, Waverly or Choteau Gr.

houghtoni, Winchell, 1862, Am. Jour. Sci., 2d ser., vol. 33, p. 363, Marshall Gr.

hyas, Hall, 1860, syn. for *G. lyoni*.

iowensis, Meek & Worthen, 1860, Proc. Acad. Nat. Sci. Phil., p. 471, and Geo. Sur. Ill., vol. 2, p. 392, Coal Meas. Type of Hyatt's genus *Paralegoceras*.

ixion, Hall, 1860, 13th Rep. N. Y. Mus. Nat. Hist., p. 125, Kinderhook Gr. This species is founded on the form which has been identified with the European species *G. rotatorius*.

kentuckiensis, n. sp. Shell very globose and wide or broadly rounded on the dorsal side; outer volution embracing the inner ones; umbilicus small and disclosing none of the inner volutions, though the body chamber is broken from our specimens; suture having a sharp, dorso-lateral lobe and an equally

deep, bifid, central dorsal lobe; dorsal saddle subangular. This species is readily distinguished by its deep, globose form and sharply bifid lobe on the dorsal side. Collected by Charles Faber at Crab Orchard, Kentucky, in the St. Louis Group.

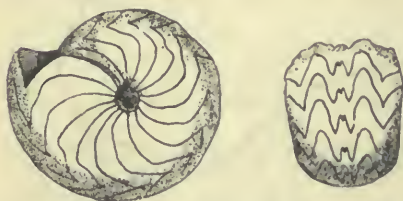


FIG. 70.—*Goniatites kentuckiensis*. The saddles are generally more angular than they appear in the figure.

kingi, Hall & Whitfield, 1877, U. S. Geo. Expl. Exped., 40th parallel, vol. 4, p. 279, Coal Meas.
lutheri, Clarke, 1885, Bull. U. S. Geo. Sur., No. 16, p. 50, Chemung Gr.
lyoni, Meek & Worthen, 1860, Proc. Acad. Nat. Sci. Phil., vol. 12, p. 471, and Geo. Sur. Ill., vol. 2, p. 165, Kinderhook Gr.
marcellensis, see *Discites marcellensis*.
marshallensis, Winchell, 1862, Am. Jour. Sci., 2d ser., vol. 33, p. 362, Marshall Gr.
minimus, Shumard, 1858, Trans. St. Louis Acad. Sci., vol. 1, p. 200, Coal Meas.
mithrax, Hall, 1860, 13th Rep. N. Y. Mus. Nat. Hist., p. 98, and Pal. N. Y., vol. 5, pt. 2, p. 433, Up. Held. Gr.
monroensis, Worthen, (in press.) Geo. Sur. Ill., vol. 8, p. 150, St. Louis Gr.
morganensis, Swallow, 1860, Trans. St. Louis Acad. Sci., vol. 1, p. 659, Waverly or Choteau Gr.
nodifer, Clarke, 1885, Bull. U. S. Geo. Sur., No. 16, p. 21, Marcellus Shale.
nolinensis, Cox, 1857, Geo. Sur. Ky., vol. 3, p. 574, Coal Meas.
nundaia, Hall, 1875, syn. for *G. sinuosus*.
ohioensis, Winchell, 1870, Proc. Am. Phil. Soc., vol. 12, p. 259, Marshall Gr.
opimus, White & Whitfield, 1862, Proc. Bost. Soc. Nat. Hist., vol. 8, p. 305, Kinderhook Gr.
orbicella, Hall, 1860, 13th Rep. N. Y. Mus. Nat. Hist., p. 99, Ham. Gr.
osagensis, Swallow, 1860, Trans. St. Louis Acad. Sci., vol. 1, p. 659, Waverly or Choteau Gr.
oweni, Hall, 1860, 13th Rep. N. Y. Mus. Nat. Hist., p. 100, Kinderhook Gr.
oweni var. *parallelus*, Hall, 1860, 13th Rep. N. Y. Mus. Nat. Hist., p. 101, Kinderhook Gr. Type of Hyatt's genus *Munsteroceras*.
parvus, Shumard, 1858, Trans. St. Louis Acad. Sci., vol. 1, p. 199, Coal Meas.
patersoni, Hall, 1860, 13th Rep. N. Y. Mus. Nat. Hist., p. 99, Portage Gr.

peracutus, Hall, 1876, Illust. Devonian Foss., pl. 69, and Pal. N. Y., vol. 5, pt. 2, p. 463, Portage Gr.
planorbiformis, Shumard, 1855, Geo. Sur. Mo., p. 208, Coal Meas.
plebeiformis, Hall, 1879, Pal. N. Y., vol. 5, p. 448, Marcellus Shale.
politus, Shumard, 1858, Trans. St. Louis Acad. Sci., vol. 1, p. 199, Coal Meas.
propinquus, Winchell, 1862, Am. Jour. Sci. and Arts, 2d series, vol. 33, p. 365, Marshall Gr.
punctatus, Conrad, 1838, Ann. Rep. N. Y., p. 117, Ham. Gr. Not properly defined.
pygmaeus, Winchell, 1862, Am. Jour. Sci. and Arts, 2d series, vol. 33, p. 366, Marshall Gr.
romingeri, Winchell, 1862, Proc. Acad. Nat. Sci., p. 427, Marshall Gr.
rotatorius, DeKoninck, 1843, Desc. des Anim. Foss. du Terr. Carb. See *G. ixion*.
shumardanus, Winchell, 1865, Am. Jour. Sci. and Arts, 2d series, vol. 33, p. 363, Marshall Gr.
simulator, Hall, 1875, 27th Rep. N. Y. Mus. Nat. Hist., p. 133, Chemung Gr. Type of Hyatt's genus *Manticoceras*.
sinuosus, Hall, 1843, Geo. Rep. 4th Dist. N. Y., p. 243, and Pal. N. Y., vol. 5, pt. 2, p. 460, Portage Gr. Type of Hyatt's genus *Gephuroceras*.

subcircularis n.

s p. Shell small, circular; outer volution embracing the inner ones; umbilicus does not expose any of the inner volution; four furrows or constrictions radiate from the umbilicus and divide the shell into four subequal parts, but become obsolete on the dorsal side, and in this respect resemble *Goniatites divisus* of DeKoninck; dorsal side round; body chamber unknown; suture lobed; entire surface longitudinally striated. Collected by Charles Faber, at Crab Orchard, Kentucky, in the St. Louis Group.

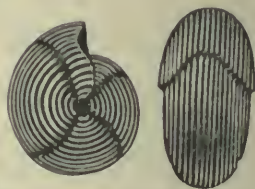


FIG. 71.—*Goniatites subcircularis*. Lateral and dorsal views magnified 2 diam.

sulciferus, Winchell. Not defined.
texanus, Shumard, 1863, Trans. St. Louis Acad. Sci., vol. 2, p. 109, Coal Meas.
uniangularis, Conrad, 1842, Jour. Acad. Nat. Sci., vol. 8, p. 268, Ham. Gr. Type of Hyatt's genus *Tornoceras*.
unilobatus, Hall, 1875, 27th Rep. N. Y. Mus. Nat. Hist., p. 133, and Illust. Devon. Foss., pl. 71, Ham. Gr.
vanuxemi, Hall, 1879, Pal. N. Y., vol. 5, p. 434, Marcellus Shale. Proposed instead of *G. expansus*, of Vanuxem, which was preoccupied by Von Buch.
whitii, Winchell, 1862, Proc. Acad. Nat. Sci., vol. 6, p. 428, Portage Gr.

GONIOCERAS, Hall, 1847, Pal. N. Y., vol. 1, p. 54. [Ety. *gonia*, angle; *keras*, horn.] Somewhat in the form of an Orthoceras, but more or less flattened and subfusiform; transverse section in the form of a depressed ellipse with projecting angles; siphuncle ventral, septa curve over the ventral side, as shown in the illustration. Type *G. anceps*.

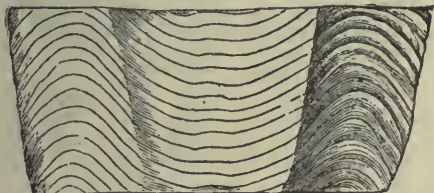


FIG. 742.—Gonloceras anceps.

anceps, Hall, 1847, Pal. N. Y., vol. 1, p. 54, Black Riv. Gr.
occidentale, Hall, 1861, Rep. of Progr. Wis., p. 47, Trenton Gr.
 GYROCERAS, DeKcninck, 1844, Desc. An. Foss. Belg., p. 530. [Ety. *gyros*, circle; *keras*, horn.] Not Gyroceratites of Meyer, 1829. Discoid, rolled in one plane; volutions in contact or open, but not embracing; transverse section circular, elliptical, scutiform, or polygonal; body chamber large and sometimes straight or tangent to the spiral; opening hollowed out on the exterior border like the Nautilus; septa arched and frequently project, curving backward; siphon slender, cylindrical, and usually subcentral toward the convex border, but sometimes found within the concave border; surface tuberculous, having imbricated excrescences or ringed with projecting fringes from the septa. Type *G. paradoxicum*.
abruptum, Hall, 1879, Desc. New Spec. Foss., p. 19, and 11th Rep. Geo. and Nat. Hist., Ind. p. 325, Niagara Gr.
americanum, Billings, 1857, Rep. of Progr. Can. Geo. Sur., p. 309, Up. Sil.
baeri, Meek & Worthen, 1865, (Trochoceras baeri,) Proc. Acad. Nat. Sci., p. 263, and Ohio Pal., vol. 1, p. 157, Hud. Riv. Gr.
bannisteri, Winchell & Marcy, 1865, Mem. Bost. Soc. Nat. Hist., vol. 1, p. 102, Niagara Gr.
burlingtonense, see Nautilus burlingtonensis.
columbiense, Whitfield, 1882, Ann. N. Y. Acad. Sci., vol. 2, p. 210, Up. Held. Gr.
constrictum, Meek & Worthen, 1868, Geo. Sur. Ill., vol. 3, p. 446, Ham. Gr.
cornutum, Owen, 1840, Rep. on Min. Lands, p. 69, Devonian.
cyclops, Hall, 1862, 15th Rep. N. Y. Mus. Nat. Hist., p. 68, and Illust. Devon. Foss., pl. 53, Up. Held. Gr.
duplicostatum, Whitfield, 1878, Ann. Rep. Geo. Sur. Wis., p. 78, and Geo. Wis., vol. 4, p. 235, Trenton Gr.

elrodi, White, 1882, 11th Ann. Rep. Geol. and Nat. Hist. Indiana, p. 356, Niagara Gr.
eryx, Hall, 1862, 15th Rep. N. Y. Mus. Nat. Hist., p. 67, Ham. Gr.
expansum, Saeman, Dunker & Von Meyer, 1853, Palaeontographica, vol. 4. See Nautilus buccinum.
gracile, Hall, 1860, 13th Rep. N. Y. Mus. Nat. Hist., p. 105, Kinderhook Gr. Probably a syn. for Trematodiscus digonus.
hartti, see Discites hartti.
inelegans, Meek, 1871, Proc. Acad. Nat. Sci. Phil., p. 89, and Ohio Pal., vol. 1, p. 232, Up. Held. Gr.
jason, Hall, 1862, (Cyrtoceras jason,) 15th Rep. N. Y. Mus. Nat. Hist., p. 71, Up. Held. Gr. Type of Hyatt's genus Rutoceras.
laciniosum, Hall, 1879, Pal. N. Y., vol. 5, p. 376, Up. Held. Gr.
liratum, see Nautilus liratus.
logani, Meek, 1868, Trans. Chi. Acad. Sci., p. 110, Devonian.
magnificum, see Lituites magnificus.
matheri, Conrad, 1840, Ann. Rep. N. Y., p. 206, and Pal. N. Y., vol. 5, pt. 2, p. 377, (Cyrtoceras matheri,) Up. Held. Gr.
nais, see Porcellia nais.
nereus, Hall, 1862, 15th Rep. N. Y. Mus. Nat. Hist., p. 67, and Pal. N. Y., vol. 5, pt. 2, p. 373, Up. Held. Gr.
numa, Billings, 1875, Can. Nat. and Geol., vol. 7, p. 238, Up. Held. Gr.
ohioense, Meek, 1871, Proc. Acad. Nat. Sci. Phil., p. 87, and Ohio Pal., vol. 1, p. 230, Up. Held. Gr.
paucinodum, Hall, 1876, Illust. Devonian Foss., pl. 55, and Pal. N. Y., vol. 5, pt. 2, p. 380, Up. Held. Gr.
pratti, Barris, 1879, Proc. Dav. Acad. Sci., vol. 2, p. 287, Up. Held. Gr.
rhombolineare, Owen, 1862, Geo. Sur. Indiana, p. 362, Silurian.
rockfordense, Meek & Worthen, 1866, (Nautilus (Cryptoceras) rockfordensis,) Proc. Acad. Nat. Sci. Phil., p. 275, and Geo. Sur. Ill., vol. 3, p. 459, Kinderhook Gr.
seminodosum, Whitfield, 1882, Ann. N. Y. Acad. Sci., vol. 2, p. 211, Up. Held. Gr.
spinosum, Conrad, 1840, (Phragmoceras spinosum,) Ann. Rep. N. Y., p. 206, and Pal. N. Y., vol. 5, pt. 2, p. 382, Schoharie grit.
stebos, Beecher, 1888, Pal. N. Y., vol. 7, p. 36, Waverly Gr.
subliratum, see Nautilus subliratus.
transversum, Hall, 1860, (Cyrtoceras transversum,) 13th Rep. N. Y. Mus. Nat. Hist., p. 104, and Pal. N. Y., vol. 5, pt. 2, p. 384, Ham. Gr.
trivolve, Conrad, 1840, (Cyrtoceras trivolve,) Ann. Rep. N. Y., p. 206, and Pal. N. Y., vol. 5, pt. 2, p. 374, Up. Held. Gr.
undulatum, Vanuxem, 1842, (Cyrtoceras undulatum,) Geo. Rep. N. Y., p. 139, and Pal. N. Y., vol. 5, pt. 2, p. 378, Up. Held. Gr. Type of Hyatt's genus Halloceras.

vagrans, Billings, 1857, Rep. of Progr. Can. Geo. Sur., p. 308, Black Riv. Gr. validum, Hall, 1876, Illust. Devonian Foss., pl. 51, and Pal. N. Y., vol. 5, pt. 2, p. 385, Schöharie grit.

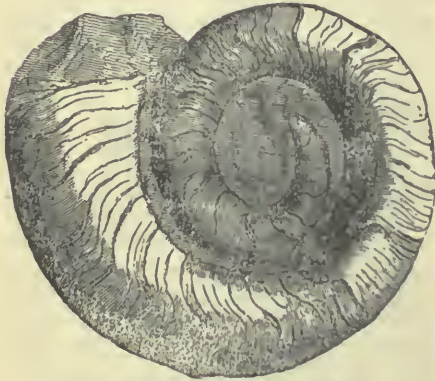


FIG. 743.—*Gyroceras undulatum*.

Hortholus americanus, see *Lituites americanus*.

HURONIA, Stokes, 1823, Geo. Trans., n. s., vol. 1, p. 203. When this genus was proposed, the author thought he was describing a coral. Prof. Billings said the name was proposed for the siphuncle of an *Orthoceras*, and is, therefore, merely a synonym. This seems to be the correct opinion, though the shells to which the peculiar siphuncles belong are unknown. Type *H. bigsbyi*.
annulata, Hall, 1851, Lake Superior Land Dist. by Foster & Whitney, p. 221, Niagara Gr.
bigsbyi, Stokes, 1823, Trans. Geo. Soc., vol. 1, p. 195, Clinton Gr.
minuens, Barrande, 1869, Syst. Sil. de Boh., 2d series, vol. 4, pl. ix, p. 435, Clinton Gr.
obliqua, Stokes, 1823, Trans. Geo. Soc., 2d series, vol. 1, p. 203, Clinton Gr.

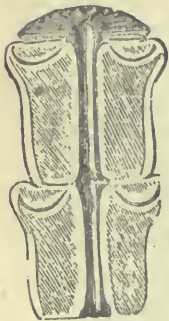


FIG. 744.—*Huronia vertebralis*.

portlocki, Stokes, 1840, Trans. Geo. Soc., 2d series, vol. 5, p. 710, Clinton Gr.
spheroidal, Stokes, 1840, Trans. Geo. Soc., 2d series, vol. 5, p. 710, Clinton Gr.
stokesi, Castelnau, 1843, Syst. Sil., p. 33, Schöharie grit. Not recognized.
turbinata, Stokes, 1823, Trans. Geo. Soc., 2d series, vol. 1, p. 203, Clinton Gr.
vertebralis, Stokes, 1840, Trans. Geo. Soc., 2d series, vol. 5, p. 710,

Niagara and Clinton Grs. See *Orthoceras canadense*.

Hydnoceras, Conrad, 1842, Jour. Acad. Nat. Sci., vol. 8. See *Dictyophyton*, a sponge. *tuberosum*, see *Dictyophyton tuberosum*.

LITUITES, Montfort, 1808, Conch. Syst., vol. 1, p. 279, [Ety. *lituus*, trumpet.] Shell spiral in the beginning; last chambers produced straight; whorls free or open in one plane; septa simple; siphuncle central; section circular. Type *L. lituus*.



FIG. 745.—*Lituites giganteus*. Quarter size.

americanus, D'Orbigny, 1850, (*Hortholus americanus*.) Prodr. d. Paléont., t. 1, p. 1, Black Riv. Gr.

apollo, Billings, 1862, Pal. Foss., vol. 1, p. 25, Calciferous Gr.

bickmoreanus, Whitfield, 1885, Bull. Am. Mus. Nat. Hist., vol. 1, p. 191, Niagara Gr.

cancellatus, McChesney, 1861, New Pal. Foss., Niagara Gr. See *L. occidentalis* and *Nautilus cancellatus* and *N. occidentalis*. If this species, as Prof. Hall suggests, is a true *Nautilus*, McChesney's name has precedence.

capax, see *Nautilus capax*.

complanatus, Shumard, 1863, Trans. St. Louis Acad. Sci., vol. 2, p. 107, Calciferous Gr.

convolvans, Schlotheim, 1813, in Jahrbuch, as identified by Hall, Pal. N. Y., vol. 1, p. 53. See *L. americanus*.

eatonii, Whitfield, 1886, Bull. Am. Mus. Nat. Hist., vol. 1, p. 331, Birdseye Gr.

eatonii var. *cassinensis*, Whitfield, 1886, Bull. Am. Mus. Nat. Hist., vol. 1, p. 332, Birdseye Gr.

farnsworthii, Billings, 1861, Pal. Foss., vol. 1, p. 21, Calciferous Gr.

graftonensis, Meek & Worthen, 1870, Proc. Acad. Nat. Sci. Phil. p. 51, and Geo. Sur. Ill., vol. 6, p. 507, Niagara Gr.

hercules, Winchell & Macey, 1865, Mem. Bost. Soc. Nat. Hist., Niagara Gr. Syn. for *Cyrtoceras amplicorne*. See 20th Rep. N. Y. Mus. Nat. Hist.

imperator, Billings, 1861, Pal. Foss., vol. 1, p. 23, Calciferous Gr.

magnificus, Billings, 1857, (*Gyroceras magnificum*.) Rep. of Progr. Geo. Sur. Can., p. 307, Hud. Riv. Gr. Type of Hyatt's genus *Aspidoceras*.

marshi, Hall, 1867, 20th Rep. N. Y. Mus. Nat. Hist., p. 404, Niagara Gr.

internistriatus, Whitfield, 1886, Bull. Am. Mus. Nat. Hist., vol. 1, p. 332, Birdseye Gr.

multicostatus, Whitfield, 1880, Ann. Rep. Geo. Sur. Wis., p. 67, and Geo. Wis., vol. 4, p. 303, Niagara Gr.

murchisoni, Troost. Not defined so as to be recognized.

niagarensis, Spencer, 1884, Bull. No. 1, Mus. Univ. St. Mo., p. 60, Niagara Gr.

occidentalis, Hall, 1861, Rep. of Progr. Geo. Sur. Wis., Niagara Gr. This species is now referred by Prof. Hall to the genus *Nautilus*, see 20th Rep. N. Y. St. Mus. Nat. Hist., p. 400. It was first described by McChesney, Jan. 1860, as *Cyrtoceras giganteum*, but that name being preoccupied, in 1861 he proposed *Lituites cancellatus*. If it is a *Nautilus*, the word *occidentalis* being preoccupied, McChesney's name *cancellatus* has precedence.

robertsoni, Meek, 1873, Ohio Pal., vol. 1, p. 186, Niagara Gr.

palinurus, Billings, 1862, Pal. Foss., vol. 1, p. 25, Calciferous Gr.

pluto, Billings, 1865, Pal. Foss., vol. 1, p. 259, Quebec Gr.

robertsoni, Hall, 1861, Rep. of Progr. Wis., p. 38, Chazy and Black Riv. Grs.

seelyi, Whitfield, 1886, Bull. Am. Mus. Nat. Hist., vol. 1, p. 330, Birdseye Gr.

undatus, Emmons, 1842, (*Inachus undatus*.) Geo. Rep. N. Y., p. 394, and Pal. N. Y., vol. 1, p. 52, Black Riv. and Trenton Grs. It is not a *Lituites*.

undatus var. *occidentalis*, Hall, 1861, Rep. of Progr. Wis., p. 38, Black Riv. and Trenton Grs.

Melina cancellatus, Emmons, 1856, Am. Geol. Not defined so as to be recognized.

cinnamintia, D'Orbigny, 1850, Prodr. d. Paléont., t. 1, p. 4. Not defined so as to be recognized.

NAUTILUS, Breynius, 1732, Dissert. Polyth., p. 11. [Ety. *Nautilus*, sailor or navigator.] Shell subglobose, compressed; volutions coiled in the same plane, contiguous; umbilicus open or closed; septa simple, arched or waved on the lateral margins; siphuncle central or subcentral; lip sinuous on the dorsal and ventro-lateral margins; surface smooth, striate, costate, or bearing nodes. Type *N. pompilius*.

acraeus, Hall, 1879, Pal. N. Y., vol. 5, pt. 2, p. 417, Ham. Gr.

avonensis, see *Solenochilus avonense*.

avus, Barrande, 1869, Syst. Sil. de Boh., vol. 4, p. viii, pl. 435, Quebec Gr.

barrandi, Hall, 1876, see *N. Magister*.

biserialis, Hall, 1860, Supp. to vol. 1, pt. 2, Iowa Geo. Sur., p. 92, Coal Meas.

buccinum, Hall, 1876, Illust. Devonian Foss., pl. 60, and Pal. N. Y., vol. 5, pt. 2, p. 412, Ham. Gr. Type of Hyatt's genus *Nephriticeras*.

calciferus, Billings, 1865, Pal. Foss., vol. 1, p. 258, Calciferous Gr.

cancellatus, McChesney, 1861, (*Lituites cancellatus*.) New Pal. Foss., p. 96, Niagara Gr.

canaliculatus, Cox, 1857, Geo. Sur. Ky., vol. 3, p. 575, Coal Meas. Type of Hyatt's genus *Solenoceras*.

capax, Hall 1860, (*Lituites capax*.) Rep. of Progr. Geo. Sur. Wis., p. 3, Niagara Gr.

capax, Meek & Worthen, 1865. This was preoccupied and must yield unless it can be retained in the subgenus *Solenochilus*.

cavus, Hall, 1879, Pal. N. Y., vol. 5, p. 416, Ham. Gr.

champlainensis, Whitfield, 1886, Bull. Am. Mus. Nat. Hist., vol. 1, p. 329, Birdseye Gr.

chesterensis, Meek & Worthen, 1860, Proc. Acad. Nat. Sci. Phil., p. 469, and Geo. Sur. Ill., vol. 2, p. 306, Kaskaskia Gr.

clarkanus, Hall, 1858, Trans. Alb. Inst., vol. 4, p. 32, and Bull. Am. Mus. Nat. Hist., p. 92, Warsaw Gr.

collectus, see *Solenochilus collectum*.

cornulum, Hall, 1876, Illust. Devonian Foss., pl. 60, and Pal. N. Y., vol. 5, pt. 2, p. 414, Ham. Gr.

coxanus, see *Temnochilus coxanus*.

danvillensis, White, 1878, Proc. Acad. Nat. Sci., p. 36, and Cont to Pal., No. 8, p. 170, Coal Meas.

decoratus, Cox, 1857, Geo. Sur. Ky., vol. 3, p. 572, Coal Meas.

desertus, Billings, 1865, Pal. Foss., vol. 1, p. 258, Quebec Gr.

digonus, see *Trematodiscus digonus*.

disciformis, see *Discites disciformis*.

discoidalis, see *Trematodiscus discoidalis*.

divinus, White & St. John, 1868, Trans. Chi. Acad. Sci., p. 124, Up. Coal Meas. The name was preoccupied by Meyer in 1831.

eccentricus, Meek & Hayden, 1858, Trans. Alb. Inst., vol. 4, p. 83, and Pal. Up. Mo., p. 65, Permian Gr.



FIG. 746.—*Nautilus faberi*. Lateral and front views. Magnified 2 diam.

faberi. n. sp. Shell small, smooth, all volutions embraced in the outer one, leaving only a small round umbilicus; aperture semielliptical above the interior volution. The species is founded on a single specimen having a piece chipped from the dorsal side of the last volution, and a small piece broken from the inner volution, but nowhere disclosing the septa. It was found in the Coal Measures, on Elk Horn Creek, Kentucky, and belongs to Mr. Charles Faber's collection.

ferox, Billings, 1865, Pal. Foss., vol. 1, p. 351, Calciferous Gr.

ferratus, Cox, 1857, Geo. Sur. Ky., vol. 3, p. 574, Coal Meas.



FIG. 747.—*Nautilus forbesanus*.

Sowerby, 1825, Min. Conch., vol. 5, p. 129, Kaskaskia Gr.

hercules, Billings, 1857, Rep. of Progr. Can. Geo. Sur., p. 306, Hud. Riv. Gr.

highlandensis, see *Discites highlandensis*.

hyatti, Beecher, 1888, Pal. N. Y., vol. 7, p. 37, Ham. Gr.

illinoisensis, McChesney, 1860, Desc. New. Pal. Foss., p. 64, Coal Meas.

ingentir, Winchell, 1862, Am. Jour. Sci., 2d series, vol. 33, p. 361, Marshall Gr.

insolens, Billings, 1865, Pal. Foss., vol. 1, p. 258, Quebec Gr.

jason, Billings, 1859, Can. Nat. and Geol., vol. 4, p. 464, Chazy Gr. Type of Hyatt's genus *Plectoceras*.

kelloggi, Whitfield, 1886, Bull. Am. Mus. Nat. Hist., vol. 1, p. 328, Birdseye Gr.

lasallensis, Meek & Worthen, 1866, Proc. Acad. Nat. Sci. Phil., p. 261, and Geo. Sur. Ill., vol. 5, p. 610, Up. Coal Meas.

latus, see *Temnochilus latus*.

lawsi, Swallow, 1860, Trans. St. Louis Acad. Sci., vol. 1, p. 658, Ham. Gr.

leidyi, see *Solenochilus leidyi*.

liratus, Hall, 1860, (*Gyroceras liratum*.) 13th Rep. N. Y. Mus. Nat. Hist., p. 104, Marcellus Shale.

liratus var. juvenis, Hall, 1879, Pal. N. Y., vol. 5, Ham. Gr.

magister, Hall, 1879, Pal. N. Y., vol. 5, p. 422, Ham. Gr. Proposed instead of *N. barrandi*, Hall, which was preoccupied.

marcellensis, see *Discites marcellensis*.

maximus, Conrad, 1838, (*Cyrtoceras maximus*.) Ann. Rep. N. Y., p. 117, and Pal. N. Y., vol. 5, pt. 2, p. 418, Ham. Gr.

meekanus, see *Trematodiscus meekanus*.

missouriensis, Swallow, 1858, Trans. St. Louis Acad. Sci., vol. 1, p. 198, Coal Meas.

montgomeryensis, Worthen, 1884, Bull. No. 2, Ill. St. Mus. Nat. Hist., p. 4, and Geo. Sur. Ill., vol. 8, p. 148, Up. Coal Meas.

natator, Billings, 1859, Can. Nat. and Geol., vol. 4, p. 466, Chazy Gr. Type of Hyatt's genus *Barrandoceras*.

forbesanus, McChesney, 1860, Desc. New Pal. Foss., p. 63, and Trans. Chi. Acad. Sci., p. 50, Coal Meas.

gilpini, Swallow, 1860, Trans. St. Louis Acad. Sci., vol. 1, p. 658, Coal Meas.

globatus, Sowerby, 1825, Min. Conch., vol. 5, p. 129, Kaskaskia Gr.

hercules, Billings, 1857, Rep. of Progr. Can. Geo. Sur., p. 306, Hud. Riv. Gr.

highlandensis, see *Discites highlandensis*.

hyatti, Beecher, 1888, Pal. N. Y., vol. 7, p. 37, Ham. Gr.

illinoisensis, McChesney, 1860, Desc. New. Pal. Foss., p. 64, Coal Meas.

ingentir, Winchell, 1862, Am. Jour. Sci., 2d series, vol. 33, p. 361, Marshall Gr.

insolens, Billings, 1865, Pal. Foss., vol. 1, p. 258, Quebec Gr.

jason, Billings, 1859, Can. Nat. and Geol., vol. 4, p. 464, Chazy Gr. Type of Hyatt's genus *Plectoceras*.

kelloggi, Whitfield, 1886, Bull. Am. Mus. Nat. Hist., vol. 1, p. 328, Birdseye Gr.

lasallensis, Meek & Worthen, 1866, Proc. Acad. Nat. Sci. Phil., p. 261, and Geo. Sur. Ill., vol. 5, p. 610, Up. Coal Meas.

latus, see *Temnochilus latus*.

lawsi, Swallow, 1860, Trans. St. Louis Acad. Sci., vol. 1, p. 658, Ham. Gr.

leidyi, see *Solenochilus leidyi*.

liratus, Hall, 1860, (*Gyroceras liratum*.) 13th Rep. N. Y. Mus. Nat. Hist., p. 104, Marcellus Shale.

liratus var. juvenis, Hall, 1879, Pal. N. Y., vol. 5, Ham. Gr.

magister, Hall, 1879, Pal. N. Y., vol. 5, p. 422, Ham. Gr. Proposed instead of *N. barrandi*, Hall, which was preoccupied.

marcellensis, see *Discites marcellensis*.

maximus, Conrad, 1838, (*Cyrtoceras maximus*.) Ann. Rep. N. Y., p. 117, and Pal. N. Y., vol. 5, pt. 2, p. 418, Ham. Gr.

meekanus, see *Trematodiscus meekanus*.

missouriensis, Swallow, 1858, Trans. St. Louis Acad. Sci., vol. 1, p. 198, Coal Meas.

montgomeryensis, Worthen, 1884, Bull. No. 2, Ill. St. Mus. Nat. Hist., p. 4, and Geo. Sur. Ill., vol. 8, p. 148, Up. Coal Meas.

natator, Billings, 1859, Can. Nat. and Geol., vol. 4, p. 466, Chazy Gr. Type of Hyatt's genus *Barrandoceras*.

notensis, see *Temnochilus notense*.

nodocarinatus, McChesney; syn. for *N. occidentalis*.

nodoso-dorsatus, Shumard, 1858, Trans. St. Louis Acad. Sci., vol. 1, p. 198, Coal Meas.

occidentalis, Swallow, 1858, Trans. St. Louis Acad. Sci., vol. 1, p. 196, and Pal. E. Neb., p. 234, Permian Gr.

occidentalis, Hall, 1860, 20th Rep. N. Y. Mus. Nat. Hist., p. 400, Niagara Gr. This name being preoccupied, McChesney's name *cancellatus*, has precedence. See *Lituites cancellatus*.

oceanus, Hall, 1879, Desc. New Spec. Foss., p. 19, and 11th Rep. Geo. and Nat. Hist. Ind., p. 325, Niagara Gr.

oriens, Hall, 1876, Illust. Devonian Foss., pl. 61, and Pal. N. Y., vol. 5, pt. 2, p. 420, Marcellus Shale.

ornatus, Hall, 1860, syn. for *N. marcellensis*.

ortoni, Whitfield, 1882, Ann. N. Y. Acad. Sci., vol. 2, p. 231, Coal Meas.

parallelus, Beecher, 1888, Pal. N. Y., vol. 7, p. 38, Coal Meas.

pauper, Whitfield, 1882, Ann. N. Y. Acad. Sci., vol. 2, p. 226, Kaskaskia Gr.

pernianus, Swallow, 1858, Trans. St. Louis Acad. Sci., vol. 1, p. 196, Permian Gr.

planidorsalis, see *Trematodiscus planidorsalis*.

planorbiformis, Meek & Worthen, 1860, Proc. Acad. Nat. Sci. Phil., p. 469, and Geo. Sur. Ill., vol. 2, p. 386, Coal Meas.

planovolvus, Shumard, 1858, Trans. St. Louis Acad. Sci., vol. 1, p. 198, Coal Meas.

pomponius, Billings, 1862, Pal. Foss., vol. 1, p. 26, Calciferous Gr.

ponderosus, White, 1872, Pal. of E. Neb., p. 236, Coal Meas. Type of Hyatt's genus *Titanoceras*.

quadrangularis, McChesney, 1860, Desc. New Pal. Foss., p. 65, and Trans. Chi. Acad. Sci., vol. 1, p. 57, Coal Meas.

Type of Hyatt's genus *Tainoceras*.

rockfordensis, Meek & Worthen, 1866, Proc. Acad. Nat. Sci. Phil., p. 275, Kinderhook Gr. Probably a *Gyroceras*. See Ill. Geo. Sur., vol. 3.

sangamonensis, Meek & Worthen, 1860, Proc. Acad. Nat. Sci. Phil., p. 470, and Geo. Sur. Ill., vol. 2, p. 386, Coal Meas. Type of Hyatt's genus *Metacoceras*.

seebachanus, see *Pteronutilus seebachanus*.

spectabilis, see *Temnochilus spectabile*.

springeri, see *Solenochilus springeri*.

striatulus, see *Trematodiscus striatulus*.

subglobosus, Meek & Worthen, 1860, Proc. Acad. Nat. Sci. Phil., p. 469, syn. for *N. globatus*, see Geo. Sur. Ill., vol. 3, p. 305.

subliratus, Hall, 1876, (*Gyroceras subliratum*.) Illust. Devon. Foss., pl. 58, and Pal. N. Y., vol. 5, pt. 2, p. 409, Ham. Gr.

subquadrangularis, Whitfield, 1882, Ann. N. Y. Acad. Sci., vol. 2, p. 232, Coal Meas.

subsulcatus, Phillips, 1836, Geo. York. Not clearly identified in this country.

sulcatus, see *Trematodiscus sulcatus*.

trigonus, see *Trematodiscus trigonus*.

trisulcatus, see *Trematodiscus trisulcatus*.

tyrans, Billings, 1859, Can. Nat. and Geo., vol. 4, p. 465, Chazy Gr.

versutus, Billings, 1865, Pal. Foss., vol. 1, p. 259, Quebec Gr. Type of Hyatt's genus *Litoceras*.

winslowi, see *Temnochilus winslowi*.

Nelimenia incognita, Castelnau, 1843, Syst. Sil., p. 33. Probably a fragment of *Phragmoceras* or *Oncoceras*.

ONCOCERAS, Hall, 1847, Pal. N. Y., vol. 1, p. 196. [Ety. *onkos*, swelling; *keras*, horn.]

Curved, aperture constricted; lower part of the body chamber, and upper part of septate portion ventricose; abruptly contracted toward the apex; siphuncle dorsal; septa plane, nearly flat, slightly elevated on the dorsal margin. Type *O. constrictum*.



FIG. 748.—*Oncoceras constrictum*.

abruptum, Hall, 1861, Rep. of Progr. Wis., p. 44, Trenton Gr.

alceus, Hall, 1861, Rep. of Progr. Wis., p. 46, Chazy and Black Riv. Grs.

amator, Billings, 1866, Catal. Sil. Foss. Antic., p. 59, Clinton Gr.

breivcurvatum, Whitfield, 1880, Ann. Rep. Geo. Sur. Wis., p. 59, and Geo. Wis., vol. 4, p. 234, Trenton Gr.

constrictum, Hall, 1847, Pal. N. Y., vol. 1, p. 197, Black Riv. and Trenton Grs.

dilatatum, Hall, 1860, 13th Rep. N. Y. Mus. Nat. Hist., p. 105, Ham. Gr.

expansum, Hall, 1852, Pal. N. Y., vol. 2, p. 337, Coralline limestone.

futile, Billings, 1866, Catal. Sil. Foss. Antic., p. 59, Clinton Gr.

gibbosum, Hall, 1852, Pal. N. Y., vol. 2, p. 13, Medina sandstone.

lycus, Hall, 1861, Rep. of Progr. Wis., p. 45, Chazy and Black Riv. Gr.

mummiforme, Whitfield, 1880, Ann. Rep. Geo. Sur. Wis., p. 58, and Geo. Wis., vol. 4, p. 232, Trenton Gr.

orca, Hall, 1861, (*Cyrtoceras orcas*) Rep. of Progr. Geo. Sur. of Wis., p. 42, Niagara Gr.

ovoides, Hall, 1859, Pal. N. Y., vol. 3, p. 342, Low. Held. Gr.

pandion, Hall, 1861, Rep. of Progr. Wis., p. 45, and Geo. Wis., vol. 4, p. 233, Chazy and Black Riv. Grs.

pettiti, Billings, 1866, Catal. Sil. Foss. Antic., p. 86, Niagara Gr.

plebeium, Hall, 1861, Geo. Rep. Wis., p. 44, Trenton Gr.

subrectum, Hall, 1852, Pal. N. Y., vol. 2, p. 94, Clinton Gr.

teucer, Billings, 1866, Catal. Sil. Foss. Antic., p. 86, Niagara Gr.

thales, Billings, 1866, Catal. Sil. Foss. Antic., p. 87, Niagara Gr.

vasiforme, Dwight, 1884, Am. Jour. Sci. and Arts, 3d ser., vol. 27, p. 257, Calciferous Gr.

ORMOCERAS, Stokes, 1840, Trans. Geo. Soc., 2d ser., vol. 5, p. 709. [Ety. *ormos*, a chain or necklace; *keras*, horn; from the appearance of the siphuncle.]

Externally like *Orthoceras*, and distinguished only by having the siphuncle constricted within each chamber instead of at the place of union with the septa. Types *O. backi*, and *O. bayfieldi*.

backi, Stokes, 1840, Trans. Geo. Soc., 2d ser., vol. 5, p. 709, Clinton Gr.

bayfieldi, Stokes, 1840, Trans. Geo. Soc., 2d ser., vol. 5, p. 709, Clinton Gr.

crebriseptum, Hall, 1847, Pal. N. Y., vol. 1, p. 313, Hud. Riv. Gr.

gracile, Hall, 1847, Pal. N. Y., vol. 1, p. 58, Black Riv. Gr.

remotiseptum, Hall, 1850, 3d Rep. N. Y. Mus. Nat. Hist., p. 181, Trenton Gr.

tenuifilum, Hall, 1847, Pal. N. Y., vol. 1, p. 55, Black Riv. and Trenton Gr.

tenuifilum var. *distans*, Hall, 1847, Pal. N. Y., vol. 1, p. 58, Black Riv. Gr.

vertebratum, Hall, 1852, Pal. N. Y., vol. 2, p. 94, Clinton Gr.

whitii, Stokes, 1840, Trans. Geo. Soc., 2d ser., vol. 5, p. 709, Clinton Gr.

ORTHO CERAS, Breynius, 1732, *Dissertatio physica de Polythalamis*. [Ety. *orthos*, straight; *keras*, horn.] Shell conical, straight, or nearly so; body chamber large, behind which the shell is composed of numerous chambers separated by convex, transverse septa, with simple edges, at right angles to the longer axis of the shell; siphuncle central, sub-central or eccentric, cylindrical or dilated in the chambers; surface smooth or transversely, or longitudinally striated, or furrowed. Typical *O. breynii*, *O. annulatum*, and *O. striatum*.

abnorme, Hall, 1867, 20th Rep. N. Y. Mus. Nat. Hist., p. 415, Niagara Gr.

abruptum, Hall, 1852, Pal. N. Y., vol. 2, p. 97, Clinton Gr.

acicula, Hall, see *Coleolus acicula*.

aciculoides, Clarke, 1885, Bull. U. S. Geo. Sur., No. 16, p. 51, Chemung Gr.

aculeatum, Swallow, 1858, Trans. St. Louis Acad. Sci., vol. 1, p. 200, Coal Meas.

ægea, Hall, 1862, 15th Rep. N. Y. Mus. Nat. Hist., p. 80, Ham. Gr.

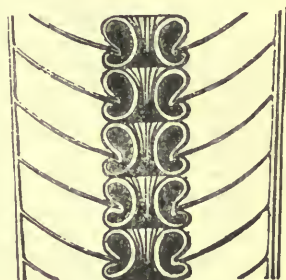


FIG. 749.—*Ormoceras bayfieldi*.

aequale, Emmons, 1842, Geo. Rep. N. Y. p. 404, Hud. Riv. Gr.
alienum, Hall, 1867, 20th Rep. N. Y. Mus. Nat. Hist., p. 414, Niagara Gr.
allumettense, Billings, 1857, Rep. of Progr. Geo. Sur. Can., p. 331, Chazy and Black Riv. Grs.
amplificameratum, Hall, 1847, Pal. N. Y., vol. 1, p. 205, Black Riv. and Trenton Grs.
amyceus, Hall, 1879, Desc. New Spec. Foss., p. 18, and 11th Rep. Geo. Sur. Ind., p. 324, Niagara Gr.
anax, Billings, 1875, Can. Nat. and Geol., vol. 7, p. 238, Up. Held. Gr.
anguis, Hall, 1879, Pal. N. Y., vol. 5, pt. 2, p. 312, Chemung Gr.
angulatum, (?) Wahlenberg, 1821, Nova. Acta. Soc. Sci. Upsal., p. 90, Niagara Gr. See remarks on this species by Prof. Hall in 20th Rep. N. Y. Mus. Nat. Hist., p. 413.
anellus, Conrad, 1843, Proc. Acad. Nat. Sci. Phil., vol. 1, p. 334, and Pal. N. Y., vol. 1, p. 202, Black Riv. and Trenton Grs.
annulato-costatum, Meek & Worthen, 1861, Proc. Acad. Nat. Sci. Phil., p. 147. This name was preoccupied by Boll in 1857. See *O. randolphense*.
annulatum, Sowerby, 1818, Min. Conch., vol. 2, p. 77, Clinton and Niagara Grs.
anterior, Billings, 1859, Can. Nat. and Geol., vol. 4, p. 463, Chazy Gr.
anticontense, Billings, 1857, Rep. of Progr. Geo. Sur. Can., p. 316, Hud. Riv. Gr.
aptum, Hall, 1879, Pal. N. Y., vol. 5, pt. 2, p. 282, Marcellus Shale.
arcuatellum, Sandberger. Is not an American species.
arcuoliratum, Hall, 1847, Pal. N. Y., vol. 1, p. 193, Black Riv. and Trenton Grs.
arenosum, Hall, 1859, Pal. N. Y., vol. 3, p. 480, Oriskany sandstone.
asmodeus, Clarke, 1885, Bull. U. S. Geo. Sur., No. 16, p. 30, Genesee Shale.
atrus, Hall, 1879, Pal. N. Y., vol. 5, p. 305, Portage Gr.
atticus, Billings, 1865, Pal. Foss., vol. 1, p. 312, Quebec Gr.
aulax, Hall, 1879, Pal. N. Y., vol. 5, p. 293, Ham. Gr.
autolyceus, Billings, 1862, Pal. Foss., vol. 1, p. 91, Quebec Gr.
baculum, Meek, 1860, Proc. Acad. Nat. Sci., p. 310, Subcarboniferous.
baculum, Hall, 1862. The name was preoccupied. See *O. stylus*.
balteatum, Billings, 1857, Rep. of Progr. Geo. Sur. Can., p. 318, Hud. Riv. Gr.
barquianum, Winchell, 1862, Am. Jour. Sci., 2d ser., vol. 33, Marshall Gr.
bartonense, Spencer, 1884, Bull. No. 1, Mus. Univ. St. Mo., p. 60, Niagara Gr.
bebryx, Hall, 1876, Illust. Devonian Foss., pl. 39, and Pal. N. Y., vol. 5, pt. 2, p. 275, Ham. Gr.;

bebryx var. *cayuga*, Hall, 1879, Pal. N. Y., vol. 5, p. 276, Chemung Gr.
becki, Billings, 1859, Can. Nat. and Geol., vol. 4, p. 362, Calciferous Gr.
bellatulum, Billings, 1866, Catal. Sil. Foss. Antic., p. 58, Clinton Gr.
beloitense, Whitfield, 1878, Ann. Rep. Geo. Sur. Wis., p. 97, and Geo. Wis., vol. 4, p. 226, Trenton Gr.
bilineatum, Hall, 1847, Pal. N. Y., vol. 1, p. 199, Chazy, Black Riv., Trenton, and Hud. Riv. Grs.
bilineatum var. *a*, Hall, 1847, Pal. N. Y., vol. 1, p. 200, Trenton Gr.
bipartitum, Hall, 1879, Pal. N. Y., vol. 5, p. 313, Up. Chemung Gr.
brainerdi, Whitfield, 1886, Bull. Am. Mus. Nat. Hist., vol. 1, p. 319, Birds-eye Gr.
brongiarti, Troost, 1838, (Conotubularia *brongiarti*,) Mem. Soc. Geo. de France, 3, p. 89, Low. Sil.
brontes, Billings, 1866, Catal. Sil. Foss. Antic., p. 83, Niagara Gr.
bucklandi, Billings, 1857, Rep. of Progr. Geo. Sur. Can., p. 330, Up. Sil.

FIG. 750.—*Orthoceras byrnesi*.

bullatum, (?) Sowerby, 1839, Murch. Sil. Syst., p. 705, Trenton Gr.
byrnesi, S. A. Miller, 1875, Cin. Quar. Jour. Sci., vol. 2, p. 126, and Jour. Cin. Soc. Nat. Hist., vol. 4, p. 319, Hud. Riv. Gr.
cadmus, Billings, 1866, Catal. Sil. Foss. Antic., p. 83, Niagara Gr.
caelamen, Hall, 1879, Pal. N. Y., vol. 5, p. 298, Ham. Gr.
cameolaré, McChesney, 1861, New Pal. Foss., p. 93, Niagara Gr.
canadense, Billings, 1857, Rep. of Progr. Geo. Sur. Can., p. 321, Mid. Sil. Prof. Billings proposed this name as a substitute for *Huronina vertebralis* for the reason that *Huronina* is a syn. for *Orthoceras*, and there is one *O. vertebralis*.
cancellatum, Hall, 1852, Pal. N. Y., vol. 2. The name was preoccupied by Eichwald in 1842. See *O. subcancellatum*.
capitolinum, Safford, 1869, Geo. of Tenn., p. 290, Trenton Gr.
carleyi, Hall & Whitfield, 1875, Ohio Pal., vol. 2, p. 98, Hud. Riv. Gr.
carltonense, Whitfield, 1878, Ann. Rep. Geo. Sur. Wis., p. 85, and Geo. Wis., vol. 4, p. 318, Niagara Gr.
carnosum, Hall, 1879, Pal. N. Y., vol. 5, p. 258, Schoharie grit.
cataline, Billings, 1865, Pal. Foss., vol. 1, p. 315, Quebec Gr.

cato, Billings, 1865, Pal. Foss., vol. 1, p. 314, Quebec Gr.

catulus, Billings, 1865, Pal. Foss., vol. 1, p. 313, Quebec Gr.

chemungense, Swallow, 1860, Trans. St. Louis Acad. Sci., vol. 1, p. 660, Waverly or Choteau Gr.

chesterense, Swallow, 1863, Trans. St. Louis Acad. Sci., vol. 2, p. 98, Kaskaskia Gr.

chouteauense, Swallow, 1860, (O. chemungense var. chouteauense,) Trans. St. Louis Acad. Sci., vol. 1, p. 660, Waverly or Choteau Gr.

cincinnatiense, S. A. Miller, 1875, Cin. Quar. Jour. Sci., vol. 2, p. 127, and Jour. Cin. Soc. Nat. Hist., vol. 4, p. 319, Hud. Riv. Gr.

cingulum, Hall, 1879, Pal. N. Y., vol. 5, p. 240, Schoharie grit.

clathratum, Hall, 1847, Pal. N. Y., vol. 1, p. 201, Trenton Gr.

clavatum, Hall, 1852, Pal. N. Y., vol. 2, p. 104, Clinton Gr.

clavatum, Hall, 1859. The name was appropriated. See O. desideratum.

clinocameratum, Winchell, 1862, Am. Jour. Sci., 2d ser., vol. 33, p. 356, Marshall Gr.

clintoni, Hall, 1877, 1st Ed. Am. Pal. Foss., p. 244, Chazy Gr. Proposed instead of O. subarcuatum, Hall, 1847, which was preoccupied.

clonei, Barrande, 1869, Sys. Sil. de Boh., 4me ser., p. viii, pl. 432 to 434, Quebec Gr.

cochleatum, Hall, 1879, Pal. N. Y., vol. 5. The name was preoccupied by Schlotheim in 1813. See O. warrenense.

collatum, Hall, 1879, Pal. N. Y., vol. 5, p. 252, Schoharie grit.

colon, White, 1874, Rep. Invert. Foss., p. 10, and Geo. Sur. W. 100th Mer., vol. 4, p. 56, Quebec Gr.

columnare, Hall, 1860, Rep. Progr. Geo. Sur. Wis. The name was preoccupied by Mark in 1857. See O. orus.

conicum, Castelnau, 1843, Syst. Sil., p. 29. The name was preoccupied by Hisinger.

consortale, Beecher, 1888, Pal. N. Y., vol. 7, p. 29, Chemung Gr.

constrictum, Vanuxem, 1842, Geo. Rep. 3d Dist. N. Y., p. 152, and Pal. N. Y., vol. 5, pt. 2, p. 288, Ham. Gr.

constrictum, Conrad, 1838. Not defined so as to be recognized.

constrictum, see *Oncoceras constrictum*.

coralliferum, Hall, 1847, Pal. N. Y., vol. 1, p. 312, Utica and Hud. Riv. Grs.

cornuoryx, Whitfield, 1886, Bull. Am. Mus. Nat. Hist., vol. 1, p. 320, Birdseye Gr.

cornuum, Billings, 1857, Rep. of Progr. Geo. Sur. Can., p. 329, Chazy Gr.

crebescens, Hall, 1867, 20th Rep. N. Y. Mus. Nat. Hist., p. 354, Niagara Gr.

crebristriatum, Meek & Worthen, 1865, Proc. Acad. Nat. Sci. Phil., p. 255, and

Geo. Sur. Ill., vol. 6, p. 503, Niagara Gr.

creon, Hall, 1879, Pal. N. Y., vol. 5, p. 260, Schoharie grit.

cribrosum, Geinitz, 1866, Carb. und Dyas in Neb., p. 4, and Pal. E. Neb., p. 234, Coal Meas.

crocus, Billings, 1866, Catal. Sil. Foss. Antic., p. 22, Hud. Riv. Gr. Proposed instead of O. perannulatum, which was preoccupied.

crotalum, Hall, 1862, 15th Rep. N. Y. Mus. Nat. Hist., p. 78, Ham. Gr. Type of Hyatt's genus *Spyroceras*.

cuvieri, Troost, 1838, (Conotubularia *cuvieri*.) Mem. Soc. Geo. de France, t. 3, p. 88, Low. Sil.

dacon, Beecher, 1888, Pal. N. Y., vol. 7, p. 28, Up. Held. Gr.

darwini, Billings, 1868, Pal. Foss., vol. 1, p. 161, Guelph Gr.

dawsonianum, S. A. Miller, 1883, 2d Ed. Am. Pal. Foss., p. 307, Carboniferous. Proposed instead of O. perstrictum, Dawson, in Acadian Geology, p. 312, fig. 129, as the name was preoccupied by Barrande.

decrescens, Billings, 1857, Rep. of Progr. Geo. Sur. Can., p. 337, Black Riv. and Trenton Gr.

defrancii, Troost, 1838, (Conotubularia *defrancei*.) Mem. Soc. Geo. de France, t. 3, p. 90, Low. Sil.

demus, Hall, 1879, Pal. N. Y., vol. 5, p. 311, Chemung Gr.

depareum, Billings, 1859, Can. Nat. and Geo., vol. 4, p. 363, Calciferous Gr.

desideratum, Hall, 1877, 1st Ed. Am. Pal. Foss., p. 244, Low. Held. Gr. Proposed instead of O. clavatum, Hall, 1859, which was preoccupied.

diffidens, Billings, 1865, Pal. Foss., vol. 1, p. 174, Chazy Gr.

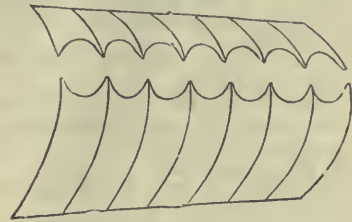
directum, Beecher, 1888, Pal. N. Y., vol. 7, p. 27, Up. Held. Gr.

dolatum, Dawson, 1868, Acad. Geol. p. 311, Carboniferous.

drummondi, Billings, 1865, Pal. Foss., vol. 1, p. 173, Black Riv. Gr.

duramen, Beecher, 1888, Pal. N. Y., vol. 7, p. 25, Schoharie grit.

duseri, Hall & Whitfield, 1875, Ohio Pal., vol. 2, p. 97, Hud. Riv. Gr.

FIG. 751.—*Orthoceras dyeri*.

dyeri, S. A. Miller, 1875, Cin. Quar. Jour. Sci., vol. 2, p. 125, and Jour. Cin. Soc. Nat. Hist., vol. 3, p. 236, Hud. Riv. Gr.

edax, Billings, 1865, Pal. Foss., vol. 1, p. 349, Calcif. Gr.
 elegantulum, Dawson, 1860, Can. Nat. and Geo., vol. 5, p. 155, and Acad. Geol., p. 607, Up. Sil.
 emaceratum, Hall, 1862, 15th Rep. N. Y. Mus. Nat. Hist., p. 170, Ham. Gr.
 epigrus, Hall, 1858, Trans. Alb. Inst., vol. 4, p. 33, and Bull. Am. Mus. Nat. Hist., p. 91, Warsaw Gr.
 eriense, Hall, 1877, 1st Ed. Am. Pal. Foss., p. 274, and Pal. N. Y., vol. 5, p. 274, Ham. Gr. Proposed instead of *O. robustum*, which was preoccupied.
 eurekaense, Walcott, 1885, Monogr. U. S. Geo. Sur., vol. 8, p. 265, Subcarboniferous.
 exile, Hall, 1862, 15th Rep. N. Y. Mus. Nat. Hist., p. 78, and Pal. N. Y., vol. 5, pt. 2, p. 290, Ham. Gr.
 exornatum, Dawson, 1860, Can. Nat. and Geo., vol. 5, p. 198, Up. Sil.
 expansum, Meek & Worthen, 1860, Proc. Acad. Nat. Sci. Phil., p. 468, and Geo. Sur. Ill., vol. 2, p. 286, St. Louis Gr.
 explorator, Billings, 1865, Pal. Foss., vol. 1, p. 253, Quebec Gr.
 expositum, Beecher, 1888, Pal. N. Y., vol. 7, p. 29, Chemung Gr.
 ferum, Billings, 1866, Catal. Sil. Foss. Antic., p. 22, Hud. Riv. and Anticosti Gr.
filiforme, Castelnau, 1843, Syst. Sil., p. 30, Niagara Gr. Not recognized.
 filosum, Clarke, 1885, Bull. U. S. Geo. Sur., No. 16, p. 52, Chemung Gr.
 flavius, Billings, 1865, Pal. Foss., vol. 1, p. 255, Quebec Gr.
 fluctum, Hall, 1879, Pal. N. Y., vol. 5, p. 239, Schoharie grit.
foliatum, syn. for *Cyrtoceras eugenium*.
 formosum, Billings, 1857, Rep. of Progr. Geo. Sur. Can., p. 317, Trenton, Hud. Riv., and Anticosti Grs.
 fosteri, S. A. Miller, 1875, Cin. Quar. Jour. Sci., vol. 2, p. 127, and Jour. Cin. Soc. Nat. Hist., vol. 4, p. 319, Hud. Riv. Gr.
fozense, Safford, 1869, Geo. of Tenn. Not defined.
 fulgidum, Hall, 1879, Pal. N. Y., vol. 5, p. 310, Chemung Gr.
 fulgur, Billings, 1866, Catal. Sil. Foss. Antic., p. 22, Hud. Riv. Gr. Proposed instead of *O. propinquum*, which was preoccupied.
 furtivum, Billings, 1865, Pal. Foss., vol. 1, p. 348, Calcif. Gr.
 fusiforme, Hall, 1847, Pal. N. Y., vol. 1, p. 60, Black Riv. and Trenton Grs.
 fustis, Hall, 1879, Pal. N. Y., vol. 5, p. 281, Marcellus Shale.
 glaucus, Billings, 1865, Pal. Foss., vol. 1, p. 350, Calciferous Gr.
 goldfussi, Troost, 1838, (Conotubularia goldfussi,) Mem. Soc. Geo. de France, t. 3, p. 90, Low. Sil.
 gracillum, Winchell, 1862, Proc. Acad. Nat. Sci., p. 429, Portage Gr.

gregarium, Hall, 1861, Rep. of Progr. Wis. Preoccupied by Sowerby in 1839, Murch. Sil. Syst. See *O. sociale*.
 griffithi, Haughton, 1857, Jour. Roy. Dub. Soc., vol. 1, Devonian.?
 hæsitans, Billings, 1865, Pal. Foss., vol. 1, p. 254, Quebec Gr.
 hageri, Hall, 1861, Geol. of Vermont, p. 718, Calciferous Gr.

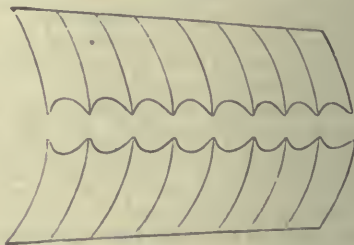


FIG. 752.—*Orthoceras hallanum*.

hallanum, S. A. Miller, 1877, 1st Ed. Am. Pal. Foss., p. 245, Hud. Riv. Gr. Proposed instead of *O. halli*, in Cin. Quar. Jour. Sci., vol. 2, p. 128, which was preoccupied by Barrande.
halli, see *O. hallanum*.
 harperi, S. A. Miller, 1875, Cin. Quar. Jour. Sci., vol. 2, p. 128, and Jour. Cin. Soc. Nat. Hist., vol. 4, p. 319, Hud. Riv. Gr.
 hartanum, S. A. Miller, 1883, 2d Ed. Am. Pal. Foss., p. 307, Carboniferous. Proposed instead of *O. laqueatum*, Hartt, in Acadian Geol., p. 312, fig. 128, which was preoccupied.
 hastatum, Billings, 1857, Rep. of Progr. Geo. Sur. Can., p. 333, Black Riv. and Trenton Grs. Type of Hyatt's genus *Triptoceras*.
 helderbergiæ, Hall, 1859, Pal. N. Y., vol. 3, p. 345, Low. Held. Gr.
 henrietta, Dwight, 1884, Am. Jour. Sci. and Arts, 3d ser., vol. 27, p. 256, Calciferous Gr.
 herculeum, Verneuil, 1846, Bull. de la Soc. Geol. de France, vol. 4, Low. Sil.
hercules, Castelnau, 1843, Syst. Sil., p. 29, Up. Sil. Not recognized.
 heterocinetum, Winchell, 1863, Proc. Acad. Nat. Sci., p. 23, Kinderhook Gr.
hindei, James. Founded on fragments of different species, most of them *O. transversum*.
 hoyi, McChesney, 1861, New Pal. Foss., p. 92, Niagara Gr.
 huronense, Billings, 1857, Rep. of Progr. Geo. Sur. Can., p. 337, Trenton Gr.
hyas, Hall, 1862, syn. for *O. thoas*.
 icarus, Beecher, 1888, Pal. N. Y., vol. 7, p. 31, Kinderhook Gr.
 idmon, Hall, 1879, Pal. N. Y., vol. 5, p. 302, Ham. Gr.
 illinoiseuse, Worthen, 1883, Geo. Sur. Ill., vol. 7, p. 323, and Geo. Sur. Ill., vol. 8, p. 148, Kaskaskia Gr.

imbricatum, Sowerby, 1839, Murch. Sil. Syst., p. 620, and Pal. N. Y., vol. 2, p. 291, Niagara Gr.

inceptum, Foerste, 1885, Bull. Sci. Lab. Denison Univ., p. 117. Not properly defined.

indagator, Billings, 1865, Pal. Foss., vol. 1, p. 349, Calciferous Gr.

indianense, Hall, 1860, 13th Rep. N. Y. Mus. Nat. Hist., p. 107, Kinderhook Gr.

infelix, Billings, 1866, Catal. Sil. Foss. Antic., p. 57, Clinton Gr.

inoptatum, Hall, 1879, Pal. N. Y. vol. 5, p. 267, Up. Held. Gr.

iowense n. sp. Devonian. Proposed instead of *O. undulatum* in Rep. on Min. Lands, p. 69, pl. 12, fig. 6, which name was preoccupied.

irregularis, McChesney, 1861, New Pal. Foss., Niagara Gr. The name was preoccupied. See *O. woodworthi*.

isogramma, Meek, 1871, Proc. Acad. Nat. Sci., p. 172, Coal Meas.

jaculum, Hall, 1879, Pal. N. Y., vol. 5, p. 266, Up. Held. Gr.

jamesi, Hall & Whitfield, 1875, Ohio Pal. vol. 2, p. 118, Clinton Gr.

jolietense, Meek & Worthen, 1865, Proc. Acad. Nat. Sci. Phil., p. 256, and Geo. Sur. Ill., vol. 6, p. 505, Niagara Gr.

junceum, Hall, 1847, Pal. N. Y., vol. 1, p. 204, Trenton Gr.

kickapoense, Swallow, 1858, Trans. Acad. Sci. St. Louis, vol. 1, p. 197, Up. Permian Gr.

kingi, Meek, 1877, U. S. Geo. Sur. 40th Parallel, vol. 4, p. 47, Devonian.

knoxense, McChesney, 1860, New Pal. Foss., p. 69, Coal Meas.

lave, Hall, 1843, Geo. Rep. 4th Dist. N. Y. The name was preoccupied by Fleming in 1825. See *O. sublave*.

lamarcki, Billings, 1859, Can. Nat. and Geo. vol. 4, p. 362, Calciferous Gr.

lamellosum, Hall, 1847, Pal. N. Y., vol. 1, p. 312, Hud. Riv. Gr.

laphami, McChesney, 1861, New Pal. Foss., p. 91, Niagara Gr.

laqueatum, Hall, 1847, Pal. N. Y., vol. 1, p. 13, Calciferous to Trenton Gr.

laqueatum var. a, Hall, 1847, Pal. N. Y., vol. 1, p. 206, Trenton Gr.

laqueatum, Hartt, 1868, Acad. Geol. The name was preoccupied. See *O. Hartt-anum*.

lasallense, Worthen, 1883, Geo. Sur. Ill., vol. 7, p. 324, and Geo. Sur. Ill., vol. 8, p. 149, Coal Meas.

lathropanum, Winchell, 1862, Am. Jour. Sci. and Arts, 2d ser., vol. 33, p. 357, Marshall Gr.

latiannulatum, Hall, 1847, Pal. N. Y., vol. 1, p. 204, Trenton Gr.

leander, Hall, 1879, Pal. N. Y., vol. 5, p. 309, Chemung Gr.

lima, Hall, 1879, Pal. N. Y., vol. 5, p. 303, Ham. Gr.

lineolatum, McChesney, 1861, New Pal. Foss., p. 93, Niagara Gr. The name was preoccupied by Phillips in 1841.

linteum, Hall, 1879, Pal. N. Y., vol. 5, p. 277, Ham. Gr.

longicameratum, Hall, 1859, Pal. N. Y., vol. 3, p. 343, Low. Held. Gr.

loxias, Hall, 1867, 20th Rep. N. Y. Mus. Nat. Hist., p. 416, Low. Sil.

luxum, Hall, 1876, Illust. Devonian Foss. pl. 35, and Pal. N. Y., vol. 5, pt. 2, p. 244, Schoharie grit.

lyelli, Billings, 1857, Rep. of Progr. Geo. Sur. Can., p. 320, Hud. Riv. Gr.

magniscalutum, Billings, 1857, Rep. of Progr. Geo. Sur. Can., p. 330, Hud. Riv. Gr.

marcellense, Vanuxem, 1842, Geo. Rep. N. Y., p. 147, and Pal. N. Y., vol. 5, pt. 2, p. 278, Ham. Gr.

marginale, Owen, 1840, Rep. on Min. Lands, p. 70, Up. Magnesian Gr.

maro, Billings, 1859, Can. Nat. and Geol., vol. 4, p. 461, Chazy Gr.

marshallense, Winchell, 1862, Am. Jour. Sci., 2d series, vol. 33, p. 356, Marshall Gr.

masculum, Hall, 1879, Pal. N. Y., vol. 5, p. 238, Schoharie grit.

medium, Hall, 1879, Pal. N. Y., vol. 5, p. 254, Schoharie grit.

medon, Billings, 1866, Catal. Sil. Foss. Antic., p. 57, Clinton Gr.

medullare, Hall, 1860, Rep. of Progr. Geo. Sur. Wis., p. 4, Niagara Gr.

meecki, S. A. Miller, 1875, Cin. Quar. Jour. Sci., vol. 2, p. 126, Hud. Riv. Gr.

menelaus, Billings, 1862, Pal. Foss., vol. 1, p. 26, Black Riv. Gr.

mephisto, Clarke, 1885, Bull. U. S. Geo. Sur., No. 16, p. 29, Genesee Shale.

michiganense, S. A. Miller, 1883, 2d Ed. Am. Pal. Foss., p. 308, Marshall Gr. in the southern part of Michigan. Proposed instead of *O. multinctum*, Winchell, Proc. Acad. Nat. Sci., Phil., Sept., 1862, p. 421.

minganense, Billings, 1857, Rep. of Progr. Geo. Sur. Can., p. 319, Chazy and Black Riv. Grs.

missisquoi, see *Cyrtoceras missisquoi*.

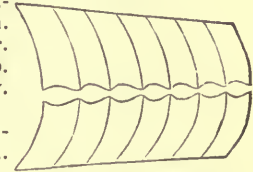


FIG. 753.—*Orthoceras meeki*.

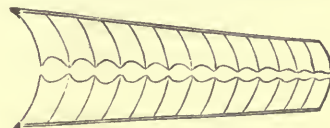


FIG. 574.—*Orthoceras mohri*.

mohri, S. A. Miller, 1875, Cin. Quar. Jour. Sci., vol. 2, p. 124, Hud. Riv. Gr.

- molestum*, Hall, 1876, *Illust. Devonian Foss.*, pl. 35, and *Pal. N. Y.*, vol. 5, pt. 2, p. 265, *Up. Held. Gr.*
moniliforme, Hall, 1847, *Pal. N. Y.*, vol. 1, p. 35, *Chazy Gr.*
moniliforme, Swallow, 1858, *Trans. St. Louis Acad. Sci.*, vol. 1. The name was preoccupied. See *O. swallowanum*.
montrealense, Billings, 1859, *Can. Nat. and Geo.*, vol. 4, p. 363, *Calciferous Gr.*
multicameratum, Emmons, 1842, *Geo. Rep. N. Y.*, p. 382, and *Pal. N. Y.*, vol. 1, p. 45, *Birdseye Gr.*
multicinctum, Hall, 1862, 15th *Rep. N. Y. Mus. Nat. Hist.*, p. 76, and *Pal. N. Y.*, vol. 5, pt. 2, p. 263, *Schoharie grit.*
multicinctum, Winchell, 1862. The name was preoccupied. See *O. michiganense*.
multilineatum, Emmons, 1842, *Geo. Rep. N. Y.*, p. 397, *Trenton Gr.*
multiseptum, Hall, 1852, *Pal. N. Y.*, vol. 2, p. 14, *Medina Gr.*
murrayi, Billings, 1857, *Rep. of Progr. Geo. Sur. Can.*, p. 332, *Black Riv. and Trenton Grs.*
niagarensis, Hall, 1867, 20th *Rep. N. Y. Mus. Nat. Hist.*, p. 416, *Niagara Gr.*
nobile, Meek & Worthen, 1865, *Proc. Acad. Nat. Sci.*, p. 256, *Kaskaskia Gr.*
nodocostum, McChesney, 1861, *New Pal. Foss.*, p. 94, *Niagara Gr.*
novamexicanum, Marcou, 1858, *Geol. North America*, p. 44, *Subcarboniferous*.
nummularium, (?) 1839, *Murch. Sil. Sys.*, p. 632, *Up. Sil.*
nuntium, Hall, 1862, 15th *Rep. N. Y. Mus. Nat. Hist.*, p. 79, and *Pal. N. Y.*, vol. 5, pt. 2, p. 299, *Ham. Gr.*
oberon, Billings, 1866, *Catal. Sil. Foss. Antic.*, p. 82, *Niagara Gr.*
occidentale, Swallow, 1858, *Trans. St. Louis Acad. Sci.*, vol. 1, p. 201, *Coal Meas., Permian Gr.*
occidentale, Winchell, 1862. This name was preoccupied. See *O. vinchellanum*.
œdipus, Hall, 1879, *Pal. N. Y.*, vol. 5, p. 294, *Ham. Gr.*
okawense, Worthen, 1883, *Geo. Sur. Ill.*, vol. 7, p. 324, and *Geo. Sur. Ill.*, vol. 8, p. 149, *Kaskaskia Gr.*
olorus, Hall, 1877, 1st Ed. *Am. Pal. Foss.*, p. 245, *Trenton Gr.* Proposed instead of *O. vertebrale*, Hall, 1847, which was preoccupied.
ommaneyi, Salter, 1852, in *Sutherland's Jour.*, vol. 2, *Devonian*.
oneidense, Walcott, 1879, *Trans. Alb. Inst.*, vol. x, p. 22, *Utica Slate Gr.*
ontario, Clarke, 1885, *Bull. U. S. Geo. Sur.*, No. 16, p. 51, *Chemung Gr.*
oppletum, Hall, 1879, *Pal. N. Y.*, vol. 5, p. 248, *Schoharie grit.*
ordinatum, Billings, 1865, *Pal. Foss.*, vol. 1, p. 350, *Calciferous Gr.*
ortoni, Meek, 1872, *Proc. Acad. Nat. Sci. Phil.*, p. 330, and *Ohio Pal.*, vol. 1, p. 155, *Hud. Riv. Gr.*
orus, Hall, 1877, 1st Ed. *Am. Pal. Foss.*, p. 245, *Niagara Gr.* Proposed instead of *O. columnare*, Hall, 1860, which was preoccupied.
ottawense, Billings, 1857, *Rep. of Progr. Geo. Sur. Can.*, p. 331, *Black Riv. and Trenton Grs.*
ozarkense, Shumard, 1863, *Trans. St. Louis Acad. Sci.*, vol. 2, p. 107, *Calciferous Gr.*
pacator, Hall, 1879, *Pal. N. Y.*, vol. 5, p. 307, *Portage Gr.*
palmatum, Hall, 1879, *Pal. N. Y.*, vol. 5, p. 312, *Chemung Gr.*
pauciseptum, Hall, 1859, *Pal. N. Y.*, vol. 3, p. 346, *Low. Held. Gr.*
pelops, Hall, 1862, 15th *Rep. N. Y. Mus. Nat. Hist.*, p. 73, and *Pal. N. Y.*, vol. 5, pt. 2, p. 233, *Schoharie grit.*
pelops var. ohioense, Hall, 1876, *Illust. Devonian Foss.*, pl. 36, and *Pal. N. Y.*, vol. 5, pt. 2, p. 236, *Up. Held. Gr.*
perannulatum, Billings, 1857, *Rep. of Progr. Geo. Sur. Can.*, p. 319. This name was preoccupied by Portlock in 1843. See *O. crocus*.
perelegans, Salter, 1848, *Mem. Geo. Sur. Gr. Brit.*, vol. 2, p. 354, *Ham. Gr.*
perparvum, Billings, 1862, *Pal. Foss.*, vol. 1, p. 27, *Black Riv. Gr.*
perseus, Billings, 1865, *Pal. Foss.*, vol. 1, p. 313, *Quebec Gr.*
persiphonatum, Billings, 1857, *Rep. of Progr. Geo. Sur. Can.*, p. 329, *Mid. Sil.* If the genus *Huronia* is valid, this species will belong to it.
perstriatum, Hall, 1859, *Pal. N. Y.*, vol. 3, p. 346, *Low. Held. Gr.*
perstrictum, Dawson, 1868. The name was preoccupied by Barrande. See *O. dawsonianum*.
pertextum, Hall, 1879, *Pal. N. Y.*, vol. 5, p. 314, *Chemung Gr.*
pertinax, Billings, 1860, *Can. Nat. and Geo.*, vol. 5, p. 75, *Black Riv. Gr.*
pervicax, Hall, 1879, *Pal. N. Y.*, vol. 5, p. 257, *Schoharie grit.*
pileolum, Billings, 1866, *Catal. Sil. Foss. Antic.*, p. 58, *Medina Gr.*
piscator, Billings, 1865, *Pal. Foss.*, vol. 1, p. 251, *Quebec Gr.*
viso, Billings, 1862, *Pal. Foss.*, vol. 1, p. 168, *Hud. Riv. Gr.*
planoconvexum, Hall, 1861, *Rep. of Progr. Wis.*, p. 47, and *Geo. Wis.*, vol. 4, p. 228, *Black Riv. and Trenton Grs.*
pravum, Hall, 1879, *Pal. N. Y.*, vol. 5, p. 255, *Schoharie grit.*
pressum, Rogers, 1868, *Bigsby, Thesaurus Siluricus*, p. 180. Not defined.
priamus, Billings, 1865, *Pal. Foss.*, vol. 1, p. 253, *Quebec Gr.*
primigenium, Vanuxem, 1842, *Geo. Rep. N. Y.*, p. 36, and *Pal. N. Y.*, vol. 1, p. 13, *Calciferous Gr.*
procerum, Hall, 1876, *Illust. Devonian Foss.*, pl. 35, and *Pal. N. Y.*, vol. 5, pt. 2, p. 249, *Schoharie grit.*

- profundum*, Hall, 1862, 15th Rep. N. Y. Mus. Nat. Hist., p. 76, Up. Held. Gr.
propinquum, Billings, 1857, Rep. of Progr. Geo. Sur. Can., p. 320. Preoccupied. See *O. fulgur*.
punctostriatum, Hall, 1860, Can. Nat. and Geo., vol. 5, p. 154, Up. Sil.
pustulosum, Winchell, 1866, Rep. Low. Peninsula Mich., p. 97, Ham. Gr.
pylades, Billings, 1866, Catal. Sil. Foss. Antic., p. 84, Niagara Gr.
python, Billings, 1857, Rep. of Progr. Geo. Sur. Can., p. 335, Trenton Gr.
randolphense, Worthen, 1882, Bull. No. 1, Ill. St. Mus. Nat. Hist., p. 38, Kaskaskia Gr. Proposed instead of *O. annulato-costatum*, Meek & Worthen, which was preoccupied.
rapax, see *Endoceras rapax*.
raptor, Billings, 1866, Catal. Sil. Foss. Antic., p. 57, Medina Gr.
recedens, Barrande, 1869, Sys. Sil. de Boh., 4me ser., p. viii, pl. 433, Quebec Gr.
rectianulatum, Hall, 1847, Pal. N. Y., vol. 1, p. 34, Chazy and Birdseye Grs.
recticameratum, Hall, 1847, Pal. N. Y., vol. 1, p. 46, Birdseye Gr.
rectum, Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 504, Niagara Gr.
remus, Billings, 1866, Catal. Sil. Foss. Antic., p. 85, Niagara Gr.
repens, Billings, 1865, Pal. Foss., vol. 1, p. 312, Quebec Gr.
reticulatum, Phillips, 1836, Geol. York., Chemung Gr. Not clearly identified in this country.
rigidum, Hall, 1859, Pal. N. Y., vol. 3, p. 344, Low. Held. Gr.
robustum, Winchell, 1862, Am. Jour. Sci., 2d ser., vol. 33, p. 356, Marshall Gr.
robustum, Hall, 1876. The name was preoccupied. See *O. eriense*.
rotulatum, Billings, 1857, Rep. of Progr. Geo. Sur. Can., p. 334, Niagara Gr.
rude, Hall, 1859, Pal. N. Y., vol. 3, p. 346, Low. Held. Gr.
rudens, Beecher, 1888, Pal. N. Y., vol. 7, p. 28, Ham. Gr.
rudicula, Hall, 1876, Illust. Devonian Foss., pl. 37, and Pal. N. Y., vol. 5, pt. 2, p. 268, Up. Held. Gr.
rushense, McChesney, 1860, New Pal. Foss., p. 68, and Geo. Sur. Ill., vol. 5, p. 612, Coal Meas.
sayi, Billings, 1865, Pal. Foss., vol. 1, p. 315, Quebec Gr.
scammoni, McChesney, 1861, New Pal. Foss., p. 92, Niagara Gr.
sceptrum, Beecher, 1888, Pal. N. Y., vol. 7, p. 26, Up. Held. Gr.
scintilla, Hall, 1879, Pal. N. Y., vol. 5, p. 293, Ham. Gr.
sedgwicki, Billings, 1857, Rep. of Progr. Geo. Sur. Can., p. 320, Hud. Riv. Gr.
selwyni, Billings, 1862, Pal. Foss., vol. 1, p. 161, Guelph Gr.
servile, Billings, 1865, Pal. Foss., vol. 1, p. 252, Quebec Gr.
shumardi, Billings, 1859, Can. Nat. and Geo., vol. 4, p. 460, Chazy Gr.
sicinus, Hall, 1879, Pal. N. Y., vol. 5, p. 301, Marcellus Shale.
sieboldi, Billings, 1866, Catal. Sil. Foss. Antic., p. 23, Hud. Riv. and Anticosti Grs.
simpsoni, Billings, 1859, Rep. of Progr. Assiniboine and Saskatchewan Ex. Exp., p. 186, Silurian.
simulator, Hall, 1876, 28th Rep. N. Y. Mus. Nat. Hist., p. 179, Niagara Gr.
sirpus, Hall, 1879, Pal. N. Y., vol. 5, p. 269, Up. Held. Gr.
sociale, Hall, 1877, 1st Ed. Am. Pal. Foss., p. 245, Hud. Riv. Gr. Proposed instead of *O. gregarium*, Hall, 1861, which was preoccupied.
sordidum, Billings, 1859, Can. Nat. and Geo., vol. 4, p. 363, Calciferous Gr.
spissiseptum, Dwight, 1884, Am. Jour. Sci. and Arts, 3d. ser., vol. 27, p. 256, Calciferous Gr.
spissum, Hall, 1879, Pal. N. Y., vol. 5, p. 287, Ham. Gr.
stebos, Clarke, 1885, Bull. U. S. Geo. Sur., No. 16, p. 29, Genesee Shale.
striatum, (?) Sowerby, 1812, Min. Conch., vol. 1, p. 129, Devonian.
strielineatum, McChesney, 1861, New Pal. Foss., p. 94, Niagara Gr.
strigatum, Hall, 1847, Pal. N. Y., vol. 1, p. 205, Trenton Gr.
strix, Hall & Whitfield, 1875, Ohio Pal., vol. 2, p. 149, Niagara Gr.
stylus, Hall, 1877, 1st Ed. Am. Pal. Foss., p. 245, and Pal. N. Y., vol. 5, pt. 2, p. 253, Schoharie grit. Proposed instead of *O. baculum*, Hall, 1862, which was preoccupied.
subarcuatum, Hall, 1847, Pal. N. Y., vol. 1, p. 34. Preoccupied by Portlock in 1843. See *O. clintoni*.
subbaculum, Meek & Worthen, 1865, Proc. Acad. Nat. Sci., p. 256, Niagara Gr.
subcancellatum, Hall, 1877, 1st Ed. Am. Pal. Foss., p. 245, Niagara Gr. Proposed instead of *O. cancellatum*, Hall, 1852, which was preoccupied.
sublève, D'Orbigny, 1850, Prodrome de Pal., t. 1, p. 28, Onondaga Gr. Proposed instead of *O. læve*, Hall, 1843, which was preoccupied.
subtextile, Hall, 1859, Pal. N. Y., vol. 3, p. 344, Low. Held. Gr.
subulatum, Hall, 1843, 4th Dist. Geo. Rep. N. Y., p. 180, and Pal. N. Y., vol. 5, pt. 2, p. 283, Marcellus Shale.
swallowanum, S. A. Miller, 1883, 2d Ed. Am. Pal. Foss., p. 308, Coal Measures in the Valley of Verdigris in Kansas. Proposed instead of *O. moniliforme*, Swallow, in Trans. St. Louis Acad. Sci., vol. 1, p. 200, which was preoccupied by Hall.
tantalus, Hall, 1879, Pal. N. Y., vol. 5, p. 241, Schoharie grit.
telamon, Hall, 1879, Pal. N. Y., vol. 5, p. 291, Ham. Gr.

tener, Hall, 1879, Pal. N. Y., vol. 5, p. 285, Ham. Gr.
 tenerum, Billings, 1860, Can. Nat. and Geo., vol. 5, p. 174, Black Riv. Gr.
 tenui-annulatum, Hall, 1859, Pal. N. Y., vol. 3, p. 345, Low. Held. Gr.
 tenuiseptum, Hall, 1847, Pal. N. Y., vol. 1, p. 35, Chazy Gr.
 teretiforme, Hall, 1847, Pal. N. Y., vol. 1, p. 198, Trenton Gr.
 tersum, Hall, 1879, Pal. N. Y., vol. 5, p. 286, Ham. Gr.
 tetricum, Hall, 1862, 15th Rep. N. Y. Mus. Nat. Hist., p. 45, and Pal. N. Y., vol. 5, pt. 2, p. 251, Schoharie grit.
 textile, Hall, 1847, Pal. N. Y., vol. 1, p. 199, Trenton Gr.
 textum, Hall, 1879, Pal. N. Y., vol. 5, p. 285, Ham. Gr.
 thestor, Hall, 1879, Pal. N. Y., vol. 5, p. 302, Marcellus shales.
 thos, Hall, 1862, 15th Rep. N. Y. Mus. Nat. Hist., p. 75, and Pal. N. Y., vol. 5, pt. 2, p. 61, Schoharie grit.
 thyestes, Hall, 1879, Pal. N. Y., vol. 5, p. 306, Portage Gr.
 tityrus, Billings, 1865, Pal. Foss., vol. 1, p. 316, Quebec Gr.
 transversum, S. A. Miller, 1875, Cin. Quar. Jour. Sci., vol. 2, p. 129, Hud. Riv. Gr.

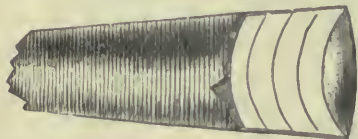


FIG. 755.—*Orthoceras transversum*.

trentonense, see *Cyrtoceras trentonense*.
 turbidum, Hall & Whitfield, 1875, Ohio Pal., vol. 2, p. 100, Hud. Riv. Gr.
 typus, Saemann, as identified by Hall, 1876, Illust. Devonian Foss., is *O. marcellense*.
 undulatum, Owen, 1840, Rep. on Min. Lands, Niagara Gr. The name was preoccupied by Sowerby in 1812. See *O. iowense*.
 undulostriatum, Hall, 1847, Pal. N. Y., vol. 1, p. 202, Trenton Gr.
 unionense, Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 505, Niagara Gr.
 varro, Billings, 1866, Catal. Sil. Foss. Antic., p. 84, Niagara Gr.
 varum, Hall, 1879, Pal. N. Y., vol. 5, p. 259, Schoharie grit.
 vastator, Hall, 1879, Pal. N. Y., vol. 5, p. 243, Schoharie grit. Correct in the index, but printed *O. obliquum*, on page 243.
 velox, Billings, 1865, Pal. Foss., vol. 1, p. 173, Chazy Gr.
 vertebrate, Hall, 1847, Pal. N. Y., vol. 1, p. 201. Preoccupied by Schlotheim in 1820, and by Eichwald in 1840. See *O. olorus*.
 veterator, Billings, 1865, Pal. Foss., vol. 1, p. 350, Calciferous Gr.
 viator, Hall, 1879, Pal. N. Y., vol. 5, p. 270, Up. Held. Gr.

vinchellanum, S. A. Miller, 1883, 2d Ed. Am. Pal. Foss., p. 308, Marshall Gr. in Southern Michigan. Proposed instead of *O. occidentale*, Winchell, 1862, Am. Jour. Sci. and Arts, 2d ser., vol. 33, p. 356, which was preoccupied by Swallow.
 vindobonense, Dawson, 1868, Acad. Geol., p. 311, Carboniferous.
 virgatum, Sowerby, 1839, Murch. Sil. Sys., p. 632, and Pal. N. Y., vol. 2, p. 291, Niagara Gr.
 virgulatum, Hall, 1852, Pal. N. Y., vol. 2, p. 96, Clinton and Niagara Grs.
 vittatum, Sandberger. Not American.
 vulgatum, Billings, 1857, Rep. of Progr. Geo. Sur. Can., p. 337, Trenton Gr.
 warrenense n. sp., Chemung Gr. Proposed instead of *O. cochleatum*, Hall, Pal. N. Y., vol. 5, p. 308, pl. cxliii, fig. 19, which name was preoccupied.
 wauwatosense, Whitfield, 1880, Ann. Rep. Geo. Sur. Wis., p. 66, and Geo. Wis., vol. 4, p. 297, Niagara Gr.
 whitii, Winchell, 1863, Proc. Acad. Nat. Sci., p. 22, Kinderhook Gr.
 winchelli, Meek & Worthen, 1866, Proc. Acad. Nat. Sci. Phil., p. 257, and Geo. Sur. Ill., vol. 6, p. 512, Ham. Gr.
 woodworthi, McChesney, 1865, New Pal. Foss., p. 53, Niagara Gr. Proposed instead of *O. irregulare*, which was preoccupied.
 xerxes, Billings, 1865, Pal. Foss., vol. 1, p. 316, Quebec Gr.
 xiphias, Billings, 1857, Rep. of Progr. Geo. Sur. Can., p. 318, Trenton Gr.
 zeus, Hall, 1879, Pal. N. Y., vol. 5, pt. 2, p. 235, Schoharie grit.

PETALICHNUS, S. A. Miller, 1880, Jour. Cin. Soc. Nat. Hist., vol. 2, p. 221. [Ety. *petalos*, spread out; *ichnos*, track.] A wide trail composed of numerous transversely elongated depressions arranged without order. Type *P. multipartitus*.
 multipartitus, S. A. Miller, 1880, Jour. Cin. Soc. Nat. Hist., vol. 2, p. 222, Utica Slate Gr.

PHRAGMOCERAS, Broderip, 1839, Murch. Sil. Syst., p. 621. [Ety. *phragmos*, partition; *keras*, horn.] Shell short, arched, compressed, more or less conical; sides of the mouth lapping toward each other; septa simple, crossed by the sigmoidal lines of growth; siphuncle on the internal edge, dilate between the septa. Type *P. arcuatum*.
 byronense, Wor-then, 1875, hector. Cast of interior. Geo. Sur. Ill., vol. 6, p. 506, Niagara Gr.

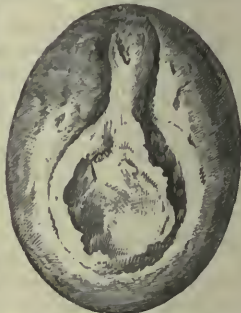


FIG. 756.—*Phragmoceras byronense*, Wor-then, 1875, hector. Cast of interior. Geo. Sur. Ill., vol. 6, p. 506, Niagara Gr.

ellipticum, Hall & Whitfield, 1875, Ohio Pal., vol. 2, p. 152, Niagara Gr.
 expansum, Winchell, 1863, Proc. Acad. Nat. Sci., p. 23, Kinderhook Gr.
 hector, Billings, 1862, Pal. Foss., vol. 1, p. 163, Guelph Gr.
 hoyi, Whitfield, 1878, Ann. Rep. Geo. Sur. Wis., p. 86, and Geo. Wis., vol. 4, p. 300, Niagara Gr.



FIG. 757.—Phragmoceras hector. Side view.

hoyi var. compressum, Whitfield, 1878, Ann. Rep. Geo. Sur. Wis., p. 82, and Geo. Wis., vol. 4, p. 301, Niagara Gr.
 labiatum, Whitfield, 1878, Ann. Rep. Geo. Sur. Wis., p. 86, and Geo. Wis., vol. 4, p. 302, Niagara Gr.
 nestor, Hall, 1867, 20th Rep. N. Y. Mus. Nat. Hist., p. 405, Niagara Gr.
 nestor var. canadense, Whiteaves, 1884, Pal. Foss., vol. 3, p. 39, Guelph Gr.
 parvum, Hall & Whitfield, 1875, Ohio Pal., vol. 2, p. 151, Niagara Gr.
 prematurem, Billings, 1866, Can. Nat. and Geo., vol. 5, p. 173, Black Riv. and Trenton Grs. Type of Hyatt's genus Mænoceras.



FIG. 758.—Piloceras wortheni.

spinusum, see Gyroceras spinosum.
 walshi, Meek & Worthen, 1866, Proc. Acad. Nat. Sci. Phil., p. 257, and Geo. Sur. Ill., vol. 6, p. 511, Ham. Gr.

PILOCERAS, Salter, 1859, Quar. Jour. Geo. Soc., vol. 15, p. 376. [Ety. *pilos*, a cap; *keras*, horn.] Broad, conical, slightly curved, subcylindrical or compressed; siphuncle and septa combined as a series of conical, concave septa, which fit into each other sheathwise. Type *P. invaginatum*.

amplum, Dawson, 1881, Can. Nat., vol. 10, p. 1, Calciferous Gr.

canadense, Billings, 1860, Can. Nat. and Geol., vol. 5, p. 171, Calciferous Gr.
 explanator, Whitfield, 1886, Bull. Am. Mus. Nat. Hist., vol. 1, p. 323, Birdseye Gr.
 gracile, Billings, 1865, Pal. Foss., vol. 1, p. 257, Quebec Gr.
 triton, Billings, 1865, Pal. Foss., vol. 1, p. 257, Quebec Gr.
 wortheni, Billings, 1865, Pal. Foss., vol. 1, p. 256, Quebec Gr.

Polygonites haani, Troost, 1840, 5th Geo. Rep. Tenn., Devonian. Not clearly defined, but probably a Gyroceras.

PTERONAUTILUS, Meek, 1864, Pal. of Up. Mo., p. 64. [Ety. *pteron*, wing; *Nautilus*, a genus.] Shell with the involute body portion comparatively very small, and globular in form, scarcely umbilicate; outer chamber very large, and deflected from the involute body, its inner or ventral side being widely open, and the lateral margins greatly dilated, so as to form a very large, wing-like expansion on each side. Type *P. seebachanus*.
 seebachanus, Geinitz, (Nautilus seebachanus,) Carb. und Dyas, p. 43, Permian Gr.

SÆRICHNITES, Billings, 1866, Catal. Sil. Foss. Antic., p. 73. The author supposed the tracks might have been made by a species of Cephalopoda. They consist of two parallel rows of semicircular or subquadrate pits; each pit is about one-half inch in diameter, and separated from the succeeding one by about one-fourth of an inch. Type *S. abruptus*.
 abruptus, Billings, 1866, Catal. Sil. Foss. Antic., p. 73, Hud. Riv. Gr.

Sidemina infundibuliforme, Castelnau, 1843, Syst. Sil., p. 33. Probably the fragment of an Endoceras.

SOLENOCHILUS, Meek & Worthen, 1870, Proc. Acad. Nat. Sci. Phil., vol. 20, p. 47. [Ety. *solen*, a channel; *cheilos*, a lip.] Nautiloid in form, with small siphuncle in contact, or nearly in contact, with the outer shell; margins of the lip near the umbilicus, terminating in spout-like auricles. Type *S. collectum*.

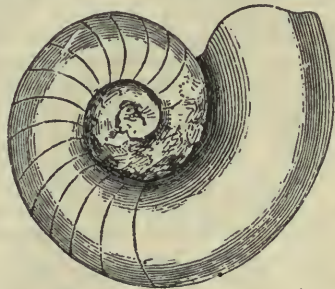


FIG. 759.—Solenochilus avonense.

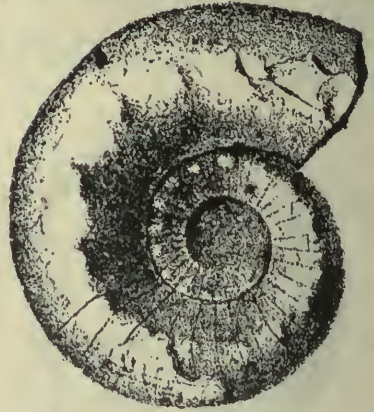
avonense, Dawson, 1868, (Nautilus avonensis,) Acad. Geol., p. 311, Carboniferous.

- capax, Meek & Worthen, 1865, (Cryptoceras capax,) Proc. Acad. Nat. Sci. Phil., p. 262, and Geo. Sur. Ill., vol. 6, p. 532, Coal Meas.
- collectum, Meek & Worthen, 1870, Proc. Acad. Nat. Sci. Phil., p. 48, and Geo. Sur. Ill., vol. 5, p. 544, St. Louis Gr.
- indianense, Worthen, (in press,) Geo. Sur. Ill., vol. 8, p. 150, St. Louis Gr.
- leidyi, Meek & Worthen, 1865, (Nautilus leidy,) Proc. Acad. Nat. Sci. Phil., p. 262, and Geo. Sur. Ill., vol. 5, p. 524, Keokuk Gr.
- springeri, White & St. John, 1868, (Nautilus springeri,) Trans. Chi. Acad. Sci., vol. 1, p. 124, Up. Coal Meas.
- Spirula*, Lamarck, 1801, Syst. An. sans Vert.
- mortoni*, Troost, 1840, 5th Geo. Rep. Tenn., Niagara Gr. Not clearly defined.
- STREPTOCERAS, Billings, 1866, Catal. Sil. Foss. Antic., p. 88. [Ety. *streptos*, twisted; *keras*, horn.] Having the general form of *Oncoceras*, but with a trilobed aperture resembling *Phragmoceras*. Type *S. janus*.
- heros, Billings, 1866, Catal. Sil. Foss. Antic., p. 89, Niagara Gr.
- janus, Billings, 1866, Catal. Sil. Foss. Antic., p. 88, Niagara Gr.

FIG. 760.—Aperture of *Streptoceras janus*.

- TEMNOCHILUS, McCoy, 1844, Synop. Carb. Foss. Ireland, p. 20. [Ety. *temno*, I divide; *cheilos*, lip.] Nautiloid in form, and characterized by a broad, deep, open umbilicus, showing all the volutions, with the outer side of the volutions broad or flattened, and the middle of each lateral margin prominently angular; the angle being sometimes nodose, while the transverse diameter of the volutions is always greater than the dorso-ventral; siphuncle between the middle and the outer side of the whorls. Type *T. biangulatus*.
- coxanum, Meek & Worthen, 1869, Proc. Acad. Nat. Sci. Phil., p. 50, and Geo. Sur. Ill., vol. 5, p. 543, St. Louis Gr.
- latum, Meek & Worthen, 1870, Proc. Acad. Nat. Sci. Phil., p. 49, and Geo. Sur. Ill., vol. 5, p. 608, Coal Meas.

- niotense, Meek & Worthen, 1865, Proc. Acad. Nat. Sci. Phil., p. 260, and Geo. Sur. Ill., vol. 5, p. 523, Keokuk Gr.
- Type of Hyatt's genus *Edaphoceras*.

FIG. 761.—*Temnochilus coxanum*.

- peramplum, Meek & Worthen, 1865, (*Endolobus peramplum*,) Proc. Acad. Nat. Sci. Phil., p. 259, Kaskaskia Gr.
- scottense, Worthen, (in press,) Geo. Sur. Ill., vol. 8, p. 151, Warsaw Gr.
- spectabile, Meek & Worthen, 1860, (*Nautilus spectabilis*,) Proc. Acad. Nat. Sci. Phil., p. 469, and Geo. Sur. Ill., vol. 2, p. 308, Kaskaskia Gr.
- winslowi, Meek & Worthen, 1870, Proc. Acad. Nat. Sci. Phil., p. 50, and Geo. Sur. Ill., vol. 5, p. 609, Coal Meas.
- TERATICHNUS, S. A. Miller, 1880, Jour. Cin. Soc. Nat. Hist., vol. 2, p. 221. [Ety. *teras*, a wonder; *ichnos*, track.] A track supposed to have been made by a cephalopod, and consisting of numerous elongated, more or less bifurcated impressions. Type *T. confertus*.
- confertus, S. A. Miller, 1880, Jour. Cin. Soc. Nat. Hist., vol. 2, p. 221, Utica Slate Gr.
- TRACHOMATICHNUS, S. A. Miller, 1880, Jour. Cin. Soc. Nat. Hist., vol. 2, p. 219. [Ety. *trachoma*, that which is made rough; *ichnos*, track.] A track supposed to have been made by a cephalopod and consisting of numerous simple or compound impressions arranged in two series. Type *T. numerosus*.
- cincinnatiensis, S. A. Miller, 1880, Jour. Cin. Soc. Nat. Hist., vol. 2, p. 220, Utica Slate Gr.
- numerosus, S. A. Miller, 1880, Jour. Cin. Soc. Nat. Hist., vol. 2, p. 219, Utica Slate Gr.
- permultus, S. A. Miller, 1880, Jour. Cin. Soc. Nat. Hist., vol. 2, p. 220, Utica Slate Gr.
- TREMATOCERAS, Whitfield, 1882, Ann. N. Y. Acad. Sci., vol. 2, p. 205. [Ety. *trema*,

hole; *keras*, horn.] Shell straight, obconical, like *Orthoceras* as to tube, septa, and siphuncle; characterized by a line of elongated, raised tubercles along one side of the shell, which at one stage of growth formed perforations, which were closed as the animal extended the shell. Type *T. ohioense*.
ohioense, Whitfield, 1882, Ann. N. Y. Acad. Sci., vol. 2, p. 206, Up. Held. Gr.
TREMATODISCUS, Meek & Worthen, 1861, Proc. Acad. Nat. Sci. Phil., p. 147. [Ety. *trema*, hole; *diskos*, quoit.] Discoid, wide, shallow, umbilicus, perforated in the middle, showing all the whorls; whorls slender, merely in contact possessed of revolving angles, grooves, or striae; siphuncle central or subcentral on the dorsal side. Type *T. stygialis*. The name having been used in 1860 by Haeckel for Radiolaria, Hyatt proposed *Trematoceras*.
altidorsalis, Winchell, 1862, Proc. Acad. Nat. Sci., p. 429, Marshall Gr.
digonus, Meek & Worthen, 1860, (*Nautilus digonus*.) Proc. Acad. Nat. Sci., p. 470, and Geo. Sur. Ill., vol. 2, p. 163, Kinderhook Gr.
discoidalis, Winchell, 1862, Am. Jour. Sci., vol. 33, 2d series, p. 360, Marshall Gr.
konincki, Wetherby, 1881, Jour. Cin. Soc. Nat. Hist., vol. 4, p. 79, Waverly Gr.

FIG. 762.—*Trematodiscus konincki*.

meekanus, Winchell, 1862, Am. Jour. Sci., 2d series, vol. 33, p. 360, Marshall Gr.
planidorsalis, Winchell, 1862, Am. Jour. Sci., 2d series, vol. 33, p. 358, Marshall Gr.
rockymontanus, S. A. Miller, 1881, Jour. Cin. Soc. Nat. Hist., vol. 4, p. 312, Burlington Gr.
striatulus, Winchell, 1862, Proc. Acad. Nat. Sci., 2d series, vol. 33, p. 358, Marshall Gr.
strigatus, Winchell, 1862, Proc. Acad. Nat. Sci., p. 426, Marshall Gr.

sulcatus, Meek & Worthen, 1866, Proc. Acad. Nat. Sci. Phil., p. 274, Kaskaskia Gr.
trigonus, Winchell, 1862, Am. Jour. Sci., 2d series, vol. 33, p. 358, Marshall Gr.
trisulcatus, Meek & Worthen, 1860, Proc. Acad. Nat. Sci. Phil., p. 470, and Geo. Sur. Ill., vol. 2, p. 162, Kinderhook Gr.
TROCHOCERAS, Hall, 1852, Pal. N. Y., vol. 2, p. 335. [Ety. *trochos*, hoop; *keras*, horn.] This name was proposed by Barrande at about the same time. Turbinate or trochiform, spire elevated, more or less ventricose; umbilicated; aperture rounded or round oval; volutions above the outer one septate; siphuncle submarginal or dorsal. Type *T. gebhardi*.
aeneas, Hall, 1870, Rev. Ed. 20th Rep. N. Y. Mus. Nat. Hist. Expl., pl. 25, Niagara Gr.
baeri, see *Gyroceras baeri*.
barrandii, Hall, 1879, Pal. N. Y., vol. 5, p. 398, Schoharie grit.
biton, Hall, 1879, Pal. N. Y., vol. 5, p. 395, Schoharie grit.
clio, Hall, 1861, 14th Rep. N. Y. Mus. Nat. Hist., p. 108, Schoharie grit. Type of Hyatt's genus *Sphyrdoceras*.
costatum, Hall, 1861, Geo. Rep. of Wis., Niagara Gr.
desplainense, McChesney, 1860, New Pal. Foss., p. 68, Niagara Gr.
discoideum, Hall, 1862, 15th Rep. N. Y. Mus. Nat. Hist., p. 64, and Illust. Devon. Foss., pl. 59, Schoharie grit.
eugenium, Hall, 1861, 14th Rep. N. Y. Mus. Nat. Hist., p. 108, Schoharie grit. Type of Hyatt's genus *Nædoceras*.
expansum, Hall, 1879, Pal. N. Y., vol. 5, p. 402, Schoharie grit.
gebhardi, Hall, 1852, Pal. N. Y., vol. 2, p. 335, Coralline Gr.
incipiens, Barrande, 1869, Syst. Sil. de Boh., 4me ser., Quebec Gr.
notum, Hall, 1867, 20th Rep. N. Y. Mus. Nat. Hist., p. 403, Niagara Gr.
obliquatum, Hall, 1876, Illust. Devonian Foss., pl. 48, Up. Held. Gr.
orion, Hall, 1876, (*Cyrtoceras orion*.) Illust. Devonian Foss., pl. 48, Up. Held. Gr.
pandion, Hall, 1876, Illust. Devonian Foss., pl. 48, and Pal. N. Y., vol. 5, pt. 2, p. 400, Schoharie grit.
pandum, Hall, 1879, Pal. N. Y., vol. 5, p. 403, Schoharie grit.
turbinatum, Hall, 1852, Pal. N. Y., vol. 2, p. 336, Coralline Gr.
waldronense, Hall, 1876, 28th Rep. N. Y. Mus. Nat. Hist., p. 179, Niagara Gr.

FIG. 763.—*Trochoceras waldronense*.

TROCHOLITES, Conrad, 1838, Ann. Geo. Rep. N. Y., p. 119. [Ety. *trochos*, hoop; *lithos*, stone.]



FIG. 764.—Trocholites ammonius.

Discoidal volutions in the same plane, about four, rounded, slightly concave on the ventral side, gradually enlarging toward the aperture; septa direct; outer chamber large; siphuncle ventral. Type *T. ammonius*. ammonius, Conrad, 1838, Ann. Geo. Rep. N. Y., p. 119, and Pal. N. Y., vol. 1, p. 192, Trenton, Utica, and Hud. Riv. Grs. circularis, Miller & Dyer, 1878, Cont. to Pal., No. 2, p. 9, Hud. Riv. Gr.

minusculus, Miller & Dyer, 1878, Cont. to Pal. No. 2, p. 9, Utica Slate Gr.



FIG. 765.—Trocholites circularis.

planorbiformis, Conrad, 1842, Jour. Acad. Nat. Sci. Phil., vol. 8, p. 274, and Pal. N. Y., vol. 1, p. 310, Utica and Hud. Riv. Grs.

CLASS LAMELLIBRANCHIATA.

[Ety. *lamella*, a thin plate; *branchiæ*, gills.]

THE Lamellibranchiata, Blainville, or Conchifera, Lamarck, have bivalve shells, abound in the rivers of North America, in every ocean, and were common in all geological ages, back to early Silurian time. The river shells are known by the common name of mussels, and nearly all belong to three genera, *Unio*, *Anodonta*, and *Margaritana*. All known Palæozoic shells of this class inhabited salt water. The animals have a bilobed mantle, the sides of which secrete a calcareous shell having two valves, which are attached by some kind of a hinge. The hinge frequently has teeth on one valve that fit in cavities on the other. The valves being on each side of the animal, one is a right valve and the other a left valve. In most genera the valves are equal, and the animals lived in an erect position, resting on the edge of the shell opposite to the hinge, and, when moving, plowed a furrow in the sand or mud by the extension of a tongue-like foot. In some genera one valve is much larger than the other, and the shell lies on the larger valve, and adheres to some foreign object, as is the case with the common oyster; in other instances the locomotion is by suddenly opening and closing the valves, which causes the shell to dart through the water, first in one direction and then another, as the *Pecten* does. Some genera have a byssus by which they are attached to submarine bodies. Each valve commences to grow at the apex or beak, which is also called the *umbo*. The umbones are almost always directed toward the ante-

rior side of the shell, and sometimes project as far as the anterior margin. The length of a shell is the distance from the anterior to the posterior side; the width is measured from the hinge or dorsal side to the base; the thickness is measured through the center of the two valves. The surface of the shells is generally marked with ribs, radiating from the umbones, or concentric lines marking the growth of the shell from the umbones. A depression, anterior to the beak, is called a lunule, and when a depression exists posterior to the beak, it is called an escutcheon. Many shells have an external hinge ligament behind the umbones; some have a ligament between the umbones. When the valves are connected internally by a single muscle, the contraction of which brings the valves together, they belong to the Order Monomyaria; if there are two equally developed contracting mussels, they belong to the Dimyaria; or if there are two muscles, one large and functionally active, the other small, they belong to the Heteromyaria. These contracting muscles are called the adductors, and their places of attachment are indicated by scars. The border of the mantle makes an impression, which is called the pallial line, and if there is a sinus in the posterior part of the pallial line, it shows the animal had a retractile siphon, which, in burrowing shells, is often of great length. The Class has also been divided into two Orders, based on the presence or absence of a siphon, to wit: Asiphonida, Asiphonata, or Asiphonophora, and Siphonida, Siphonata, or Siphonophora. Each Order is spelled three different ways by different authors. Shells having a siphon are always gaping at the posterior or anterior side or at both.

It will be observed from the foregoing, the essential characters upon which Palæozoic shells are classified are the following: Equality or inequality of the valves; the presence or absence of an external ligament; the number of muscular scars; the character of the hinge and its dentition; the presence or absence of a pallial sinus; the position of the umbones; the radiate or concentric surface markings; whether the valves fit each other or are gaping at one or both ends; and the presence or absence of a byssal sinus.

ORDER ASIPHONIDA.

Ambonychiidæ, Amphicæliidæ, Anodontopsidæ, Arcidæ, Aviculidæ, Aviculopectenidæ, Cytherodontidæ, Modiomorphidæ, Mytilidæ, Nuculidæ, Nyassidæ, Orthotidæ, Ostreidæ, Palæoconchidæ, Pinnidæ, Prothyridæ, Pteriniidæ, Technophoridæ, Trigoniidæ, Unionidæ.

ORDER SIPHONIDA.

Cardiidæ, Cardiomorphidæ, Conocardiidæ, Cyprinidæ, Eopteriidæ, Grammysiidæ, Lucinidæ, Myacidæ, Palæanatinidæ, Pholadellidæ, Sanguinolitidæ, Solenidæ, Spirodomidæ, Tellinidæ.

FAMILY AMBONYCHIIDÆ.—Ambonychia, Angellum, Anomalodonta, Byssopteria.

FAMILY AMPHICÆLIIDÆ.—Amphicælia.

FAMILY ANODONTOPSIDÆ.—Anodontopsis, Cycloconcha.

FAMILY ARCIDÆ.—Carbonarca, Clinopistha, Macrodon, Megalomus, Ptychodesma.

- FAMILY AVICULIDÆ.—Actinodesma, Avicula, Aviculopinna, Bakevella, Ectenodesma, Glyptodesma, Inoceramus, Liopteria, Leptodesma, Limoptera, Monopteria, Monotis, Palæopinna, Posidonomya, Pseudomonotis, Pteronitella, Pteronites.
- FAMILY AVICULOPECTENIDÆ.—Aviculopecten, Crenipecten, Euchondria, Lyriopecten, Pernopecten, Pterinopecten, Streblopteria.
- FAMILY CARDIIDÆ.—Cardiola, Cardiopsis, Cardium, Dexiobia, Glyptocardia, Lunulicardium, Palæocardia, Panenka, Paracardium, Pararca.
- FAMILY CARDIOMORPHIDÆ.—Cardiomorpha, Edmondia, Euthydesma, Protomya.
- FAMILY CHÆNOCARDIIDÆ.—Chænocardia.
- FAMILY CONOCARDIIDÆ.—Conocardium.
- FAMILY CYPRINIDÆ.—Astartella, Cardinia, Clidophorus, Cypricardia, Cypricardites, Matheria, Pleurophorus, Vanuxemia.
- FAMILY CYTHERODONTIDÆ.—Cytherodon, Lyrodesma, Schizodus.
- FAMILY EOPTERIIDÆ.—Eopteria, Euchasma.
- FAMILY GRAMMYSIIDÆ.—Allorisma, Chænomya, Cuneameya, Grammysia, Lepedomus, Sedgwickia.
- FAMILY LUCINIDÆ.—Paracylas.
- FAMILY MODIOMORPHIDÆ.—Amnigenia, Cypricardella, Elymella, Goniophora, Glossites, Modiomorpha.
- FAMILY MYACIDÆ.—Anthracomya.
- FAMILY MYTILIDÆ.—Anthracoptera, Gosselettia, Lithophaga, Megambonia, Modiella, Modiolopsis, Myalina, Mytilarca, Mytilops, Plethomytilus, Pyanomya.
- FAMILY NUCULIDÆ.—Nucula, Nuculana, Nuculites, Palæoneilo, Pyrenomæus, Solenomya, Tellinomya, Yoldia.
- FAMILY NYASSIDÆ.—Nyassa.
- FAMILY ORTHONOTIDÆ.—Orthodesma, Orthonota, Orthonotella, Palæosolen, Sphenolium.
- FAMILY OSTREIDÆ.—Ostrea, Placunopsis.
- FAMILY PALÆANATINIDÆ.—Ilionia, Palæanatina, Prorhynchus.
- FAMILY PALÆOCONCHIDÆ.—Palæoconcha.
- FAMILY PHOLADELLIDÆ.—Cimitaria, Pholadella, Phthonia.
- FAMILY PINNIDÆ.—Pinda.
- FAMILY PROTHYRIDÆ.—Prothyris.
- FAMILY PTERINIDÆ.—Actinopteria, Pterinea, Ptychopteria, Vertumnia.
- FAMILY SANGUINOLITIDÆ.—Cypricardinia, Promacrus, Spathella, Sphenotus, Sanguinolites.
- FAMILY SOLENIDÆ.—Solenopsis.
- FAMILY SPIRODOMIDÆ.—Spirodomus.
- FAMILY TECHNOPHORIDÆ.—Technophorus.
- FAMILY TELLINIDÆ.—Tellinopsis.
- FAMILY TRIGONIIDÆ.—Dolabra, ? Ischyria. ?
- FAMILY UNIONIDÆ.—Anthracosia, Priscoanaia.

Actinodesma subrectans, see *Glyptodesma subrectum*.

ACTINOPTERIA, Hall, 1883, Pal. N. Y., vol. 5, pt. 1, explanation of plate 17, fig. 6. [Ety. *aktin*, a ray; *Pteria*, a genus.] In the text published in 1884, pt. 1, p. 107, he wrote the word *Actinopteria*, which indicates he derived the name from the genus *Pteria*. Distinguished from *Pterinea* by strong cardinal and lateral teeth, and no striations on the ligamental area; right valve convex. The first species mentioned on page 3, where the genus is defined, is *A. decussata*, but the first one mentioned on page 107 of the text is *A. eximia*. No type is designated.

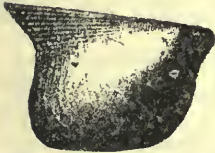


FIG. 766.—*Actinopteria boydi*. Right valve.

1884, Pal. N. Y., vol. 5, pt. 1, p. 121, Chemung Gr.

boydi, Conrad, 1842, (*Avicula boydi*), Jour. Acad. Nat. Sci. Phil., vol. 8, p. 237, and Pal. N. Y., vol. 5, p. 113, Ham. Gr.

decussata, Hall, 1843, (*Avicula decussata*), Geo. 4th Dist.

N. Y., p. 203, and Pal. N. Y., vol. 5, p. 111, Ham. Gr.

delta, Hall, 1883, Pal. N. Y., vol. 5, p. 121, Chemung Gr.

doris, Hall, 1884, Pal. N. Y., vol. 5, p. 109, Marcellus Shale.

epsilon, Hall, 1883, Pal. N. Y., vol. 5, pt. 1, p. 122, Chemung Gr.

eta, Hall, 1884, Pal. N. Y., vol. 5, pt. 1, p. 124, Chemung Gr.

eximia, Hall, 1883, Pal. N. Y., vol. 5, pt. 1, p. 107, Up. Held. Gr.

iota, Hall, 1884, Pal. N. Y., vol. 5, pt. 1, p. 127, Chemung Gr.

kappa, Hall, 1884, Pal. N. Y., vol. 5, pt. 1, p. 128, Chemung Gr.

muricata, Hall, 1843, (*Avicula muricata*), Geo. Sur. 4th Dist. N. Y., p. 181, and Pal. N. Y., vol. 5, p. 108, Marcellus Shale.

perobliqua, Conrad, 1842, (*Avicula perobliqua*), Jour. Acad. Nat. Sci. Phil., vol. 8, p. 235, and Pal. N. Y., vol. 5, p. 116, Ham. Gr.

perstrialis, Hall, 1883, Pal. N. Y., vol. 5, pt. 1, p. 118, Chemung Gr.

pleuroptera, Conrad, 1842, (*Avicula pleuroptera*), Jour. Acad. Nat. Sci., vol. 8, p. 242, Ham. Gr.

pusilla, Hall, 1884, Pal. N. Y., vol. 5, pt. 1, p. 117, Ham. Gr.

subdecussata, Hall, 1884, Pal. N. Y., vol. 5, pt. 1, p. 110, Ham. Gr.



FIG. 767.—*Actinopteria boydi*. Left valve.

tenuistriata, Hall, 1884, Pal. N. Y., vol. 5, pt. 1, p. 120, Chemung Gr.

theta, Hall, 1884, Pal. N. Y., vol. 5, pt. 1, p. 125, Chemung Gr.

zeta, Hall, 1883, Pal. N. Y., vol. 5, pt. 1, p. 123, Chemung Gr.

ALLORISMA, King, 1844, Ann. Mag. Nat. Hist., vol. 14, p. 315. [Ety. *allos*, variable; *ereisma*, support, expressive of the variable nature of the cartilage support or fulcrum.] Equivalve, inequilateral, elongate, thin; anterior side short; posterior long and gaping at the extremity; beaks anterior, depressed; surface concentrically ridged or undulated; hinge edentulous; ligament external; dorsal margin inflected, forming a lanceolate depression along the cardinal border behind the beaks; anterior adductor scar occupying a low position; pallial line faintly marked. Type *A. sulcatum*.

altirostratum, see *Secgwickia altirostrata*.

andrewsi, Whitfield, 1882, Ann. N. Y. Acad. Sci., vol. 2, p. 222, Kaskaskia Gr.

antiquum, Swallow, 1863, Trans. St. Louis Acad. Sci., vol. 2, p. 95, Kaskaskia Gr.

capax, Newberry, 1861, Ives' Col. Ex. Exped., p. 120, Coal Meas.

clavatum, McChesney, 1860, New Pal. Foss., p. 56, Kaskaskia Gr.

cooperi, see *Chænomya cooperi*.

costatum, Meek & Worthen, 1869, Proc. Acad. Nat. Sci. Phil., p. 171, and Geo. Sur. Ill., vol. 5, p. 585, Coal Meas.

cuneatum, Swallow, 1858, Trans. St. Louis Acad. Sci., vol. 1, p. 210, Mid. Coal Meas.

curtum, Swallow, 1858, Trans. St. Louis Acad. Sci., vol. 1, p. 194, Permian Gr.

elegans, King, as identified by Geinitz. See *A. geinitzi*.

elongatum, Morton, 1836, (*Pholadomya elongata*), Am. Jour. Sci. and Arts, vol. 29, p. 153, Coal Meas.

elongatum, Worthen, see *A. worthenanum*.

ensiforme, Swallow, 1860, Trans. St. Louis Acad. Sci., vol. 1, p. 656, Coal Meas.

geinitzi, Meek, 1867, Am. Jour. Sci., vol. 44, 2d ser., p. 170, and Geo. Sur. Ill., vol. 5, p. 586, Coal Meas.

gilberti, White, 1879, Bull. U. S. Geo. Sur., vol. 5, No. 2, p. 217, and Cont. to Pal., No. 6, p. 137, Carboniferous.

granosum, Shumard, 1853, (*Leptodomus granosus*), Trans. St. Louis Acad. Sci., vol. 1, p. 207, and Pal. E. Neb. p. 220, Coal Meas.

hannibalense, see *Grammysia hannibalense*.

hybridum, Meek & Worthen, 1865, (*Chænomya hybrida*), Proc. Acad. Nat. Sci. Phil., p. 250, and Geo. Sur. Ill., vol. 3, p. 538, Keokuk Gr.

illinoisense, Worthen, 1884, Bull. No. 2, Ill. St. Mus. Nat. Hist., p. 11, and Geo. Sur. Ill., vol. 8, p. 132, Keokuk Gr.

lanceolatum, Swallow, 1858, Trans. St. Louis Acad. Sci., vol. 1, p. 194, Permian Gr.

latum, Swallow, 1858, Trans. St. Louis Acad. Sci., vol. 1, p. 210, Mid. Coal Meas.

leavenworthense, see *Chænomya leavenworthensis*.

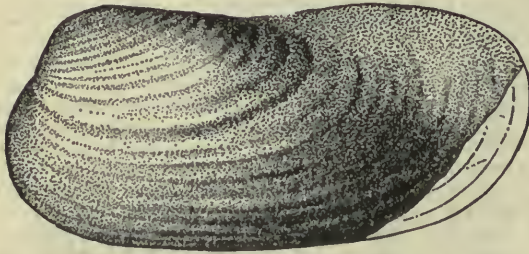


FIG. 768.—*Allorisma subcuneatum*.

marionense, White, 1876, Proc. Acad. Nat. Sci., p. 31, and Cont. to Pal., No. 8, p. 167, St. Louis Gr.

maxillense, Whitfield, 1882, Ann. N. Y. Acad. Sci., vol. 2, p. 222, Kaskaskia Gr.

minnehaha, see *Chænomya minnehaha*.

pleuropistha, Meek, 1871, Proc. Acad. Nat. Sci. Phil., p. 70, and Ohio Pal., vol. 2, p. 309, Waverly Gr.

reflexum, Meek, 1872, Pal. E. Neb., p. 217, Coal Meas.

sinuatum, McChesney, 1860, New Pal. Foss., p. 56, Chester Gr.



FIG. 769.—*Allorisma subcuneatum*.

Geo. Sur. Ill., vol. 8, p. 133, which was preoccupied.

AMBONYCHIA, Hall, 1847, Pal. N. Y., vol. 1, p. 163. [Ety. *ambon*, the boss of a shield; *onyx*, a claw or talon.] Equivalve, inequilateral, subalate poste-

riorly, abrupt or curving down anteriorly; umbones high; beak incurved, cardinal line oblique; sinuate on the anterior side for the passage of the byssus; muscular impression large; cardinal tooth below the beak anteriorly; two or three remote lateral teeth, elongated and ranging parallel with the cardinal line posteriorly; surface radiately furrowed and concentrically lined. Type A. bellistriata.

acutirostra, Hall, 1867, 20th Rep. N. Y. Mus. Nat. Hist., p. 383, Niagara Gr.

alata, see *Anomalodonta alata*.

amygdalina, see *Cypricardites amygdalinus*.

aphæa, Hall, 1867, 20th Rep. N. Y. Mus. Nat. Hist., p. 383, Niagara Gr.

attenuata, Hall, 1861, Geo. Rep. Wis., p. 33, and Geo. Wis., vol. 4, p. 206, Trenton Gr.

bellistriata, Hall, 1847, Pal. N. Y., vol. 1, p. 163, Trenton Gr.

cancellosa, Hall, 1861, Geo. Rep. Wis., p. 31. Mistake for *A. lamellosa*.

carinata, Goldfuss, 1826, (*Pterinea carinata*.) Germ. Petref., p. 136, and Pal. N. Y., vol. 1, p. 292, 294, Trenton and Hud. Riv. Gr.

casii, Meek & Worthen, 1866, Proc. Chi. Acad. Nat. Sci., p. 22, Hud. Riv. Gr.

costata, Meek, 1873, Ohio Pal., vol. 1, p. 130, Hud. Riv. Gr.

erecta, Hall, 1861, Geo. Rep. Wis., p. 32, Trenton Gr.

illinoisensis, Worthen, 1875, Geo. Rep. Ill., vol. 6, p. 495, Hud. Riv. Gr.

intermedia, Meek & Worthen, 1868, Geo. Sur. Ill., vol. 3, p. 306, Galena Gr.

jamesi, Meek, 1872, (*Megambonia jamesi*.) Proc. Acad. Nat. Sci. Phil., p. 321, and Ohio Pal., vol. 1, p. 136, Hud. Riv. Gr.

lamellosa, Hall, 1861, Geo. Rep. Wis., p. 31, and Geo. Wis., vol. 4, p. 205, Trenton Gr.

maxima, Safford, 1869, Geo. of Tenn. Not defined.

mytiloides, Hall, 1847, Pal. N. Y., vol. 1, p. 315, Chazy Gr.

neglecta, see *Amphicoelia neglecta*.

nitida, Billings, 1866, Catal. Sil. Foss. Antic., p. 50, Anticosti Gr.

obtusata, see *Cypricardites obtusata*.

orbicularis, Emmons, 1842, (*Pterinea orbicularis*.) Geo. Rep. N. Y., p. 397, and Pal. N. Y., vol. 1, p. 164, Trenton Gr.

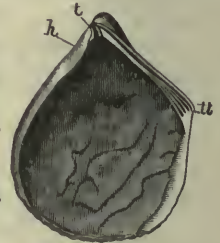


FIG. 770.—*Ambonychia bellistriata*. *h*, Byssal sinus; *t*, cardinal teeth; *u*, lateral teeth.

planistriata, Hall, 1861, Geo. Rep. Wis., p. 32, Trenton Gr.



FIG. 771.—*Ambonychia radiata*.

radiata, Hall, 1847, Pal. N. Y., vol. 1, p. 292, Trenton, Hud. Riv. Grs., and Mid. Sil. Probably a syn. for *A. carinata*.

rauchi, McChesney, 1860, New Pal. Foss., p. 89, Hud. Riv. Gr. Not recognized.

retrorsa, S. A. Miller, 1878, Jour. Cin.

Soc. Nat. Hist., vol. 1, p. 104, Hud. Riv. Gr.

robusta, S. A. Miller, 1880, Jour. Cin. Soc. Nat. Hist., vol. 3, p. 315, Hud. Riv. Gr.

striæcosta, see *Pterinea striæcosta*.

superba, Billings, 1866, Catal. Sil. Foss. Antic., p. 50, Anticosti Gr.

swanana, Safford, 1869, Geo. of Tenn. Not defined.

undata, Emmons, 1842, (*Pterinea undata*), Geo. Rep. N. Y., p. 395, and Pal. N. Y., vol. 1, p. 165, Black Riv. and Trenton Grs. Possibly belonging to an undefined genus.

large triangular cartilage pit beneath the beaks, and smaller pit just anterior. Type *A. leidyi*.

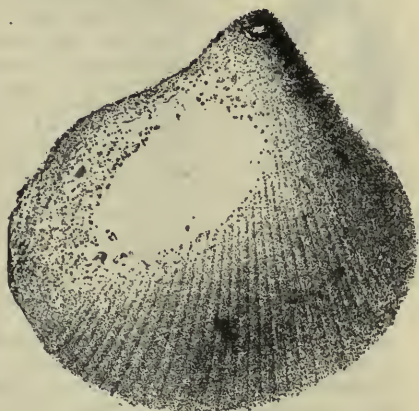


FIG. 773.—*Amphicella costata*.

costata, Hall & Whitfield, 1875, Ohio Pal., vol. 2, p. 140, Niagara Gr.

leidyi, Hall, 1867, 20th Rep. N. Y. Mus. Nat. Hist., p. 387, Niagara Gr.



FIG. 772.—*Amnigena catskillensis*.

AMNIGENIA, Hall, 1883, Pal. N. Y., vol. 5.

[Ety. *amnis*, a river; *gigno*, to bear.]

Like *Anodonta* in form and external characters; anterior muscular impressions large and prominent; posterior ones large and shallow. Type *A. catskillensis*.

catskillensis, Vanuxem, 1842, (*Cypricardites catskillensis*), Geo. Rep. 3d Dist. N. Y., p. 186, and Pal. N. Y., vol. 5, p. 516, Catskill Gr.

AMPHICELLA, Hall, 1863, 20th Rep. N. Y.

Mus. Nat. Hist., p. 386. [Ety. *amphi*, both; *koilos*, hollow.] Equivalve, inequilateral, subrhomboidal; umbones gibbous; beaks elevated and incurved; external ligamental area flattened;

neglecta, McChesney, 1861, (*Ambonychia neglecta*) Pal. Foss., p. 88, and Geo. Sur. Ill., vol. 3, p. 358, Niagara Gr.

Amphidesma deloefeldi, Castelnau, 1843, Syst. Sil., p. 44. Not recognized.

Anatina, Lamarck, 1809, Phil. Zool. [Ety. pertaining to the duck, or like the duck's bill.] Oblong, ventricose, attenuated, and gaping posteriorly; umbones fissured; spoon-shaped cardinal process in each valve. Type *A. rostrata*. Not a Palæozoic genus.

leda, Hall, 1860, 13th Rep. N. Y. Mus. Nat. Hist., p. 110, Ham. Gr. Not properly defined.

sinuata, see *Ilionia sinuata*.

ANGELLUM, S. A. Miller, 1878, Jour. Cin. Soc. Nat. Hist., vol. 1, p. 105. [Ety. *aggos*, a pail; *ellus*, diminutive.] Equivalve, hanging down; umbones prominent; beaks incurved posteriorly; concentrically lined. Type *A. cuneatum*.



FIG. 74.—*Angellum cuneatum*.

ANODONTOPSIS, McCoy, 1851, Ann. and Mag. Nat. Hist., 2d series, vol. 7, p. 54. [Ety. from the resemblance to the shells of the genus *Anodonta*.] Equivalve, inequilateral, compressed; rotundato-quadrangle or subtrigonal; posterior side wide, round, or obliquely subtruncate; anterior end slightly contracted in front of the beak; beaks small, prominent nearer the anterior than posterior end; hinge-line shorter than the length of the shell, with a posterior long, slender, lateral tooth extending just below it (double in the right valve), and another similar but shorter one in front of the beaks; anterior and posterior muscular impressions ovate; slight clavicular ridge between the beak and the adductor impressions; pallial impression entire; surface smooth or concentrically lined. Type *A. angustifrons*. Part of the generic definition is from *A. milleri*, as the interior of the type is not known.

A. amygdaliformis, Walcott, 1885, Monogr. U. S. Geo. Sur., vol. 8, p. 180, Devonian. *A. concinna*, Whiteaves, 1884, Pal. Foss., vol. 3, p. 12, Guelph Gr.

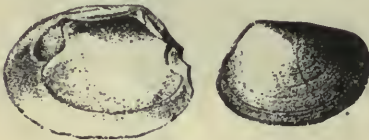


FIG. 75.—*Anodontopsis milleri*.

(?) *milleri*, Meek, 1871, Am. Jour. Sci., 3d series, vol. 2, p. 297, and Ohio Pal., vol. 1, p. 140, Hud. Riv. Gr.

unionoides, see *Modiolopsis unionoides ventricosa*, Billings, 1874, Pal. Foss., vol. 2, p. 55, Gaspé limestone No. 8, Devonian.

ANOMALODONTA, S. A. Miller, 1874, Cin. Quar. Jour. Sci., vol. 1, p. 16. [Ety. *anomalos*, irregular; *odous*, tooth.] Equivalve, inequilateral, alate posteriorly, abrupt anteriorly; umbones high; beak incurved; deeply sinuate for the byssus; cardinal ridge beneath the umbone sloping posteriorly; cartilage grooves extending from the cardinal

ridge to the termination of the posterior wing, and also from the cardinal

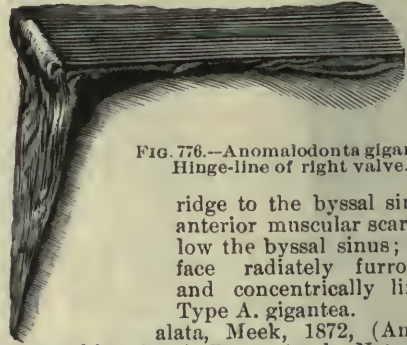


FIG. 76.—*Anomalodonta gigantea*. Hinge-line of right valve.

ridge to the byssal sinus; anterior muscular scar below the byssal sinus; surface radiately furrowed and concentrically lined. Type *A. gigantea*.

alata, Meek, 1872, (Amboynychia *alata*), Proc. Acad. Nat. Sci. Phil., p. 319, and Ohio Pal., vol. 1, p. 131, Hud. Riv. Gr.



FIG. 77.—*Anomalodonta gigantea*. Left valve, showing hinge-line and muscular impression.

gigantea, S. A. Miller, 1874, Cin. Quar. Jour. Sci., vol. 1, p. 17, Hud. Riv. Gr.

ANTHRACOMYA, Salter, 1861, Mem. Geo. Sur. Gr. Brit. Iron Ores, pt. 3, p. 229. [Ety. *anthrax*, coal; *Mya*, a genus.] Equivalve, inequilateral, mytiliform; ligament external; beak anterior; hinge-line straight; no teeth; surface concentrically marked; shell composed of an internal, lamellar, and subnacreous layer, a thin layer of vertical prismatic shell, and an epidermis; structure similar to the *Unionidæ*. Type *A. elongata*.

angulata, Dawson, 1860, (Naiadites angulatus,) Acadian Geology, p. 205, Coal Meas.



FIG. 778.—*Anomalodonta gigantea*, external surface.

arenacea, Dawson, 1860, (Naiadites arenaceus,) Acadian Geology, p. 205, Coal Meas.

carbonaria, Dawson, 1860, (Naiadites carbonarius,) Acadian Geology, p. 204, Coal Meas.

elongata, Dawson, 1860, (Naiadites elongatus,) Acadian Geology, p. 204, Coal Meas.

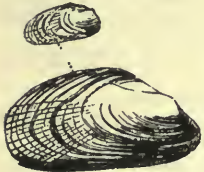


FIG. 779.—*Anthracomya elongata*.

ovalis, Dawson, 1860, (Naiadites ovalis,) Acadian Geology, p. 205, Coal Meas.

ANTHRACOPTERA, Salter, 1862, Mem. Geo. Sur. Country Around Wigan, p. 37. [Ety. *anthrax*, coal; *pteron*, a wing.] Shells small, aviculoid; height greater than width; valves subequal, wing short, hinge straight; surface concentrically marked.

carbonaria, see *Anthracomya carbonaria*.

(?) *fragilis*, Meek & Worthen, 1866, Proc. Chi. Acad. Sci., p. 18, Keokuk Gr.

laevis, see *Anthracomya laevis*.

polita, White, 1880, 12th Rep. U. S. Geo. Sur. Terr., p. 166, Coal Meas.

ANTHRACOSIA, King, 1844, Ann. and Mag. Nat. Hist., p. 313. [Ety. *anthrax*, coal.] Equivalve, inequilateral; tooth in each valve below the umbo; crown of tooth of right valve excavated anteriorly and ridged posteriorly; crown of tooth of left valve ridged anteriorly and sloped posteriorly; furrow in hinge-plate, between umbone and tooth; scars of anterior pedal muscles above the anterior adductor impressions. Type A. beanana.

bradorica, Dawson, 1868, Acad. Geol., p. 314, Carb.

Arca, Linne, 1758. This genus is unknown in the Palæozoic rocks.



carbonaria, Cox. See Fig. 780.—*Anthracosia bradorica*.
Macronodon carbonarius.

cuspidata, Swallow, 1858, Trans. St. Louis Acad. Sci., vol. 1, p. 209, Up. Coal Meas. Founded on a cast. Genus unknown.

modesta, Winchell, 1863, Proc. Acad. Nat. Sci., p. 15, Marshall Gr. Not an *Arca*.

striata, Schlothheim, as identified by Geinitz, is *Macronodon tenuistriatus*.

punctifera, Dawson, 1868, Acad. Geol., Carb. The name was preoccupied by Deshayes in his work, 1824-1836.

Astarte, Sowerby, 1818, Min. Conch., vol. 2, p. 85. Not a Palæozoic genus.

mortonensis, see *Edmondia mortonensis*.

nebraskensis, see *Edmondia nebraskensis*.

subtextilis, see *Enthydesma subtextile*.

ASTARTELLA, Hall, 1858, Geo. Rep. Iowa, p. 715. [Ety. diminutive of *Astarte*.] Shell thick, smooth, or concentrically furrowed; lunule impressed, ligament external; hinge teeth, two in each valve; anterior tooth in right valve large and strong, with a longitudinal pit in the summit. Type A. vera.

concentrica, McChesney, 1860, (*Edmondia concentrica*,) Descr. New Pal. Foss., p. 55, Coal Meas.

gurleyi, White, 1878, Proc. Acad. Nat. Sci., p. 35, and Cont. to Pal., No. 8, p. 166, Coal Meas.

newberryi, Meek, 1875, Ohio Pal., vol. 2, p. 340, Coal Meas.

varica, McChesney, 1860, Descr. New Pal. Foss., p. 55, Coal Meas.

vera, Hall, 1858, Geo. Rep. Iowa, p. 715, Coal Meas.

AVICULA, Klein, 1753, Ostrac. [Ety. *avicula*, a little bird.] Very inequivalve, inequilateral, obliquely oval; hinge produced posteriorly into a flattened defined wing; the inferior or right valve flattened, notched for the passage of the byssus; anterior muscular impression very small and faintly marked; adductor large, superficial, a little behind the middle; cartilage external, linear, simple, placed on a narrow marginal facet, extending from the beak toward the cardinal angle; hinge edentulous, or with two small cardinal teeth beneath the beak in one valve, and one in the other, and a long, slender, posterior bifid lateral tooth in each; substance corneo-calcareous, lamellar without, pearly within. Type A. hirundo. Not a Palæozoic genus. Species are left here for want of better material to determine their generic relations.

acanthoptera, Hall, 1843, Geo. Rep. 4th Dist. N. Y., p. 263, Chemung Gr.

acosta, Cox, 1857, Geo. Sur. Ky., vol. 3, p. 572, Coal Meas. The correct etymology would make this word *incosta*.
æquilatera, see *Aviculopecten æquilaterus*.
æquiradiata, Hall, 1859, Pal. N. Y., vol. 3, p. 285, Low. Held. Gr.



FIG. 781.—*Avicula hirundo*.

æsosopus, Conrad, 1842, Jour. Acad. Nat. Sci., vol. 8, p. 238, Ham. Gr.
angustirostra, Conrad, 1842, Jour. Acad. Nat. Sci., p. 236, Ham. Gr.
antiqua, see *Bakevellia antiqua*.
arenaria. Not American.
aviformis, see *Pterinea aviformis*.
bella, see *Aviculopecten bellus*.
bellula, Hall, 1859, Pal. N. Y., vol. 3, p. 289, Low. Held. Gr.
boydi, see *Actinopteria boydi*.
cancellata, see *Pterinea cancellata*.
chemungensis, see *Liopteria chemungensis*.
chemungensis, see *Pterinea chemungensis*.
circulus, see *Entolium circulus*.
communis, Hall, 1859, Pal. N. Y., vol. 3, p. 286, Low. Held. Gr.
cooperensis see *Pernopecten cooperensis*.
corrugata, see *Pterinea corrugata*.
cruciformis, see *Glyptodesma cruciforme*.
dammoniensis, Sowerby; as identified in the early N. Y. Reports. See *Liopteria chemungensis*.
decussata, see *Actinopteria decussata*.
demissa, see *Pterinea demissa*.
desquamata, Hall, 1847. The dorsal valve of *Obolella crassa*.
elliptica, see *Pterinea elliptica*.
emacerata, Conrad, 1842, Jour. Acad. Nat. Sci., p. 241, and Pal. N. Y., vol. 2, p. 83 and 282, Clinton and Niagara Grs.
erecta, see *Glyptodesma erectum*.
ferruginea, Conrad, 1848, Proc. Acad. Nat. Sci., vol. 3, p. 23, Up. Sil.
flabella, see *Pterinea flabellum*.
fragilis, see *Lunulicardium fragile*.
gebhardi, Conrad, 1841, Ann. Rep. N. Y., p. 54, Oriskany sandstone.
hermione, Billings, 1862, Pal. Foss., vol. 1, p. 40, Trenton Gr.
honeymani, see *Pterinea honeymani*.
insueta, see *Pterinea insueta*.
lævis, see *Liopteria lævis*.
leptonota, Hall, 1843, Geo. Rep. 4th Dist. N. Y., p. 76, syn. for *A. emacerata*.
limiformis, Hall, 1852, Pal. N. Y., vol. 2, p. 332, Coralline limestone.
longa, Geinitz, 1866, (*Gervillia longa*.) Carb. and Dyas in Neb., p. 32, and Pal. E. Neb., p. 199, Coal Meas.
longispina, see *Leptodesma longispinum*.
magna, Swallow, 1863, Trans. St. Louis Acad. Sci., vol. 2, p. 98, Kaskaskia Gr.
manticula, Conrad, 1842, Jour. Acad. Nat. Sci., vol. 8, p. 241, and Pal. N. Y., vol. 3, p. 284, Low. Held. Gr.

morganensis, Meek & Worthen, 1866, (*Pteria morganensis*.) Proc. Acad. Nat. Sci., p. 259, and Geo. Sur. Ill., vol. 5, p. 576, Coal Meas.
multilineata, Conrad, 1842, Jour. Acad. Nat. Sci., vol. 8, p. 241, Chemung Gr.
muricata, see *Actinopteria muricata*.
naviformis, Conrad, 1842, Jour. Acad. Nat. Sci., p. 240, and Pal. N. Y., vol. 3, p. 279, Low. Held. Gr.
obliquata, Hall, 1859, Pal. N. Y., vol. 3, p. 285, Low. Held. Gr.
oblonga, see *Aviculopecten oblongus*.
obscura, Hall, 1859, Pal. N. Y., vol. 3, p. 280, Low. Held. Gr.
orbicularis, Stevens, 1858, Am. Jour. Sci., vol. 25, 2d ser., Coal Meas. The name was preoccupied by Sowerby in 1839.
orbiculata, Hall, 1843, see *Lyriopecten orbiculatus*.
orbiculata, Hall, 1852, Pal. N. Y., vol. 2, p. 284, Niagara Gr.
parilis, see *Aviculopecten parilis*.
pauciradiata, Hall, 1859, Pal. N. Y., vol. 3, p. 287, Low. Held. Gr.
pectiniformis, see *Aviculopecten pectiniformis*.
perobliqua, see *Actinopteria perobliqua*.
pinniformis, Geinitz, 1848, (Solon pinnæformis.) Versteinerungen d. deutsch Zechsteingebirg, p. 8, and Carb. und Dyas in Neb., p. 31, Coal Meas.
pleuroptera, see *Actinopteria pleuroptera*.
protecta, see *Leptodesma protectum*.
quadrula, syn. for *Actinopteria boydi*.
rectilateraria, see *Aviculopecten rectilaterarius*.
recticosta, Hall, 1859, Pal. N. Y., vol. 3, p. 466, Oriskany sandstone.
rhomboidea, Hall, 1852, Pal. N. Y., vol. 2, p. 84, Clinton Gr.
rugosa, see *Pterinea rugosa*.
schoharie, Hall, 1859, Pal. N. Y., vol. 3, p. 283, Low. Held. Gr.
securiformis, Hall, 1852, Pal. N. Y., vol. 2, p. 331, Coralline limestone.
securiformis, Hall, 1859, Pal. N. Y., vol. 3, p. 290. This name was preoccupied.
semielliptica, Shumard, 1858, Trans. St. Louis Acad. Sci., vol. 1, p. 210, Up. Coal Meas.
shawneensis, Shumard, 1858, Trans. St. Louis Acad. Sci., vol. 1, p. 211, Up. Coal Meas.
shumardi, see *Entolium shumardi*.
signata, s-e *Aviculopecten signatus*.
speciosa, see *Panenka speciosa*.
spinigera, see *Leptodesma spinigerum*.
spinulifera, Hall, 1859, Pal. N. Y., vol. 3, p. 282, Low. Held. Gr.
subæquilatera, Hall, 1859, Pal. N. Y., vol. 3, p. 281, Low. Held. Gr.
subfalcata, Conrad, 1842, Jour. Acad. Nat. Sci., vol. 8, p. 242, Ham. Gr.
subplana, Hall, 1852, Pal. N. Y., vol. 2, p. 283, Niagara Gr.
subquadrans, Conrad, 1842, Jour. Acad. Nat. Sci., vol. 8, p. 236, Devonian.
subrecta, see *Aviculopecten subrectus*.

- subrugosa*, D'Orbigny, 1850, Prodr. d. Paléont., t. 1, p. 33. Syn. for *Pterinea rugosa*.
- tenuilamellata*, Hall, 1859, Pal. N. Y., vol. 3, p. 281, Low. Held. Gr.
- textilis*, Hall, 1859, Pal. N. Y., vol. 3, p. 288, Low. Held. Gr.
- textilis* var. *arenaria*, Hall, 1859, Pal. N. Y., vol. 3, p. 465, Oriskany Gr.
- trentonensis*, see *Pterinea trentonensis*.
- tricostata*, see *Lyriopecten tricostatus*.
- trilobata*, Conrad, 1842, Jour. Acad. Nat. Sci., vol. 8, p. 240, Ham. Gr.
- triplichiata*, Stevens, 1858, Am. Jour. Sci., vol. 25, p. 265, Coal Meas.
- triquetra*, Hall, 1843, Geo. Rep. N. Y., p. 137, Onondaga Gr.
- tuberculata*, Conrad, 1838, Ann. Rep. N. Y., p. 117, Corniferous Gr.
- umbonata*, Hall, 1859, Pal. N. Y., vol. 3, p. 284, Low. Held. Gr.
- undata*, Hall, 1852, Pal. N. Y., vol. 2, p. 283, Niagara Gr.
- undosa*, Ringueberg, 1886, Bull. Buf. Soc. Nat. Sci., vol. 5, p. 18, Niagara Gr.
- welchi*, James, 1874, Cin. Quar. Jour. Sci., vol. 1, p. 239, Hud. Riv. Gr.
- whitii*, Winchell, 1863, Proc. Acad. Nat. Sci., p. 8, Marshall Gr.
- AVICULOPECTEN**, McCoy, 1851, Ann. Mag. Nat. Hist., 2d ser., vol. 7, p. 171. [Ety. from the genera *Avicula* and *Pecten*.] Inequivalve, inequilateral; straight or slightly extended obliquely toward the posterior side; anterior ear flattened, smaller than the posterior, sharply and deeply defined, with a notch in the right valve between it and the body of the shell for the passage of the byssus; posterior ear pointed, extending about as far as the margin of the shell, defined or not; ligament confined to a narrow facet along the hinge margin, or having a wider cardinal area with cartilage furrows; no medial cartilage pit; muscular impression and pallial scar as in *Pecten*. Type *A. docens*.
- acadicus*, Hartt, 1868, Acad. Geol., p. 307, Carb.
- acutialatus*, Swallow, 1858, (*Avicula acutialata*.) Trans. St. Louis Acad. Sci., p. 185, Permian Gr.
- æquilateralis*, Hall, 1883, Pal. N. Y., vol. 5, pt. 1, p. 19, Chemung Gr.
- æquilaterus*, Hall, 1843, (*Avicula æquilatera*.) Geo. Rep. 4th Dist. N. Y., p. 181, Up. Held. Gr. and Marcellus Shale.
- affinis*, Walcott, 1885, Monogr. U. S. Geo. Sur., vol. 8, p. 229, Subcarboniferous.
- amplus*, Meek & Worthen, 1860, Proc. Acad. Nat. Sci. Phil., p. 454, and Geo. Sur. Ill., vol. 2, p. 257, Keokuk Gr.
- armigerus*, Conrad, 1835, (*Pecten armigerus*.) Trans. Geo. Soc. Penn., p. 268, Coal Meas.
- bellus*, Conrad, 1841, (*Avicula bella*.) Ann. Rep. N. Y., p. 54, and Pal. N. Y., vol. 5, pt. 1, p. 35, Ham. Gr.
- burlingtonensis*, Meek & Worthen 1860, Proc. Acad. Nat. Sci., p. 453, and Geo. Sur. Ill., vol. 2, p. 231, Burlington Gr. cancellatus, Hall, 1843, (*Pecten cancellatus*.) Geo. Rep. 4th Dist. N. Y., p. 264, and Pal. N. Y., vol. 5, pt. 1, p. 18, Chemung Gr.
- carboniferus*, Stevens, 1858, (*Pecten carboniferus*.) Am. Jour. Sci. and Arts, vol. 25, p. 261, and Pal. E. Neb., p. 193, Coal Meas.
- caroli*, Winchell, 1863, Proc. Acad. Nat. Sci., p. 9, and Pal. N. Y., vol. 5, pt. 1, p. 29, Waverly Gr.
- catactus*, Meek, 1877, U. S. Geo. Expl. 40th parallel, vol. 4, p. 93, Carboniferous.
- celsus*, Hall, 1883, Pal. N. Y., vol. 5, pt. 1, p. 23, Chemung Gr.
- chesterensis*, Worthen, 1884, Bull. No. 2, Ill. St. Mus. Nat. Hist., p. 20, and Geo. Sur. Ill., vol. 8, p. 115, Kaskaskia Gr.
- cleon*, Hall, 1883, Pal. N. Y., vol. 5, pt. 1, p. 6, Up. Held. Gr.
- clevelandicus*, Swallow, 1858, (*Pecten clevelandicus*.) Trans. St. Louis Acad. Sci., vol. 1, p. 184, Permian Gr.
- colletti*, Worthen, 1884, Bull. No. 2, Ill. St. Mus. Nat. Hist., p. 21, and Geo. Sur. Ill., vol. 8, p. 119, Keokuk Gr.
- coloradoensis*, Newberry, 1861, Ives' Col. Ex. Exped., p. 129, Coal Meas.
- convexus*, Hall, 1843, (*Pecten convexus*.) Geo. Rep. 4th Dist. N. Y., p. 265, and Pal. N. Y., vol. 5, pt. 1, p. 28, Chemung Gr.
- cora*, Dawson, 1868, Acad. Geol., p. 307, Carb.
- coreyanus*, White, 1874, Rep. Invert. Foss., p. 21, and Geo. Sur. W. 100th Mer., vol. 4, p. 147, Coal Meas.
- coxanus*, Meek & Worthen, 1860, Proc. Acad. Nat. Sci. Phil., p. 453, and Geo. Sur. Ill., vol. 2, p. 326, Low. Coal Meas.
- crassicostratus*, Hall & Whitfield, 1872, 24th Rep. N. Y. Mus. Nat. Hist., p. 188, Up. Held. Gr.
- crenistriatus*, Meek, 1871, Proc. Acad. Nat. Sci. Phil., p. 60, and Ohio Pal., vol. 2, p. 295, Waverly Gr.
- curticardinalis*, Hall & Whitfield, 1877, U. S. Geo. Expl. 40th parallel, vol. 4, p. 273, Coal Meas.
- debertanus*, Dawson, 1868, Acad. Geol., p. 307, Carboniferous.
- dolabriformis*, Hall, 1843, (*Pecten* (?) *dolabriformis*.) Geo. Rep. 4th Dist. N. Y., p. 265, and Pal. N. Y., vol. 5, pt. 1, p. 26, Chemung Gr.
- duplicatus*, Hall, 1843, (*Pecten duplicatus*.) Geo. Rep. 4th Dist. N. Y., p. 264, and Pal. N. Y., vol. 5, pt. 1, p. 17, Chemung Gr.
- edwardsi*, Worthen, 1884, Bull. No. 2, Ill. St. Mus. Nat. Hist., p. 22, and Geo. Sur. Ill., vol. 8, p. 119, Keokuk Gr.
- ellipticus*, Hall, 1883, Pal. N. Y., vol. 5, pt. 1, p. 25, Chemung Gr.

elsahensis, Worthen, 1884, Bull. No. 2, Ill. St. Mus. Nat. Hist., p. 19, and Geo. Sur. Ill., vol. 8, p. 115, Kinderhook Gr. eurekaensis, Walcott, 1885, Monogr. U. S. Geo. Sur., vol. 8, p. 227, Subcarboniferous. exacutus, Hall, 1883, Pal. N. Y., vol. 5, pt. 1, p. 8, Ham. Gr. fasciculatus, Hall, 1883, Pal. N. Y., vol. 5, pt. 1, p. 11, Ham. Gr. formio, Hall, 1883, Pal. N. Y., vol. 5, pt. 1, p. 9, Ham. Gr. glaber, see *Pernopecten glaber*. gradocostatus, White, 1862, Proc. Bost. Soc. Nat. Hist., vol. 9, p. 31, Marshall Gr. haguei, Walcott, 1885, Monogr. U. S. Geo. Sur., vol. 8, p. 226, Subcarboniferous. halli, Swallow, 1860, (Avicula halli,) Trans. St. Louis Acad. Sci., vol. 1, p. 656, Coal Meas.



FIG. 782.—*Aviculopecten princeps*.

hardinensis, Worthen, (in press,) Geo. Sur. Ill., vol. 8, p. 117, St. Louis Gr. hertzeri, Meek, 1871, Proc. Acad. Nat. Sci., p. 61, and Ohio Pal., vol. 2, p. 330, Coal Meas. idas, Hall, 1883, Pal. N. Y., vol. 5, pt. 1, p. 13, Ham. Gr. ignotus, Hall, 1883, Pal. N. Y., vol. 5, pt. 1, p. 33, Up. Held. Gr. incultus, Hall, 1883, Pal. N. Y., vol. 5, pt. 1, p. 30, Up. Chemung Gr. indianensis, Meek & Worthen, 1866, Proc. Chi. Acad. Sci., vol. 1, p. 14, Keokuk Gr. insignis, Hall, 1883, Pal. N. Y., vol. 5, pt. 1, p. 34, Ham. Gr. intercostalis, Winchell, 1866, Rep. Low. Peninsula Mich., p. 95, Ham. Gr. interlineatus, Meek & Worthen, 1860, Proc. Acad. Nat. Sci. Phil., p. 454, and Geo. Sur. Ill., vol. 2, p. 329, Low. Coal Meas.

invalidus, Hall, 1883, (*Pterinopecten invalidus*,) Pal. N. Y., vol. 5, pt. 1, p. 31, Marcellus Shale. iowensis, S. A. Miller, 1883, 2d Ed. Am. Pal. Foss., p. 310, Marshall or Kinderhook Gr., at Burlington, Iowa. Proposed instead of *A. occidentalis* of Winchell, in 1863, in Proc. Acad. Nat. Sci., Phil., p. 9, which was preoccupied by Shumard. itys, Hall, 1883, Pal. N. Y., vol. 5, pt. 1, p. 20, Chemung Gr. konincki, Meek & Worthen, 1860, Proc. Acad. Nat. Sci. Phil., p. 453, and Geo. Sur. Ill., vol. 2, p. 328, Low. Coal Meas. lantus, Hall, 1883, Pal. N. Y., vol. 5, pt. 1, p. 14, Ham. Gr. limaformis, see *Pernopecten limiformis*. lyelli, Dawson, 1868, Acad. Geol., p. 305, Carb. lyelli var. alternans, Dawson, 1883, Rep. on Redpath Mus., p. 12, Carboniferous. maccoyi, Meek & Hayden, 1865, Pal. Up. Mo., p. 50, Permian Gr. macwhorteri, Worthen, (in press,) Geo. Sur. Ill., vol. 8, p. 118, Kinderhook Gr. mazonensis, Worthen, (in press,) Geo. Sur. Ill., vol. 8, p. 117, Coal Meas. menardi, Worthen, (in press,) Geo. Sur. Ill., vol. 8, p. 120, Coal Meas. missouriensis, Shumard, 1855, (*Pecten missouriensis*,) Geo. Rep. Mo., p. 207, St. Louis Gr. monroensis, Worthen, 1884, Bull. No. 2, Ill. St. Mus. Nat. Hist., p. 21, and Geo. Sur. Ill., vol. 8, p. 114, St. Louis Gr. mucronatus, Hall, 1883, Pal. N. Y., vol. 5, pt. 1, p. 38, Ham. Gr. newarkensis, Winchell, 1870, Notices and Desc. Foss. from Marshall Gr., Proc. Acad. Nat. Sci., p. 255, Marshall Gr. niotensis, Worthen, 1884, Bull. No. 2, Ill. St. Mus. Nat. Hist., p. 19, and Geo. Sur. Ill., vol. 8, p. 113, Keokuk Gr. nodocostatus, White & Whitfield, 1862, Proc. Bost. Soc. Nat. Hist., vol. 8, p. 296, Kinderhook Gr. oblongus, Meek & Worthen, 1860, (*Avicula oblonga*,) Proc. Acad. Nat. Sci. Phil., p. 454, and Geo. Sur. Ill., vol. 2, p. 258, Keokuk Gr. occidentaneus, Meek, 1877, U. S. Geo. Expl. 40th parallel, vol. 4, p. 96, Carboniferous. occidentalis, Shumard, 1855, (*Pecten occidentalis*,) Geo. Rep. Mo., p. 207, Carboniferous and Permian. occidentalis, Winchell, 1863, Proc. Acad. Nat. Sci., p. 9. This name was preoccupied.

orbiculatus, see *Lyriopecten orbiculatus*.
orestes, Worthen, 1884, Bull. No. 2, Ill. St. Mus. Nat. Hist., p. 18, and Geo. Sur. Ill., vol. 8, p. 112, Keokuk Gr.
orestes, Hall, syn. for *A. fasciculatus*.
ornatus, Hall, 1883, Pal. N. Y., vol. 5, pt. 1, p. 37, Ham. Gr.
oweni, Meek & Worthen, 1860, Proc. Acad. Nat. Sci. Phil., p. 452, and Geo. Sur. Ill., vol. 2, p. 256, Keokuk Gr.
parilis, Conrad, 1842, (*Avicula parilis*.) Jour. Acad. Nat. Sci. Phil., vol. 8, p. 239, and Ohio Pal., vol. 1, p. 197, Cornif. Gr.
parvulus, Hall & Whitfield, 1877, U. S. Geo. Expl. 40th parallel, vol. 4, p. 274, Coal Meas.

plenus, Hall, 1883, Pal. N. Y., vol. 5, pt. 1, p. 21, Chemung Gr.

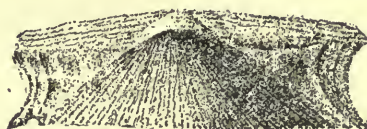


FIG. 783.—*Aviculopecten princeps*. Cardinal part showing ligamental area.

princeps, Conrad, 1838, (*Monotis princeps*.) Ann. Rep. N. Y., p. 117, and Pal. N. Y., vol. 5, pt. 1, p. 1, Ham. Gr.

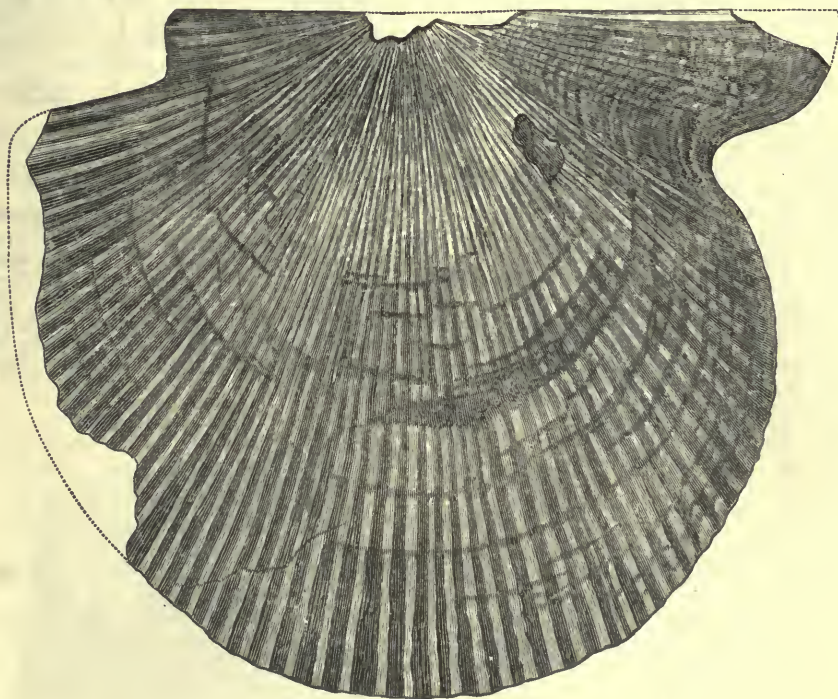
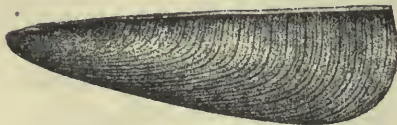


FIG. 784.—*Aviculopecten varsoviensis*.

patulus, Hall, 1883, Pal. N. Y., vol. 5, pt. 1, p. 24, Up. Chemung Gr.
pecteniformis, Conrad, 1842, (*Avicula pecteniformis*.) Jour. Acad. Nat. Sci., vol. 8, p. 240, and Pal. N. Y., vol. 5, pt. 1, p. 4, Up. Held. Gr. and Marcellus Shale.
pellucidus, Meek & Worthen, 1860, Proc. Acad. Nat. Sci. Phil., p. 455, and Geo. Sur. Ill., vol. 2, p. 327, Low. Coal Meas.
peroccidens, Walcott, 1885, Monogr. U. S. Geo. Sur., vol. 8, p. 227, Subcarboniferous.
phorcus, Hall, 1883, Pal. N. Y., vol. 5, pt. 1, p. 10, Ham. Gr.
pintoensis, Walcott, 1885, Monogr. U. S. Geo. Sur., vol. 8, p. 228, Subcarboniferous.

providencensis, Cox, 1857, (*Pecten providencensis*.) Geo. Sur. Ky., vol. 3, p. 566, Coal Meas.
rectilaterarius, Cox, 1857, (*Avicula rectilateraria*.) Geo. Sur. Ky., vol. 3, p. 571, Coal Meas.
repletus, Hall, syn. for *A. fasciculatus*.
reticulatus, Dawson, 1868, Acad. Geol., p. 306, Carboniferous.
ringens, Swallow, 1858, (*Pecten ringens*.) Trans. St. Louis Acad. Sci., p. 184, Permian Gr.
rugistriatus, Hall, 1843, (*Lima rugæstriata*.) Geo. Rep. 4th Dist. N. Y., p. 264, and Pal. N. Y., vol. 5, pt. 1, p. 15, Chemung Gr.
sanduskiensis, Meek, 1871, Proc. Acad. Nat. Sci. Phil., p. 161, Up. Held. Gr.

- scabridus, Hall, 1883, Pal. N. Y., vol. 5, pt. 1, p. 7, Ham. Gr.
- signatus, Hall, 1843, (*Avicula signata*.) Geo. Rep. 4th Dist. N. Y., p. 265, and Pal. N. Y., vol. 5, pt. 1, p. 29, Chemung Gr.
- simplex, Dawson, 1868, Acad. Geol., p. 306, Carboniferous.
- spinuliferus, Meek & Worthen, 1870, Proc. Acad. Nat. Sci., p. 39, and Geo. Sur. Ill., vol. 8, p. 116, Keokuk Gr.
- squama, Hall, 1883, Pal. N. Y., vol. 5, pt. 1, p. 27, Chemung Gr.
- striatus, Hall, 1843, (*Pecten striatus*.) Geo. Rep. 4th Dist. N. Y., p. 264, and Pal. N. Y., vol. 5, pt. 1, p. 22, Chemung Gr.
- subcancellatus, Hall, 1883, syn. for *A. cancellatus*.
- subrectus, Hall, 1852, (*Avicula subrecta*.) Pal. N. Y., vol. 2, p. 331, Coralline limestone.
- talboti, Worthen, 1884, Bull. No. 2, Ill. St. Mus. Nat. Hist., p. 21, St. Louis Gr.
- tenuicostus, Winchell, 1863, Proc. Acad. Nat. Sci., p. 10, Marshall Gr.
- tenuis, Hall, 1883, Pal. N. Y., vol. 5, pt. 1, p. 39, Up. Chemung Gr.
- terminalis, Hall, 1883, (*Pterinopecten terminalis*.) Pal. N. Y., vol. 5, pt. 1, p. 32, Up. Held. Gr.
- unionensis, Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 511, Corniferous Gr.
- utahensis, Meek, 1860, (*Pecten utahensis*.) Proc. Acad. Nat. Sci., p. 310, Coal Meas.
- varsoviensis, Worthen, 1883, Geo. Sur. Ill., vol. 7, p. 321, Keokuk Gr.
- weberensis, Hall & Whitfield, 1877, U. S. Geo. Sur., 40th parallel, vol. 4, p. 273, Coal Meas.
- whitii, Meek, 1872, Pal. E. Neb., p. 195, Coal Meas.
- williamsi, Meek, 1871, Proc. Acad. Nat. Sci., p. 178, Choteau limestone.
- winchelli, see *Crenipecten Winchelli*.
- AVICULOPINNA, Meek, 1867, Am. Jour. Sci., vol. 44, 2d ser., p. 282. [Ety. the genera *Avicula* and *Pinna*.] Compressed, slender, elongated, subtrigonal, or nearly in the form of a *Pinna*; beaks nearly obsolete, extremely oblique, and slightly behind the anterior extremity. Type *A. americana*.
- americana, Meek, 1867, Am. Jour. Sci., vol. 44, 2d ser., p. 282, and Pal. E. Neb., p. 197, Coal Meas.

FIG. 785.—*Aviculopinna americana*.

- illinoisensis, Worthen, 1884, Bull. No. 2, Ill. St. Mus. Nat. Hist., p. 13, and Geo. Sur. Ill., vol. 8, p. 128, Coal Meas.
- Axinus*, Sowerby, 1821, Min. Conch., vol. 3. [Ety. *axine*, battle-axe.] This genus is unknown in Palæozoic rocks.

- ovatus, see *Schizodus ovatus*.
- securis, Shumard, 1859, Trans. St. Louis Acad. Sci., Permian Gr. Not recognized.
- BAKEVELLIA, King, 1849, Perm. Foss., p. 166. [Ety. proper name.] Shell aviculiform, subequivalve; valves sinuous, gaping in front for the passage of the byssus; umbones depressed, oblique; surface with concentric striae; hinge with linear anterior and posterior lateral teeth parallel to the cardinal margin; muscular scars as in *Pteria*; cardinal area in both valves; two to five cartilage furrows in each valve. Type *B. antiqua*.
- antiqua, Munster, 1826, (*Avicula antiqua*.) Goldfuss Germ. Petref. Not American.
- illinoisensis, Worthen, 1884, Bull. No. 2, Ill. St. Mus. Nat. Hist., p. 14, and Geo. Sur. Ill., vol. 8, p. 126, Up. Coal Meas.
- parva, Meek & Hayden, 1858, Trans. Alb. Inst., vol. 4, p. 78, and Pal. Up. Mo., p. 57, Permian Gr.
- (?) pulchra, Swallow, 1858, Trans. St. Louis Acad. Sci., vol. 1, p. 189, Permian Gr.
- sulcata, Geinitz, 1866, (*Gervillia sulcata*.) Carb. und Dyas in Neb., p. 33, Coal Meas.
- BYSSOPTERIA, Hall, 1883, Pal. N. Y., vol. 5, pt. 1, p. 4. [Ety. *byssos*, byssus; *Pteria*, a genus.] Shell erect, equivalve, alate posteriorly, truncate, with a nasute projection in front; surface radiately furrowed and concentrically lined. Type *B. radiata*.

FIG. 786.
Bakevellia parva.FIG. 787.—*Byssopteria radiata*.

- radiata, Hall, 1883, Pal. N. Y., vol. 5, pt. 1, p. 252, Up. Chemung Gr.
- CARBONARCA, Meek & Worthen, 1870, Proc. Acad. Nat. Sci. Phil., p. 39. [Ety.

carbo, coal; *Arca*, a genus.] Inequivalve, inequilateral, very convex, transversely oblong or oval; umbones gibbous, prominent, strongly incurved, with subangular posterior slopes; valves closed all around with smooth margins; ligament external; cardinal margin arched; two anterior oblique teeth, and behind these minute crenulations, as in *Arca*. Type *C. gibbosa*. *gibbosa*, Meek & Worthen, 1870, Proc. Acad. Nat. Sci. Phil., p. 40, and Geo. Sur. Ill., vol. 6, p. 531, Coal Meas.



FIG. 788.—*Cardinia listeri*.

CARDINIA, Agassiz, 1838, in Societ. Basil. [Ety. *cardo*, the hinge of a door.] Oblong, attenuated posteriorly, compressed; ligament external; cardinal teeth obscure, lateral, remote, prominent; adductor impressions deep; pallial line simple. Type *C. listeri*.

æquimarginalis, see *Edmondia æquimarginalis*.

antigenesensis, Dawson, 1868, Acad. Geol., p. 304, Carb.

complanata, Winchell, 1862, Proc. Acad. Nat. Sci., p. 413, Portage Gr.

concentrica, see *Sanguinolites concentricus*.

cordata, Swallow, 1858, Trans. St. Louis Acad. Sci., vol. 1, p. 191, Permian Gr.

(?) *fragilis*, Cox, 1857, Geo. Sur. Ky., vol. 3, p. 570, Coal Meas.

occidentalis, Swallow, 1860, Trans. St. Louis Acad. Sci., p. 655, Waverly or Choteau Gr.

subangulata, Swallow, 1858, Trans. St. Louis Acad. Sci., vol. 1, p. 192, Permian Gr.

subangulata, Dawson, 1868, Acad. Geol., p. 304. This name was preoccupied.

CARDIOLA, Broderip, 1844, Trans. Geo. Soc. [Ety. *kardia*, the heart.] Obliquely oval or sub-circular, tumid, inequilateral;

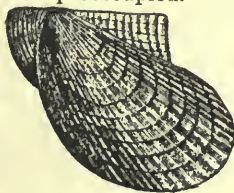


FIG. 789.—*Cardiola interrupta*.

beaks large, prominent, obliquely incurved anteriorly; ends subequal, rounded; ventral margin convex; hinge-line shorter than the shell, with a flattened cardinal area, widest between the beaks, extending its whole length; surface radiately ribbed. Type *C. interrupta*.

æquilatera, see *Panenka æquilatera*.

dichotoma, see *Panenka dichotoma*.

doris, see *Paracardium doris*.

elevata, see *Panenka ventricosa*.

erecta, see *Pararca erecta*.

flicostata, Walcott, 1885, Monogr. U. S. Geo. Sur., vol. 8, p. 251, Subcarboniferous.

hero, see *Panenka hero*.

lincklæni, see *Panenka lincklæni*.

radians, see *Panenka radians*.

robusta, see *Panenka robusta*.

salteri, Houghton, 1857, Jour. Roy. Soc. Dub., vol. 1, Devonian.

sao, see *Pararca sao*.

speciosa, Hall, 1883, Pal. N. Y., vol. 5, pl. 70, fig. 2-9, and pl. 80, fig. 10, Genesee Slate.

transversa, see *Pararca transversa*.

CARDIOMORPHA, DeKoninck, 1844, Anim.

Foss. Carb. Belg., p. 101. [Ety. *kardia*, heart; *morphe*, form.] Shell very thin, equivalve, inequilateral, margins closed, oblique, tumid; beaks tumid, produced, spirally inrolled to the anterior side; no hinge teeth; hinge margin inflected nearly at right angles to form a hollow lunette, running from the beak nearly to the cardinal angle; two adductor impressions in each valve; pallial scar simple, very faintly marked; a shallow anterior depression beneath the beaks, but the margin sharp and prominent. Type *C. elongata*.

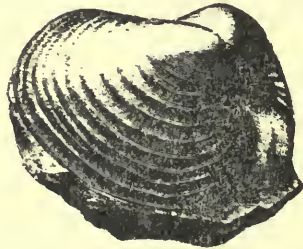


FIG. 790.—*Cardiomorpha cordata*.

archiacana, DeKoninck, 1843, Desc. An.

Foss. Belg., p. 104, Carboniferous.

bellatula, Hall, 1870, Prelim. Notice Lam. Shells, p. 92, and Pal. N. Y., vol. 5, pl. 63, figs. 1-3, Ham. Gr.

capuloides, Winchell, 1862, Proc. Acad. Nat. Sci., p. 416, Marshall Gr.

concentrica, Hall, 1883, Pal. N. Y., vol. 5, pl. 63, fig. 4, syn. for *C. zonata*.

cordata, Hall, 1883, Pal. N. Y., vol. 5, pl. 62, figs. 10-19, Ham. Gr.

donaciformis, Hall, 1883, Pal. N. Y., vol. 5, pl. 63, fig. 6, Ham. Gr.

eriopia, Hall, 1870, Prelim. Notice Lam. Shells, p. 92, and Pal. N. Y., vol. 5, pl. 63, figs. 7-8, Ham. Gr.

julia, Winchell, 1862, Proc. Acad. Nat. Sci., p. 416, Marshall Gr.

kansasensis, Swallow, 1858, Trans. St. Louis Acad. Sci., vol. 1, p. 191, Permian Gr.

missouriensis, Shumard, 1858, Trans. St. Louis Acad. Sci., vol. 2, p. 207, and Geo. Sur. Ill., vol. 5, p. 588, Coal Meas.

modiolaris, Winchell, 1862, Proc. Acad. Nat. Sci., p. 416, Marshall Gr.

(?) *obliquata*, Meek, 1872, Proc. Acad. Nat. Sci. Phil., p. 327, and Ohio Pal., vol. 1, p. 146, Hud. Riv. Gr.

oblonga, see *Protomya oblonga*.

ovata, see *Dexiobia ovata*.

parvirostris, White, 1862, Proc. Bost. Soc. Nat. Hist., vol. 8, p. 31, syn. for *Dexiobia ovata*.

pellensis, Worthen, 1884, Bull. No. 2, Ill. St. Mus. Nat. Hist., p. 16, and Geo. Sur. Ill., vol. 8, p. 126, St. Louis Gr.

radiata, see *Cardiopsis radiata*.

rhomboidea, Hall, see *Cardiomorpha subrhomboidea*.

rhomboidea, Swallow, 1858, Trans. St. Louis Acad. Sci., vol. 1, p. 191, Permian Gr.

rotunda, Hall, 1883, Pal. N. Y., vol. 5, pl. 63, figs. 17–20, refer figs. 18 and 19 to *Paracyclas rotunda*, fig. 17 to *Schizodus degener*, and fig. 20 to *S. patulus*.

subglobosa, Meek, 1875, Ohio Pal., vol. 2, p. 304, Waverly Gr.

suborbicularis, Hall, 1843, (Ungulina suborbicularis,) Geo. Rep. 4th Dist. N. Y., p. 244, and Pal. N. Y., vol. 5, pl. 63, figs. 9–10, Portage Gr.

subrhomboidea, Hall, 1877, 1st Ed. Am. Pal. Foss., p. 186, (proposed instead of *Cypricardites rhomboidea*, in Geo. Rep. Iowa, p. 523, which was preoccupied,) Kinderhook Gr.

textilis, Hall, 1883, Pal. N. Y., vol. 5, pl. 63, figs. 11–15, Chemung Gr.

triangulata, Swallow, 1860, Trans. St. Louis Acad. Sci., vol. 1, p. 655, Waverly or Choteau Gr.

trigonalis, Winchell, 1863, Proc. Acad. Nat. Sci., p. 15, Marshall Gr.

undulata, Hall, 1883, Pal. N. Y., vol. 5, pl. 63, fig. 16, Portage Gr.

(?) *vetusta*, see *Cypricardites vetustus*.

vindobonensis, Hartt, 1868, Acad. Geol., p. 304, Carboniferous.

zonata, Hall, 1883, Pal. N. Y., vol. 5, pl. 63, fig. 5, Ham. Gr.

CARDIOPSIS, Meek & Worthen, 1861, Proc. Acad. Nat. Sci. Phil., p. 144. [Ety. *kardia*, the heart; *opsis*, appearance.] Equivalve, somewhat inequilateral, oblique, ovate or cordiform, entirely closed; beaks elevated, incurved, directed anteriorly; cardinal margin short; rounding into the posterior border; two anterior teeth in each valve; surface radiated. Type C. *radiata*.

crassicostata, Hall & Whitfield, 1873, 24th Rep. N. Y. St. Mus. Nat. Hist., p. 188, Schoharie grit and Corniferous limestone.

crenistriata, see *Pterinea crenistriata*.

jejuna, Winchell, 1862, Proc. Acad. Nat. Sci., p. 417, Marshall Gr.

megambonata, Winchell, 1862, Proc. Acad. Nat. Sci., p. 417, Marshall Gr.

parvirostris, White, 1862, Proc. Bost. Soc. Nat. Hist., vol. 9, p. 31, syn. for *Dexiobia ovata*.

radiata, Meek & Worthen, 1860, (Cardiomorpha radiata,) Proc. Acad. Nat. Sci. Phil., p. 458, and Geo. Sur. Ill., vol. 2, p. 157, Kinderhook Gr.

Cardium, Linnæus, 1758, Syst. Nat., 10th Ed. [Ety. *kardia*, the heart.] Not a Palæozoic genus.

iovensis, see *Cypricardites iowensis*.

lexingtonensis, Swallow, 1858, Trans. St. Louis Acad. Sci., vol. 1, p. 207, Mid. Coal Meas.

nautiloidea, Castelnau, 1843, Syst. Sil. Seneca Lake, N. Y. Not recognized.

vetustum, see *Præcardium vetustum*.

CHÆNOCARDIA, Meek & Worthen, 1869, Proc. Acad. Nat. Sci., p. 170. [Ety. *chairo*, to gape; *kardia*, the heart.] Ovate, ventricose, gaping anteriorly, edgetruncated, hinge-line short, beaks small, incurved; surface concentrically marked. Type C. *ovata*.



FIG. 791.—*Chænocardia ovata*. hinge-line short, beaks small, incurved; surface concentrically marked. Type C. *ovata*.

ovata, Meek & Worthen, 1869, Proc. Acad. Nat. Sci. Phil., p. 170, and Geo. Sur. Ill., vol. 5, p. 586, Coal Meas.

CHÆNOMYA, Meek, 1864, Pal. of Up. Mo., p. 42. [Ety. *chairo*, to open or gape; *Mya*, a genus of shells.] Shell thin, equivalve, longitudinally oblong, subcylindrical; anterior side rounded, closed; posterior side long, truncated, gaping at the extremity; surface granulo- and concentrically marked; cardinal margin inflected as in *Allorisma*; ligament external; hinge edentulous; posterior muscular impressions near the posterior extremity of the dorsal margin; scars of the anterior adductor and pedal muscles connected; pallial line with a broad shallow sinus. Type C. *leavenworthensis*.

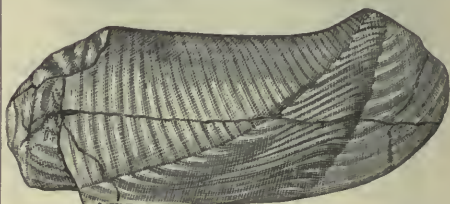


FIG. 792.—*Chænomya marla*. Right valve.

cooperi, Meek & Hayden, 1858, (Panopæa cooperi,) Trans. Alb. Inst., vol. 4, p. 83, and Pal. Up. Mo., p. 44, Coal Meas.

hybrida, see *Allorisma hybridum*.

leavenworthensis, Meek & Hayden, 1858, (Allorisma leavenworthense,) Proc. Acad. Nat. Sci. Phil., p. 263, and Pal. Up. Mo., p. 43, Coal Meas. maria, Worthen, 1882, Bull. No. 1. Ill. St. Mus. Nat. Hist., p. 39, and Geo. Sur. Ill., vol. 7, p. 319, Up. Coal Meas.



FIG. 793.—*Chænomys maria*. Dorsal view.

minnehaha, Swallow, 1858, (Allorisma (?) minnehaha,) Trans. St. Louis Acad. Sci., vol. 1, p. 194, and Geo. Sur. Ill., vol. 5, p. 588, Coal Meas. rhomboidea, Meek & Worthen, 1865, Proc. Acad. Nat. Sci. Phil., p. 250, and Geo. Sur. Ill., vol. 5, p. 540, St. Louis Gr.

CIMITARIA, Hall, 1870, Prelim. Notice Lam. Shells, p. 66. [Ety. from resemblance to a cimiter.] Equivalve, transversely elongated; valves depressed, with an antero-mesial constriction; beaks incurved; cardinal line recurved; escutcheon and lunule; ligament external; surface concentrically lined. Type *C. recurva*.

angulata, Hall, 1885, Pal. N. Y., vol. 5, p. 468, Chemung Gr. *corrugata*, Conrad, 1842, (Cypricardites *corrugatus*,) Jour. Acad. Nat. Sci., vol. 8, p. 244, and Pal. N. Y., vol. 5, pl. 77, figs. 1-4, Ham. Gr.

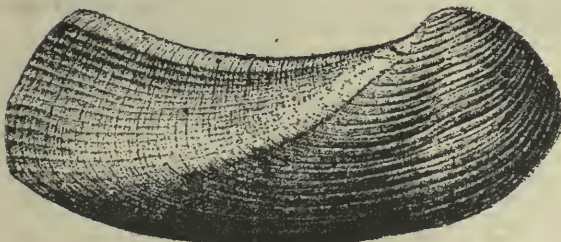


FIG. 794.—*Cimitaria recurva*.

elongata, Conrad, 1841, (Cypricardites *elongatus*,) Ann. Rep. N. Y., p. 51, and Pal. N. Y., vol. 5, pl. 77, figs. 5-8, Ham. Gr.

recurva, Conrad, 1842, (Cypricardites *recurvus*,) Jour. Acad. Nat. Sci., vol. 8, p. 245, and Pal. N. Y., vol. 5, pl. 77, figs. 9-16, Ham. Gr.

CLIDOPHORUS, Hall, 1847, Pal. N. Y., vol. 1, p. 300. [Ety. *kleidos*, a clavicle; *phoros*, bearing.] Equivalve, inequilateral; hinge without teeth or crenulations; cast marked by an oblique linear de-

pression extending from the anterior cardinal margin toward the base, indicating the existence of a clavicle as in *Solecurtus*; surface concentrically lined. Type *C. planulatus*.

chicagoensis, S. A. Miller, 1880, Jour. Cin. Soc. Nat. Hist., vol. 3, p. 314, Niagara Gr.

concentricus, Hall, 1860, Can. Nat. and Geo., vol. 5, p. 149, Low. Sil.

concentricus, Dawson, 1868. The name was preoccupied.

cuneatus, Hall, 1860, Can. Nat. and Geo., vol. 5, p. 148, Low. Sil.

ellipticus, Ulrich, 1879, Jour. Cin. Soc. Nat. Hist., vol. 2, p. 25, Hud. Riv. Gr.

elongatus, Hall, 1860, Can. Nat. and Geo., vol. 5, p. 150, Low. Sil.

erectus, Hall, 1860, Can. Nat. and Geo., vol. 5, p. 149, and Acad. Geol., p. 600, Up. Sil.

erectus, Dawson, 1868. The name was preoccupied.

faberi, n. sp. Shell small, smooth, subelliptical in outline, length greater than height; anterior end narrower than the posterior; basal margin a semi-elliptic curve; beaks prominent, and but little in advance of the middle; umbonal slope rounded, and tapering to the postero-basal margin of the shell; cardinal line gently curving, reaching the highest point posterior to the middle of the shell; pallial line simple and well defined; furrow deep, and extending from immediately in front of the beaks to the pallial line. Distinguished from *C. fabula* by the more prominent beaks and higher arch in the cardinal line posterior to the beaks and other minor particulars; beside it is generally a larger shell, though variable in size. Collected in the upper part of the Hud. Riv. Gr., near Versailles, Indiana, and in Butler County, Ohio.



FIG. 795.—*Clidophorus faberi*. Mag. 5 diam.

fabula, Hall, 1845, (Nucula *fabula*,) Am. Jour. Sci. and Arts, vol. 43, p. 295, and Ohio Pal., vol. 1, p. 138, Hud. Riv. Gr. *macchesneyanus*, syn. for *Modiolopsis recta*. major, Ulrich, 1879, Jour. Cin. Soc. Nat. Hist., vol. 2, p. 25, Hud. Riv. Gr. *neglectus*, Hall, 1862, Geo. Rep. Wis., p. 55, Hud. Riv. Gr.



FIG. 796.—*Clidophorus macchesneyanus*. Right side and dorsal view of a cast magnified 10 diameters.

nuculiformis, Hall, 1860, Can. Nat. and Geo., vol. 5, p. 150, Up. Sil.

planulatus, Conrad, 1841, (Nuculites planulatus,) Ann. Rep. N. Y., p. 48, and Pal. N. Y., vol. 1, p. 300, Hud. Riv. Gr.

semiradiatus, Hall, 1860, Can. Nat. and Geo., vol. 5, p. 150, Arisaig series of Up. Sil.

solenoides, see *Solenopsis solenoides*.

subovatus, Hall, 1860, Can. Nat. and Geo., vol. 5, p. 151, Arisaig series of Up. Sil.

CLINOPISTHA, Meek & Worthen, 1870, Proc. Acad. Nat. Sci. Phil., p. 43. [Ety. *klino*, I lean; *opisthe*, backward.] Shell short, gibbous, subquadrate, beaks posterior, and muscular impressions immediately behind the beaks; muscular impressions near the margins of the valves; ligament external. Type *C. lævis*.

insularis, Walcott, 1885, (Dystactella insularis,) Monogr. U. S. Geo. Sur., vol. 8, p. 172, Devonian. *antiqua*, Meek, 1871, Proc.

Acad. Nat. Sci. Phil., p. 67, and Ohio Pal., vol. 1, p. 208, Corniferous Gr.

lævis, Meek & Worthen, 1870, Proc. Acad. Nat. Sci. Phil., p. 44, and Geo. Sur. Ill., vol. 5, p. 584, Coal Meas.

radiata, Hall, 1858, (Edmondia radiata,) Geo. Rep. Iowa, p. 716, Coal Meas.

subnasuta, Hall & Whitfield, 1872, (Tellinomya subnasuta,) 24th Rep. N. Y. Mus. Nat. Hist., p. 192, and Pal. N. Y., vol. 5, p. 512, Ham. Gr.

telliniformis, Hall, 1883. (Dystactella telliniformis,) Pal. N. Y., vol. 5, p. 513, Up. Held. Gr.

CONOCARDIUM, Bronn, 1835, Leth. Geo., vol. 1, p. 92. [Ety. *konos*, a cone; *kardia*, the heart.] Equivalve, very inequilateral, hemifusiform; beaks prominent, incurved close to the anterior end, which is broad, flattened, more or less truncate nearly at right angles to the straight hinge-line, which is prolonged as an abruptly contracted, slender, tubular wing from the dorsal part of the anterior face; body of the shell diminishing conoidally from the edge of the anterior face toward the posterior end, which is attenuated, roundly and widely gaping; substance of the shell very thick, of a minute quadrangular cellular tissue, with strong internal ribs radiating from the beak, and often smaller external ones, strongest anteriorly. Type *C. hibernicum*.

acadianum, Hartt, 1868, Acad. Geol., p. 304, Carb.

æquilaterale, Hall, 1858, Trans. Alb. Inst., vol. 4, p. 16, and Bull. Am. Mus. Nat. Hist., p. 62, Warsaw Gr.

altum, Keyes, 1888, Proc. Acad. Nat. Sci. Phil., pl. xii, figs. 4a, 4b, Ham. Gr.

antiquum, Owen, 1852, (Pleurorhynchus antiqua,) Geo. Wis., Iowa, and Minn., pl. 2, fig. 19, Silurian.

attenuatum, Conrad, 1842, (Pleurorhynchus attenuatus,) Jour. Acad. Nat. Sci., vol. 8, p. 252, Up. Held. Gr.

bifarium, Winchell, 1856, Rep. Low. Peninsula Mich., p. 95, Ham. Gr.

blumenbachium, see *Euchasma blumenbachi*.

bovipedale, Winchell, 1862, Proc. Acad. Nat. Sci., p. 419, Marshall Gr.

carinatum, Hall, 1858, Trans. Alb. Inst., vol. 4, p. 14, and Bull. Am. Mus. Nat. Hist., p. 59, Warsaw Gr.

catastomum, Hall, 1858, Trans. Alb. Inst., vol. 4, p. 13, and Bull. Am. Mus. Nat. Hist., p. 58, Warsaw Gr.

concinnum, Hall, 1883, Pal. N. Y., vol. 5, pl. 68, figs. 26-27, Ham. Gr.

crassifrons, Conrad, 1842, (Pleurorhynchus crassifrons,) Jour. Acad. Nat. Sci., vol. 8, p. 252, Ham. Gr.

cuneatum, Hall, 1858, Trans. Alb. Inst., vol. 4, p. 14, and Bull. Am. Mus. Nat. Hist., p. 60, Warsaw Gr.

cuneus, Conrad, 1840, (Pleurorhynchus cuneus,) Ann. Rep. N. Y., p. 206, and Pal. N. Y., vol. 5, pl. 67, figs. 21-32, Up. Held. Gr.

denticulatum, Hall, 1883, Pal. N. Y., vol. 5, pl. 68, figs. 24-25, Ham. Gr.

eboraceum, Hall, 1860, 13th Rep. N. Y. Mus. Nat. Hist., p. 91, and Pal. N. Y., vol. 5, p. 412, Ham. Gr.

elegantulum, Billings, 1866, Catal. Sil. Foss., Antic., p. 53, Anticosti Gr.

emmetense, Winchell, 1866, Rep. Low. Peninsula Mich., p. 95, Ham. Gr.

immaturum, Billings, 1862, Pal. Foss., vol. 1, p. 41, Black Riv. Gr.

inceptum, Hall, 1859, Pal. N. Y., vol. 3, p. 491, Low. Held. Gr.

liratum, Hall, 1883, Pal. N. Y., vol. 5, pl. 68, figs. 28-29, Chemung Gr.

meekanum, Hall, 1858, Trans. Alb. Inst., vol. 4, p. 15, and Bull. Am. Mus. Nat. Hist., p. 61, Warsaw Gr.

napoleonense, Winchell, 1862, Proc. Acad. Nat. Sci., p. 419, Marshall Gr.

nasutum, Hall, 1883, Pal. N. Y., vol. 5, pl. 67, figs. 12-20, Schoharie grit.

nevadense, Walcott, 1885, Monogr. U. S. Geo. Sur., vol. 8, p. 177, Devonian.

niagarensis, Winchell & Marcy, 1865, Mem. Bost. Soc. Nat. Hist., p. 97, Niagara Gr.

normale, Hall, 1883, Pal. N. Y., vol. 5, pl. 68, figs. 17-19, Ham. Gr.

obliquum, Meek & Worthen, 1865, Proc. Acad. Nat. Sci. Phil., p. 249, and Geo. Sur. Ill., vol. 6, p. 529, Coal Meas.



FIG. 797.—*Clinopectista antiqua*.



FIG. 798.—*Clinopectista radiata*.

ohioense, Meek, 1871, Proc. Acad. Nat. Sci. Phil., p. 65, and Ohio Pal., vol. 1, p. 203, Corniferous Gr.

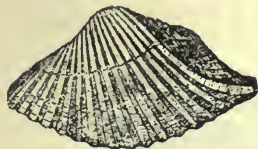


FIG. 799.—Conocardium subtrigonale. Side view.

ornatum, Winchell & Marcy, 1865, Mem. Bost. Soc. Nat. Hist., p. 111, Niagara Gr.
parrishi, Worthen, (in press,) Geo. Sur. Ill., vol. 8, p. 112, Up. Coal Meas.

prattenanum, Hall, 1858, Trans. Alb. Inst., vol. 4, p. 15, and Bull. Am. Mus. Nat. Hist., p. 61, Warsaw Gr.

pulchellum, White & Whitfield, 1862, Proc. Bost. Soc. Nat. Hist., vol. 8, p. 299, Kinderhook Gr.

reliquum, Hall, 1883, Pal. N. Y., vol. 5, pl. 68, fig. 33, Chemung Gr.

rugosum, Hall, 1883, Pal. N. Y., vol. 5, pl. 68, fig. 32, Ham. Gr.

subtrigonale, D'Orbigny, 1850, Prodr. d. Paléont., t. 1, p. 80, Up. Held. Gr.

Proposed instead of *C. trigonale*, Hall, 1843, Geo. Rep. 4th Dist., N. Y., p. 171, which was preoccupied.

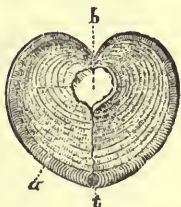


FIG. 800.—Conocardium subtrigonale. b, Broken end; t, opening; a, connection of the alations.

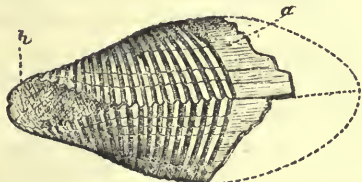


FIG. 801.—Conocardium subtrigonale. a, Shows part of the alation; b, points to the posterior hiatus.

tegulum, Hall, 1883, Pal. N. Y., vol. 5, pl. 68, figs. 30-31, Niagara Gr.

trigonale, Phillips, 1836, (Pleurorhynchus trigonale,) Geol. Yorkshire, p. 211, Devonian.

trigonale, Hall, see *C. subtrigonale*.

ventricosum, Hall, 1860, 13th Rep. N. Y. Mus. Nat. Hist., p. 91, Ham. Gr.

vomer, Conrad, 1842, (Pleurorhynchus vomer,) Jour. Acad. Nat. Sci., vol. 8, p. 253, Devonian.

CRENIPETEN, Hall, 1883, Pal. N. Y., vol. 5, p. 3. (Plates and Explanations.) [Ety. *crena*, notch; *Pecten*, a genus.] In form like *Aviculopecten*, but the hinge is furnished with a series of small cartilage pits throughout its entire length. Type *C. crenulatus*.

amplus, Hall, 1883, Pal. N. Y., vol. 5, pt. 1, p. 81, Chemung Gr.

crenulatus, Hall, 1843, (Pecten crenulatus,) Geo. Sur. 4th Dist. N. Y., p. 265, and Pal. N. Y., vol. 5, pt. 1, p. 82, Chemung Gr.

glaber, Hall, 1843, (Lima glabra,) Geo. Sur. 4th Dist. N. Y., p. 255, and Pal. N. Y., vol. 5, pt. 1, p. 85, Chemung Gr.

hallanus, Walcott, 1885, Monogr. U. S. Geo. Sur., vol. 8, p. 231, Subcarboniferous.

impolitus, Hall, 1883, Pal. N. Y., vol. 5 pt. 1, p. 83, Chemung Gr.



FIG. 802.—Crenipecten crenulatus.



FIG. 803.—Creniptecten crenulatus. Hinge-line.

leon, Hall, 1883, Pal. N. Y., vol. 5, pt. 1, p. 88, Chemung Gr.

liratus, Hall, 1883, Pal. N. Y., vol. 5, pt. 1, p. 87, Chemung Gr.

micropterus, Hall, 1883, Pal. N. Y., vol. 5, pt. 1, p. 86, Chemung Gr.

obsoletus, Hall, 1843, (Lima obsoleta,) Geo. Sur. 4th Dist., N. Y., p. 265, and Pal. N. Y., vol. 5, pt. 1, p. 84, Chemung Gr.



FIG. 804.—Crenipecten retiferus.

retiferus, Shumard, 1858, (Lima retifera,) Trans. St. Louis Acad. Sci., vol. 1, p. 214, and Geo. Sur. Ill., vol. 5, p. 588, Coal Meas.

winchelli, Meek, 1875, (Aviculopecten winchelli,) Ohio Pal., vol. 2, p. 296, Waverly Gr.

Ctenodonta, Salter, 1851, syn. for *Tellinomya*.

abrupta, see *Tellinomya abrupta*.
angela, see *Tellinomya angela*.
astartiformis, see *Tellinomya astartiformis*.
contracta, see *Tellinomya contracta*.
gibberula, see *Tellinomya gibberula*.
hartsvillensis, see *Tellinomya hartsvillensis*.
hubbardi, syn. for *Nuculites sulcatus*.
iphigenia, see *Tellinomya iphigenia*.
logani, see *Tellinomya logani*.

Cucullæa, Lamarck, 1801, Syst. An. [Ety. *Cucullus*, a hood.] Not a Palæozoic genus.

opima, Hall, 1843, syn. for *Nucula lirata*.

CUNEAMYA, Hall & Whitfield, 1875, Ohio Pal., vol. 2, p. 90. [Ety. *cuneus*, a wedge; *Mya*, a genus.] Shell large, equivalve, inequilateral ventricose; beaks prominent, incurved; cardinal line straight, ligament external; lunule and escutcheon

eon; pallial line simple. Type *C. miamiensis*.

coriformis, n. sp. Shell large, having a length in some specimens of three inches, and a height of two inches; larger at the anterior end, and cuneiformly tapering to the posterior point; beaks large, high, pointed and inrolled above the cardinal line; cardinal line straight from the top of the lunule three-fourths of the length of the shell, the posterior part forming a wing-like appendage of the shell; escutcheon dis-

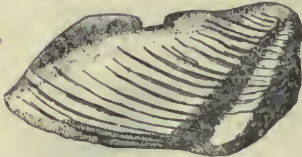


FIG. 805.—*Cuneameya coriformis*. Right valve, below medium size.

tinged and well marked; lunule heart-shaped, very large, wide and deep, margins angular; the anterior end of the shell rapidly slopes backward from the lower extremity of the lunule to the basal line; an obtuse angle is formed at the base of the lunule (this is better shown in the illustrations by the figure of the right valve than by the anterior view); a cincture or furrow, arising at the point of the beaks, and very gradually widening, reaches the basal line anterior to the middle of the shell; anterior umbonal ridge very prominent; posterior umbonal slope prominent, flattened on the outer face so as to form an obtuse angle toward posterior cardinal wing; basal line slightly curved, with a sinus at the cincture surface; concentrically lined. Distinguished from *C. miamiensis* by the remarkably large lunule, better defined cincture, and posterior cardinal wing.



FIG. 806.—*Cuneameya coriformis*. Anterior view, showing lunule.

Found in the Hudson River Group at Cincinnati, Ohio. The specific name is from the heart-shaped lunule. The specimen illustrated is from the collection of Charles Faber.

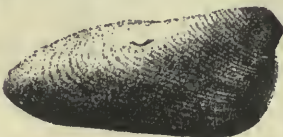


FIG. 807.—*Cuneameya miamiensis*. Right valve.

curta, Whitfield, 1878, Jour. Cin. Soc. Nat. Hist., vol. 1, p. 138, Hud. Riv. Gr.

elliptica, S. A. Miller, 1881, Jour. Cin. Soc. Nat. Hist., vol. 4, p. 317, Hud. Riv. Gr.

miamiensis, Hall & Whitfield, 1875, Ohio Pal., vol. 2, p. 91, Hud. Riv. Gr.



FIG. 808.—*Cuneameya miamiensis*. Dorsal view.

neglecta, Meek, 1871, (Sedgwickia neglecta,) Proc. Acad. Nat. Sci. Phil., p. 325, and Ohio Pal., vol. 1, p. 142, Hud. Riv. Gr.

parva, S. A. Miller, 1880, Jour. Cin. Soc. Nat. Hist., vol. 3, p. 316, Hud. Riv. Gr. *scapha*, Hall & Whitfield, 1875, Ohio Pal., vol. 2, p. 92, Hud. Riv. Gr.

CYCLOCONCHA, S. A. Miller, 1874, Cin. Quar. Jour. Sci., vol. 1, p. 231. [Ety. in allusion to the nearly circular form of the shell.] Equivalve, subequilateral, sub-circular, concentrically lined; cardinal teeth near the middle, with a long lateral tooth on each side. Type *C. mediocardinalis*.

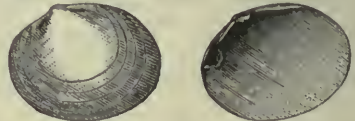


FIG. 809.—*Cycloconcha mediocardinalis*.

mediocardinalis, S. A. Miller, 1874, Cin. Quar. Jour. Sci., vol. 1, p. 231, Hud. Riv. Gr.

CYPRICARDELLA, Hall, 1858, Trans. Alb. Inst., vol. 4, p. 17. [Ety. diminutive of *Cypricardia*.]

Shell ovate, subelliptical or subquadrate, closed; surface concentrically striated; two



FIG. 810.—*Cypricardella bellistriata*.

cardinal teeth in right valve, one beneath the beak, triangular, the posterior one more slender, and turned obliquely backward, leaving a triangular pit for the tooth from the other valve; long, narrow groove in the anterior cardinal margin apparently for a projection from the left valve; posterior side beveled from above, edge thin, ligament external, occupying a deep cavity; muscular impressions distinct, shallow; pallial impression simple. Type *C. subelliptica*.

bellistriata, Conrad, 1842, (Microdon bellistriatus,) Jour. Acad. Nat. Sci., vol. 8, p. 247, Ham. Gr.

- complanata, Hall, 1870, (Microdon complanatus,) Prelim. Notice Lam. Shells, p. 33, and Pal. N. Y., vol. 5, pl. 42, fig. 22, and pl. 74, figs. 14 to 19, Ham. Gr.
- connata, Walcott, 1885, Monogr. U. S. Geo. Sur., vol. 8, p. 250, Subcarboniferous.
- gregaria, Hall, 1870, (Microdon gregarius,) Prelim. Not. Lam. Shells, p. 32, and Pal. N. Y., vol. 5, pl. 73, figs. 1-6, and pl. 74, figs. 1-4, Ham. Gr.
- macrostriata, Walcott, 1885, Monogr. U. S., Geo. Sur., vol. 8, p. 180, Devonian.
- major, Hall, 1885, Pal. N. Y., vol. 5, p. 307, Up. Held. Gr.
- nucleata, Hall, 1858, Trans. Alb. Inst., vol. 4, p. 17, and Geo. Sur. Iowa, p. 663, Warsaw Gr.
- oblonga, Hall, 1858, Trans. Alb. Inst., vol. 4, p. 18, and Bull. Am. Mus. Nat. Hist., p. 65, Warsaw Gr.
- plicata, see Goniophora plicata.
- quadrata, White & Whitfield, 1862, Proc. Bost. Soc. Nat. Hist., vol. 8, p. 300, Kinderhook Gr.
- reservata, Hall, 1870, (Microdon reservatus,) Prelim. Notice Lam. Shells, p. 33, and Pal. N. Y., vol. 5, pl. 74, figs. 11-13, Waverly Gr.
- subelliptica, Hall, 1858, Trans. Alb. Inst., vol. 4, p. 17, and Geo. Sur. Iowa, p. 664, Warsaw Gr.
- tenuistriata, Hall, 1870, (Microdon tenuistriatus,) Prelim. Notice Lam. Shells, p. 32, and Pal. N. Y., vol. 5, pl. 73, figs. 23 to 30, and pl. 74, figs. 20, 21, Ham. Gr.
- CYPRICARDIA, Lamarek, 1801, Syst. An. sans Vert. [Ety. from the two genera *Cyprina* and *Cardium*.] Oblong, oblique posterior ridge; umbones anterior, depressed; ligament external, in deep, narrow grooves; cardinal teeth two, lateral one, in each valve, sometimes obscure; muscular impressions two, oval, placed below the extreme anterior and posterior ends of the cardinal line; pallial line simple. Typical *C. obesa*.
- angusta*, see Cypricardites angustus.
- angustata*, Vanuxem, syn. for Amnigenia catskillensis.
- choteauensis*, Swallow, 1863, Trans. St. Louis Acad. Sci., vol. 2, p. 96, Waverly or Choteau Gr.
- contracta*, see Sphenotus contractus.
- indianensis*, see Cypricardinia indianensis.
- insecta*, Dawson, 1868, Acad. Geol., p. 303, Carboniferous.
- leidyi*, Lea, see Leaia, leidy.
- obsoleta*, see Cypricardites obsoletus.
- occidentalis*, Hall, 1852, Stans. Ex. to Great Salt Lake, p. 412, Coal Meas.
- occidentalis*, Swallow, 1863, Trans. St. Louis Acad. Sci. This name was pre-occupied. See *C. swallovana*.
- pikensis*, Swallow, 1863, Trans. St. Louis Acad. Sci., vol. 2, p. 95, Coal Meas.
- plicatula*, Swallow, 1858, Trans. St. Louis Acad. Sci., vol. 4, p. 205, Mid. Coal Meas.
- primigenia*, see Modiolopsis primigenia.
- randolphensis*, see Sanguinolites randolphensis.
- rhombea*, see Cytherodon rhombeus.
- rigida*, see Sphenotus rigidus.
- shumardana*, Swallow, 1863, Trans. St. Louis Acad. Sci., vol. 2, p. 95, St. Genevieve limestone.
- subplana*, see Edmondia subplana.
- swallovana*, S. A. Miller, 1863, 2d Ed. Am. Pal. Foss., p. 310, Coal Measures of Harrison County, Missouri. Proposed instead of *C. occidentalis*, Swallow, 1863, in Trans. St. Louis Acad. Sci., p. 96.
- undulata*, Gurley, 1883, New. Carb. Foss., p. 3, Coal Meas. Publication invalid.
- ventricosa*, Hall, 1860, 13th Rep. N. Y. Mus. Nat. Hist., p. 110, Kinderhook Gr.
- wheeleri*, see Schizodus wheeleri.
- CYPRICARDINIA, Hall, 1859, Pal. N. Y., vol. 3, p. 266. [Ety. *Cypricardinia*, from its resemblance to Cypricardia.] General form of Cypricardia; inequilateral; oblique posterior ridge; umbones anterior, elevated; concentrically grooved, sometimes cancellated; postero-cardinal margin sometimes alate. Type *C. lamellosa*.
- arcuata*, Hall, 1885, Pal. N. Y., vol. 5, p. 486, Chemung Gr.
- arata*, Hall, 1867, 20th Rep. N. Y. Mus. Nat. Hist., p. 385, Niagara Gr.
- carbonaria*, Meek, 1871, FIG. 812.—Cypricardinia distincta. Left valve, long specimen. Proc. Acad. Nat. Sci. Phil., p. 163, and Ohio Pal., vol. 2, p. 342, Coal Meas.
- concentrica*, Hall, 1859, Pal. N. Y., vol. 3, p. 268, Low. Held. Gr.
- consimilis*, Hall, 1885, Pal. N. Y., vol. 5, p. 486, Waverly Gr.
- crassa*, Hall, 1859, Pal. N. Y., vol. 3, p. 268, Low. Held. Gr.
- (?) *cylindrica*, Hall & Whitfield, 1872, 24th Rep. N. Y. Mus. Nat. Hist., p. 190, Corniferous Gr.
- distincta*, Gilling, 1874, Pal. Foss., vol. 2, p. 56, Gaspe limestone, No. 8, Devonian.



FIG. 811.—Cypricardina obesa.

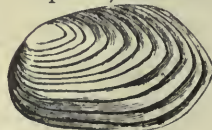
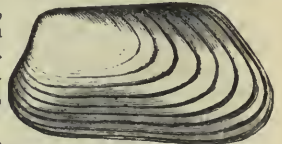


FIG. 813.—Cypricardinia distincta. Left valve, short specimen.



- dorsata, Hall, 1859, Pal. N. Y., vol. 3, p. 267, Low. Held. Gr.
- indenta, Conrad, 1842, (Cypricardites indentus,) Jour. Acad. Nat. Sci., vol. 8, p. 244, Up. Held. Gr.
- indianensis, Hall, 1858, (Cypricardia indianensis,) Trans. Alb. Inst., vol. 4, p. 18, and Bull. Am. Mus. Nat. Hist., p. 58, Warsaw Gr.
- inflata var. subaequalis, Hall & Whitfield, 1872, 24th Rep. N. Y. Mus. Nat. Hist., p. 189, Up. Held. Gr.
- lamellosa, Hall, 1859, Pal. N. Y., vol. 3, p. 266, Up. Held. Gr.
- planulata, Conrad, 1842, (Pterinea planulata,) Jour. Acad. Nat. Sci., vol. 8, p. 251, and Pal N. Y., vol. 5, p. 484, Low. Held. Gr.
- sublamellosa, Hall, 1859, Pal. N. Y., vol. 3, p. 267, Low. Held. Gr.
- subovata, Miller & Dyer, 1878, Cont. to Pal. No. 2, p. 10, Niagara Gr.
- sulcifera, Winchell, 1863, (Sanguinolites sulcifera,) Proc. Acad. Nat. Sci. Phil., p. 14, and Pal. N. Y., vol. 5, p. 487, Waverly Gr.
- CYPRICARDITES**, Conrad, 1841, Ann. Geo. Rep. N. Y., p. 51. [Ety. from resemblance to the genus *Cypricardia*.] Equivalve, profoundly inequilateral; external flattened ligamental area; hinge with four or five short oblique cardinal teeth; anterior one largest and most prominent; lateral teeth two, short and remote from the cardinal teeth; two muscular scars; surface concentrically lined with marks of growth. Type *C. curtus*. If the genus can stand, it must be based on this type (all other species are referred to other genera), because this species alone has a hinge-line like the one Conrad made.
- acutum bonus, Billings, 1866, (Cyrtodonta acutumbona,) Catal. Sil. Foss. Antic., p. 49, Anticosti Gr.
- alta, see *Modiomorpha alta*.
- alveatus, Conrad, 1843, Geo. Rep. 3d Dist. N. Y., Ham. Gr.
- amygdalinus, Hall, 1847, (Ambonychia amygdalina,) Pal. N. Y., vol. 1, p. 165, Black Riv. and Trenton Grs.
- angustus, Hall, 1843, (Cypricardia angusta,) Geo. Rep. 4th Dist. N. Y., p. 76, Clinton Gr.
- angustatus, syn. for *Amnigenia catskillensis*.
- angustifrons, syn. for *Modiolopsis modiolaris*.
- anodontoides, see *Modiolopsis anodontoides*.
- anticostiensis, Billings, 1866, (Cyrtodonta (?) anticostiensis,) Catal. Sil. Foss. Antic., p. 14, Hud. Riv. Gr.
- bisulcata, see *Grammysia bisulcata*.
- breviusculus, Billings, 1859, (Cyrtodonta brevisculus,) Can. Nat. and Geo., vol. 4, p. 446, Chazy Gr.
- canadensis, Billings, 1858, (Cyrtodonta canadensis,) Can. Nat. and Geo., vol. 3, p. 434, Black Riv. and Trenton Grs.
- carinatus, see *Goniophora carinata*.
- carinatus, Meek, 1872, (Dolabra carinata,) Proc. Acad. Nat. Sci. Phil., p. 326, and Ohio Pal., vol. 1, p. 135, Hud. Riv. Gr. This name was preoccupied.
- cariniferus, Conrad, 1842, Jour. Acad. Nat. Sci., vol. 8, p. 245, syn. for *Goniophora chemungensis*.
- catskillensis, see *Amnigenia catskillensis*.
- chemungensis, see *Goniophora chemungensis*.
- concentrica, see *Modiomorpha concentrica*.
- cordiformis, Billings, 1858, (Cyrtodonta cordiformis,) Can. Nat. and Geo., vol. 3, p. 437, Black Riv. and Trenton Grs.
- corrugatus, Conrad, 1842, Jour. Acad. Nat. Sci., vol. 8, p. 244, Ham. Gr.
- curtus, Conrad, 1841, Ann. Rep. N. Y., p. 53, Hud. Riv. Gr.
- elongatus, see *Cimitaria elongata*.
- emma, Billings, 1862, (Cyrtodonta emma,) Pal. Foss., vol. 1, p. 150, Hud. Riv. Gr.
- ferrugineus, Hall & Whitfield, 1875, Ohio Pal., vol. 2, p. 116, Clinton Gr.
- ganti, Safford, 1869, (Cyrtodonta ganti,) Geo. of Tenn., p. 287, Trenton and Hud. Riv. Grs.
- hainesi, S. A. Miller, 1874, Cin. Quar. Jour. Sci., vol. 1, p. 147, Hud. Riv. Gr.
- harrietta, Billings, 1862, (Cyrtodonta harrietta,) Pal. Foss., vol. 1, p. 149, Hud. Riv. Gr.
- haynanus, Safford, 1869, (Cyrtodonta hayniana,) Geo. of Tenn., p. 287, Trenton and Hud. Riv. Grs.
- hindi, Billings, 1862, (Cyrtodonta hindi,) Pal. Foss., vol. 1, p. 151, Hud. Riv. Gr.
- huronensis, Billings, 1858, (Cyrtodonta huronensis,) Can. Nat. and Geo., vol. 3, p. 432, Black Riv. and Trenton Grs.
- indentus, see *Cypricardia indenta*.
- inflatus, Conrad, 1842, Jour. Acad. Nat. Sci., vol. 8, p. 246, syn. for *Cypricardia indenta*.
- inflatus, Emmons, 1842, (Nuculites inflatus,) Geo. Rep. N. Y., p. 395, Trenton Gr.
- insularis, Billings, 1866, (Cyrtodonta insularis,) Catal. Sil. Foss. Antic., p. 14, Hud. Riv. Gr.
- islandicus, Hall, 1877, 1st Ed. Am. Pal. Foss., p. 189. Proposed instead of *Cypricardites, ventricosus*, Hall, 1859, which was preoccupied, Low. Held. Gr.

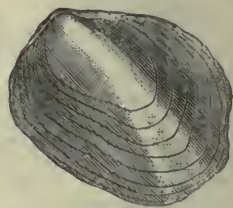


FIG. 814. — *Cypricardites hainesi*. Left valve.

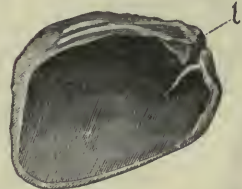


FIG. 815. — *Cypricardites hainesi*. Interior of left valve, two teeth injured at *t*.

- iowense*, Owen, 1840, (*Cardium iowense*.)
 Rep. on Mineral lands, pl. 17, fig. 8,
 Calciferous Gr.
latus, Hall, 1847, (*Modiolopsis latus*.) Pal.
 N. Y., vol. 1, p. 160, Trenton Gr.
leucothea, Billings, 1862, (*Cyrtodonta*
leucothea.) Pal. Foss., vol. 1, p. 46, Black
 Riv. Gr.
marcellensis, see *Lunulicardium marcel-*
lense.
megambonus, Whitfield, 1878, Ann. Rep.
 Geo. Sur. Wis., p. 73, and Geo. Wis.,
 vol. 4, p. 210, Trenton Gr.
modiolaris, Emmons, syn. for *Modiolopsis*
nasuta.
mytiloides, see *Modiomorpha mytiloides*.
nasutus, see *Modiolopsis nasuta*.
niota, Hall, 1861, Geo. Rep. Wis., p. 29,
 and Geo. Wis., vol. 4, p. 208, Tren-
 ton Gr.
obliquus, Meek & Worthen, 1868, Geo.
 Sur. Ill., vol. 3, p. 311, Galena Gr.
oblongus, Conrad, syn. for *Modiomorpha*
concentrica.
obsoletus, Hall, 1843, (*Cypricardia obso-*
leta.) Geo. Rep. 4th Dist. N. Y., pl. 8,
 fig. 3, Clinton Gr.
obtusus, Hall, 1847, (*Ambonychia ob-*
tusa.) Pal. N. Y., vol. 1, p. 167, Black
 Riv. and Trenton Gr.
ovata, syn. for *Modiolopsis modiolaris*.
plebeius, Billings, 1866, (*Cyrtodonta ple-*
beia.) Catal. Sil. Foss., Antic., p. 14,
 Hud. Riv. Gr.
ponderosus, Billings, 1862, (*Cyrtodonta*
ponderosa.) Pal. Foss., vol. 1, p. 150,
 Hud. Riv. Gr.
quadrangularis, Whitfield, 1878, Jour.
 Cin. Soc. Nat. Hist., vol. 1, p. 138, Hud.
 Riv. Gr.
quadrilateralis, Hall, 1867, 20th Rep. N. Y.
 Mus. Nat. Hist., p. 388, Niagara Gr.
radiatus, Conrad, 1841, Ann. Rep. N. Y.,
 p. 53, Ham. Gr. Not recognized.
rectus, Conrad, 1841, Ann. Rep. N. Y., p.
 52, Up. Held. Gr.
rectirostris, Hall, 1861, Geo. Rep. Wis., p.
 29, Trenton Gr.
recurvus, see *Cimitaria recurva*.
rotundatus, Hall, 1861, Geo. Rep. Wis.,
 p. 29, and Geo. Wis., vol. 4, p. 208,
 Trenton Gr.
rugosus, Billings, 1858, (*Cyrtodonta ru-*
gosa.) Can. Nat. and Geo., vol. 3, p. 432,
 Black Riv. Gr.
rugosus, see *Goniophora rugosa*.
saffordi, Hall, 1852, (*Palæarca saffordi*.) 12th
 Rep. N. Y. Mus. Nat. Hist., p. 11, and
 Geo. of Tenn., p. 287, Low. Held. Gr.
sectifrons, see *Phthonia sectifrons*.
sigmoideus, Billings, 1858, (*Cyrtodonta*
sigmoidea.) Can. Nat. and Geo., vol. 3,
 p. 438, Black Riv. Gr.
sinuatus, see *Modiolopsis sinuata*.
spiniferus, Billings, 1858, (*Cyrtodonta spi-*
nifera.) Can. Nat. and Geo., vol. 3, p.
 435, Black Riv. Gr.
sterlingensis, Meek & Worthen, 1866,
 (*Dolabra sterlingensis*.) Proc. Acad.
 Nat. Sci. Phil., p. 260, and Geo. Sur.
 Ill., vol. 3, p. 339, Hud. Riv. Gr.
subalatus, see *Modiomorpha subalata*.
subangulatus, Hall, 1847, (*Edmondia sub-*
angulata.) Pal. N. Y., vol. 1, p. 156,
 Black Riv. and Trenton Grs.
subcarinatus, Billings, 1858, (*Cyrtodonta*
subcarinata.) Can. Nat. and Geo., vol.
 3, p. 433, Black Riv. Gr.
subspatulatus, Hall, 1847, (*Modiolopsis*
subspatulata.) Pal. N. Y., vol. 1, p. 159,
 Black Riv. and Trenton Grs.
truncatus, see *Sphenotus truncatus*.
ungulatus, Billings, 1866, (*Cyrtodonta un-*
gulata.) Catal. Sil. Foss. Antic., p. 15,
 Hud. Riv. Gr.
ventricosus, Hall, 1847, (*Edmondia ven-*
triosa.) Pal. N. Y., vol. 1, p. 155, Tren-
 ton Gr.
ventricosus, Hall, 1859, (*Palæarca ven-*
triosa.) Pal. N. Y., vol. 3. This name
 was preoccupied. See *Cypricardites is-*
landicus.
vetustus, Hall, 1847, (*Cardiomorpha ve-*
tusta.) Pal. N. Y., vol. 1, p. 154, Tren-
 ton Gr.
winchelli, Safford, 1869, (*Cyrtodonta win-*
chelli.) Geo. Tenn., p. 287, Trenton and
 Hud. Riv. Grs.
Cyrtodonta, syn. for *Cypricardites*.
acutumbona, see *Cypricardites acutum-*
bonus.
anticostiensis, see *C. anticostiensis*.
breviuscula, see *C. brevisculus*.
canadensis, see *C. canadensis*.
cordiformis, see *C. cordiformis*.
emma, see *C. emma*.
ganti, see *C. ganti*.
harrietta, see *C. harrietta*.
hayniana, see *C. haynanus*.
hindi, see *C. hindi*.
huronensis, see *C. huronensis*.
insularis, see *C. insularis*.
leucothea, see *C. leucothea*.
normanensis, Safford. Not defined.
plebeia, see *Cypricardites plebeius*.
ponderosa, see *C. ponderosus*.
rugosa, see *C. rugosus*.
saffordi, see *C. saffordi*.
sigmoidea, see *C. sigmoideus*.
spinifera, see *C. spiniferus*.
subcarinata, see *C. subcarinatus*.
ungulata, see *C. ungulatus*.
winchelli, see *C. winchelli*.
CYTHERODON, Hall & Whitfield, 1873, in 23d
 Rep. N. Y., pl. 14, figs. 19-21. [Ety.
Cythere, a genus; *odus*, tooth.] Ovate,
 pointed posteriorly; beaks pointed;
 sharp, oblique, umbonal ridge; cardinal
 line short; subcircular anterior and
 posterior muscular scars distinct; hinge
 area strong with angular teeth or crenu-
 lations beneath the beaks, pallial line
 simple, surface concentrically lined.
 Type *C. nasutus*.
appressus, Conrad, (*Nuculites appressus*.)
 1842, Jour. Acad. Nat. Sci., vol. 8, p.
 248, and Pal. N. Y., vol. 5, pl. 75, figs.
 3-9, Ham. Gr.

chemungensis, Conrad, 1842, (*Nuculites chemungensis*,) Jour. Acad. Nat. Sci., vol. 8, p. 247, and Pal. N. Y., vol. 5, pl. 75, figs. 37-40, Chemung Gr. cuneus, Hall, 1883, Pal. N. Y., vol. 5, pl. 75, figs. 27-30, Waverly Gr.

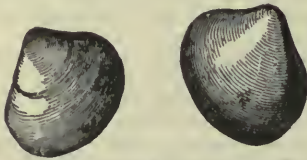


FIG. 816.—*Cytherodon rhombeus*.

ellipticus, Hall, 1870, (*Schizodus ellipticus*,) Prelim. Notice Lam. Shells, p. 96, and Pal. N. Y., vol. 5, pl. 75, figs. 13-15, Ham. Gr.

gregarius, Hall, 1883, Pal. N. Y., vol. 5, pl. 75, figs. 41-45, Chemung Gr.

nasutus, Hall, 1883, Pal. N. Y., vol. 5, pl. 75, figs. 10-12, Ham. Gr.

oblatus, Hall, Pal. N. Y., vol. 5, pl. 75, figs. 41-45, Chemung Gr.

pauper, Hall, 1883, Pal. N. Y., vol. 5, pl. 75, figs. 24-26, Chemung Gr.

(?) placidus, Billings, 1874, Pal. Foss., vol. 2, p. 137, Up. Sil.

quadrangularis, Hall, 1870, (*Schizodus quadrangularis*,) Prelim. Notice Lam. Shells, p. 96, and Pal. N. Y., vol. 5, pl. 75, figs. 31-36, Chemung Gr.

rhombeus, Hall, 1843, (*Cypricardia rhombea*,) Geo. Rep. 4th Dist. N. Y., p. 291, and Pal. N. Y., vol. 5, pl. 75, figs. 19-23, Subcarboniferous.

socialis, Billings, 1874, Pal. Foss., vol. 2, p. 138, Up. Sil.

tumidus, Hall, 1870, (*Schizodus tumidus*,) Prelim. Notice Lam. Shells, p. 94, and Pal. N. Y., vol. 5, pl. 75, figs. 1-2, Up. Held. Gr.

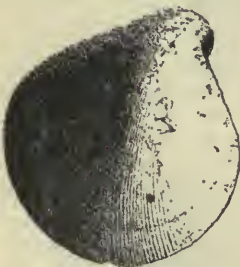


FIG. 817.—*Dextiobia ovata*.

beak incurved forward; left valve less inflated; hinge-line having a thickened cartilage plate. bearing a linear posterior groove. Type D. ovata.

DEXIOBIA, Winchell, 1863, Proc. Acad. Nat. Sci., p. 10. [Ety. *dexios*, on the right side; *bia*, strength.] Inequivalve, inequilateral, area undefined, right valve very ventricose, umbo prominent;

halli, Winchell, 1863, Proc. Acad. Nat. Sci., p. 11, Marshall Gr.

ovata, Hall, 1855, (*Cardiomorpha ovata*,) Geo. Rep. Iowa, p. 522, Kinderhook Gr.

whitii, Winchell, 1863, Proc. Acad. Nat. Sci., p. 11, Marshall Gr.

DOLABRA, McCoy, 1844, Syn. Carb. Foss. Ireland, p. 64. [Ety. *dolabra*, a mattock or pickaxe.] Obliquely ovate, gibbous;

left valve larger than the right; beaks large, obtuse, nearer the anterior than posterior end; hinge-line straight, shorter than the shell, not crenulated; a flat, narrow ligamental area the length of the hinge-line, widest between the beaks; anterior end narrower than the posterior, rounded; no byssal sinus or furrows; ventral margin slightly convex; posterior end obliquely truncated, slope flattened; surface smooth or finely striated.

alpina, Hall, 1858, Geo. Rep. Iowa, p. 716, Coal Meas.

carinata, see *Cypricardites carinatus*.

sterlingensis, see *Cypricardites sterlingensis*.

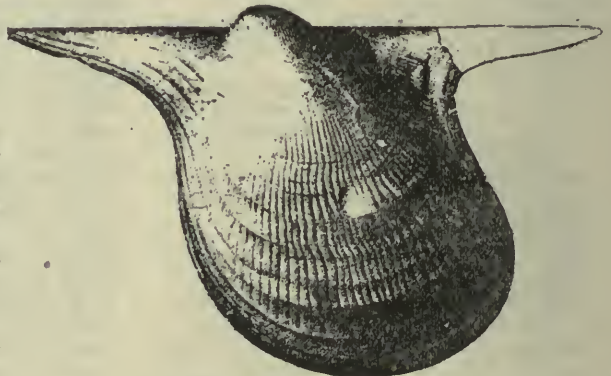


FIG. 818.—*Ectenodesma birostratum*.

Dystactella, Hall, 1883, Pal. N. Y., vol. 5, p. 4, (Plates and Explanations,) synonym for *Clinopistha*.

insularis, see *Clinopistha insularis*.

subnasuta, see *Clinopistha subnasuta*.

telliniformis, see *Clinopistha telliniformis*.

ECTENODESMA, Hall, 1883, Pal. N. Y., vol. 5, pt. 1, p. 4. (Plates and Explanations.)

[Ety. *ektenes*, stretched out; *desma*, a ligament.] Body ovate, oblique; height greater than length; both valves more or less convex; hinge-line longer than the length of the shell; byssal sinus shallow; oblique lateral tooth; ligamental area narrow, striated; surface rayed; distinguished from *Glyptodesma* by having the anterior wing more produced, and both wings more acute at their extremities. Type E. birostratum. birostratum, Hall, 1883, Pal. N. Y., vol. 5, pt. 1, p. 242, Chemung Gr.

EDMONDIA, DeKoninck, 1844, Desc. Anim. Foss., Carb. Belg., p. 66. [Ety. proper

name.] Shell equivalve, inequilateral, tumid, short, oblong or rounded, closed all around; dorsal and ventral margins slightly convex; beaks tumid, with an impressed lunette between them; surface with concentric striæ; no teeth, but an internal lamellar cartilage support, much dilated within the cavity of the beaks, the broad end forming the slits in casts coinciding with the edges of the anterior lunette, and the posterior end running nearly parallel to and close within the hinge-line; dorsal margins erect and simple; two simple adductor impressions, often with an accessory impression over each, pallial scar simple, entire. Type *E. unioniformis*.

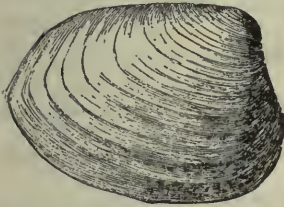


FIG. 819.—*Edmondia aspenwallensis*. Right valve.

1868, Acad. Geo., p. 303, Carb.
aspenwallensis, Meek, 1871, Hayden's Rep. Sur. Wyoming, p. 299, and Pal. E. Neb., p. 216, Coal Meas.
bicarinata, Winchell, 1863, Proc. Acad. Nat. Sci., p. 13, Marshall Gr. Prof. Hall regards this as a syn. for *Sanguinolites rigidus*.
binumbonata, Winchell, 1862, Proc. Acad. Nat. Sci., p. 414, Marshall Gr.
burlingtonensis, White & Whitfield, 1862, Proc. Bost. Soc. Nat. Hist., vol. 8, p. 301, and Pal. N. Y., vol. 5, p. 390, Kinderhook Gr.
calhouni, see *Pleurophorus calhouni*.
circularis, Walcott, 1885, Monogr. U. S. Geo. Sur., vol. 8, p. 246, Carboniferous.
concentrica, see *Astartella concentrica*.
depressa, Hall, 1870, Prelim. Notice Lam. Shells, p. 91, and Pal. N. Y., vol. 5, pl. 64, fig. 32, Waverly Gr.
ellipsis, Hall, 1885, Pal. N. Y., vol. 5, p. 392, Waverly Gr.
elliptica, Winchell, 1863, Proc. Acad. Nat. Sci., p. 13, Marshall Gr.
gibbosa, Swallow, 1858, Trans. St. Louis Acad. Sci., vol. 1, p. 189, Permian Gr.
glabra, Meek, 1872, Pal. E. Neb. p. 214, Coal Meas.
hartti, Dawson, 1868, Acad. Geol., p. 303, Carb.

æquimarginalis, Winchell, 1862, (*Cardinia æquimarginalis*,) Proc. Acad. Nat. Sci., p. 413, Marshall Gr.

anomala, Dawson,



FIG. 820.—*Edmondia aspenwallensis*. Cardinal view.

hawni, Swallow, 1858, Trans. St. Louis Acad. Sci., vol. 1, p. 209, Coal Meas.
illinoisensis, Worthen, 1884, Bull. No. 2 Ill. St. Mus. Nat. Hist., p. 18, and Geo. Sur. Ill., vol. 8, p. 122, Keokuk Gr.
ledoides, Winchell, 1866, Rep. Low. Peninsula Mich., p. 96, Ham. Gr.
mactroides, Winchell, 1866, Rep. Low. Peninsula Mich., p. 96, Ham. Gr.
marionensis, Swallow, 1860, Trans. St. Louis Acad. Sci., vol. 1, p. 654, Chocteau Gr.
medon, Walcott, 1884, Monogr. U. S. Geo. Sur., vol. 8, p. 245, Subcarboniferous.
mortonensis, Geinitz, 1866, (*Astarte mortonensis*,) Carb. und Dyas in Neb., p. 17, Coal Meas.
nebraskensis, Geinitz, 1866, (*Astarte nebraskensis*,) Carb. und Dyas in Neb., p. 16, and Pal. E. Neb., p. 214, Coal Meas.
nilesi, Winchell & Marcy, 1865, Proc. Bost. Soc. Nat. Hist., p. 97, Niagara Gr.
nitida, Winchell, 1863, Proc. Acad. Nat. Sci., p. 12, Marshall Gr.
nuptialis, Winchell, 1863, Proc. Acad. Nat. Sci., p. 12, Marshall Gr.
obliqua, Hall, 1885, Pal. N. Y., vol. 5, p. 38, Chemung Gr.
otoensis, Swallow, 1858, Trans. St. Louis Acad. Sci., vol. 1, p. 189, Permian Gr.
peroblonga, Meek & Worthen, 1866, Proc. Acad. Nat. Sci. Phil., p. 249, and Geo. Sur. Ill., vol. 5, p. 583, Coal Meas.
philipi, Hall, 1870, Prelim. Notice Lam. Shells, p. 90, and Pal. N. Y., vol. 5, pl. 64, figs. 9-18, Chemung Gr.
pinonensis, Meek, 1877, U. S. Geo. Expl. 40th parallel, vol. 4, p. 46, Devonian.
radiata, see *Clinopistha radiata*.
reflexa, Meek, 1872, Pal. E. Neb., p. 213, Coal Meas.
rhomboidea, Hall, 1883, Pal. N. Y., vol. 5, pl. 64, figs. 7-8, Chemung Gr.
semiorbiculata, Swallow, 1858, Trans. St. Louis Acad. Sci., vol. 1, p. 190, Permian Gr.
strigillata, Winchell, 1863, Proc. Acad. Nat. Sci., p. 12, Marshall Gr.
subangulata, see *Cypricardites subangulatus*.
subcarinata, Hall, 1885, Pal. N. Y., vol. 5, pl. 64, fig. 31, Chemung Gr.
subnasuta, Hall, 1883, Pal. N. Y., vol. 5, pl. 64, figs. 5-6, Chemung Gr.
subovata, Hall, 1885, Pal. N. Y., vol. 5, p. 389, Chemung Gr.
subplana, Hall, 1858, (*Cypricardia subplana*,) Trans. Alb. Inst., vol. 4, p. 19, and Bull. Am. Mus. Nat. Hist., p. 66, Warsaw Gr.
subtruncata, see *Cuneamya subtruncata*.
subtruncata, Meek, 1872, Pal. E. Neb., p. 215, Coal Meas.
tapetiformis, Meek, 1875, (*E. tapesiformis*,) Ohio Pal., vol. 2, p. 304, Waverly Gr.
tenuistriata, Hall, 1885, Pal. N. Y., vol. 5, p. 393, Chemung Gr.
transversa, Hall, 1885, Pal. N. Y., vol. 5, p. 389, Chemung Gr.

undata, see *Grammysia undata*.
undulata, Hall, 1870, Prelim. Notice Lam. Shells, p. 91, and Pal. N. Y., vol. 5, pl. 64, figs. 1-4, Chemung Gr.
unioniformis, Phillips, 1836, (*Isocardia unioniformis*), Geol. Yorkshire, vol. 2, p. 209, and Geo. Sur. Ill., vol. 2, p. 346, Coal Meas.
varsoviensis, Worthen, 1884, Bull. No. 2 Ill. St. Mus. Nat. Hist., p. 18, and Geo. Sur. Ill., vol. 8, p. 121, Keokuk Gr.

ventricosa, see *Cypricardites ventricosus*.
 ELYMELLA, Hall, 1885, Pal. N. Y., vol. 5, p. 50. [Ety. *elymos*, a case.] Equivalve, inequilateral, ovate, elliptical; anterior end short, rounded; posterior end narrower, rounded; beaks closely incurved; umbo prominent; cardinal line short; umbonal slope prominent in the upper part, not defined below; surface concentrically lined. Type *E. nuculoides*.

fabalis, Hall, 1885, Pal. N. Y., vol. 5, p. 502, Ham. Gr.
levata, Hall, 1885, Pal. N. Y., vol. 5, p. 504, Ham. Gr.
nuculoides, Hall, 1885, Pal. N. Y., vol. 5, p. 503, Ham. Gr.
patula, Hall, 1885, Pal. N. Y., vol. 5, p. 505, Waverly Gr.

Entolium, Meek, 1865, Cal. Geo. Sur., vol. 2. [Ety. *entos*, inside; *leion*, smooth.] If synonymous with *Pernopecten*, then the latter has priority; but if distinct, then probably it is not a Paleozoic genus, as the type is from rocks of Jurassic age.

Eodon, Hall, 1877, 1st Ed. Am. Pal. Foss., p. 244. Proposed instead of *Microdon*, Conrad, which was preoccupied.

EOPTERIA, Billings, 1865, Pal. Foss., vol. 1, p. 221. [Ety. *eos*, dawn; *pteron*, a wing.] Prof. Billings said if *Euchasma* is the same as *Eopteria*, then he desired *Eopteria* to be withdrawn from science. Winged as in *Pterinea*, both valves equally convex and gaping; ligament external. Type *E. typica*.

(?) *ornata*, Billings, 1865, Pal. Foss., vol. 1, p. 307, Quebec Gr.
richardsoni, Billings, 1865, Pal. Foss., vol. 1, p. 306, Quebec Gr.

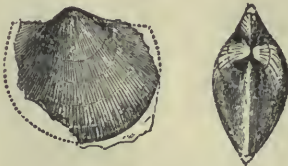


FIG. 821.—*Eopteria richardsoni*.

typica, Billings, 1865, Pal. Foss., vol. 1, p. 221, Quebec Gr.

EUCHASMA, Billings, 1865, Pal. Foss., vol. 1, p. 360. [Ety. *eu*, well; *chasma*, a hollow.] Strongly convex, triangular, in-

equilateral, equivalve, subcordiform, gaping, posterior extremity flattened, hinge short, ligament external. Type *E. blumenbachi*.

blumenbachi, Billings, 1859, (*Conocardium blumenbachi*), Can. Nat. and Geo., vol. 4, p. 350, Quebec Gr.

EUCHONDRIA, Meek, 1874, Am. Jour. Sci., 3d series, vol. 7, p. 445. Like *Aviculopecten* in form, but with an unsymmetrical subrostral cartilage pit and unequal crenulations on the two sides. Type *E. neglecta*.
neglecta, Geinitz, 1866,



FIG. 822.—*Euchondria neglecta*. Right valve enlarged two diameters.



FIG. 823.—*Euchondria neglecta*. Hinge-line enlarged.

Eumicrotus, Meek, 1864, syn. for *Pseudomonotis*.

hawni, see *Pseudomonotis hawni*.
hawni var. *ovata*, see *Pseudomonotis hawni* var. *ovata*.
hawni var. *sinuata*, see *Pseudomonotis hawni* var. *sinuata*.

EUTHYDESMa, Hall, 1885, Pal. N. Y., vol. 5, p. 32.

[Ety. *euthus*, straight; *desma*, a ligament.] Equivalve, inequilateral, broadly subovate, with a subalate

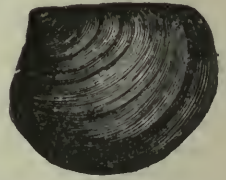


FIG. 824.—*Euthydesma* subtextile.

cardinal expansion; cardinal line straight; anterior end short; surface concentrically lined; hinge-line marked by a continuous ligamental groove. Type *E. subtextile*.
subtextile, Hall, 1843, (*Astarte subtextilis*), Geo. Sur. 4th Dist. N. Y., p. 245, Portage Gr.

Exochorhynchus, Meek, 1864, Pal. Up. Mo. [Ety. *exochos*, prominent; *rhynchos*, beak.] This name was suggested as a probable genus or subgenus to include *Sedgwickia altirostrata*.

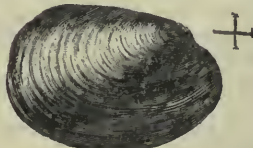


FIG. 825.—*Fordilla troyensis*.

FORDILLA, Bar-
 rande, 1881,
 Acephales.
 Etudes Loc.
 et Comp.,
 pl. 361, and
 Bull. U. S.
 Geo. Sur.,
 No. 30, p. 123.

A minute bivalve, somewhat resembling a *Modiolopsis* or an *Orthonotella*. Type *F. troyensis*.
troyensis, Bar-
 rande, 1886, Bull. U. S. Geo. Sur., vol. 30, p. 125, Up. Taconic.

Gervillia, DeFrance, 1820, Dict. Sci. Nat., xviii. [Ety. proper name.] Type *G. anceps*. This genus is probably unknown in the American Palæozoic rocks.

auricula, see *Monopteria auricula*.

longa, see *Avicula longa*.

longispina, see *Monopteria longispina*.

strigosa, see *Pterinea strigosa*.

sulcata, see *Bakevellia sulcata*.

GLOSSITES, Hall, 1885, Pal. N. Y., vol. 5, p. 49. [Ety. *glosse*, the tongue.] Equivalve, inequilateral, elliptical; anterior end short, margin declining from the beak and curving below; posterior end large, broadly rounded; beaks small, appressed; cardinal line long, gently arcuate; umbonal slope not defined; surface marked concentrically; ligament external; lunule distinct; muscular impressions shallow. Type *G. lingualis*.

amygdalinus, Winchell, 1863, (*Sanguinolites amygdalinus*.) Proc. Acad. Nat. Sci. Phil., p. 13, and Pal. N. Y., vol. 5, p. 501, Waverly Gr.

depressus, Hall, 1885, Pal. N. Y., vol. 5, p. 496, Chemung Gr.

ellipticus, Hall, 1885, Pal. N. Y., vol. 5, p. 498, Chemung Gr.

lingualis, Hall, 1885, Pal. N. Y., vol. 5, p. 497, Chemung Gr.

patulus, Hall, 1885, Pal. N. Y., vol. 5, p. 501, Chemung Gr.

procerus, Hall, 1885, Pal. N. Y., vol. 5, p. 499, Chemung Gr.

rudicula, Hall, 1885, Pal. N. Y., vol. 5, p. 498, Chemung Gr.

subnasutus, Hall, 1885, Pal. N. Y., vol. 5, p. 500, Chemung Gr.

subtenuis, Hall, 1885, Pal. N. Y., vol. 5, p. 495, Ham. Gr.

teretis, Hall, 1885, Pal. N. Y., vol. 5, p. 494, Up. Held. Gr.



FIG. 826.

Glyptocardia speciosa.

GLYPTOCARDIA, Hall, 1885, Pal. N. Y., vol. 5, p. 35.

[Ety. *glyptos*, sculptured; *cardia*, the heart.] Shell

small, equivalve, inequilateral, broadly elliptical

or subcircular; beaks incurved; surface plicated and marked with concentric striae; no area beneath the beaks. Type *G. speciosa*.

speciosa, Hall, 1843, (*Avicula speciosa*.) Geo. Sur. 4th Dist. N. Y., p. 243, and Pal. N. Y., vol. 5, p. 426, Ham. and Portage Grs.

GLYPTODESMA, Hall, 1883, Pal. N. Y., vol. 5, pt. 1, p. 4. (Plates and Explanations.) [Ety. *glyptos*, sculptured; *desma*, a ligament.] Aviculiform, ligamental area striated, continuous, hinge with two strong lateral teeth, and numerous irregular transverse plications along the cardinal margin; surface concentrically striated. Type *G. erectum*.

cruciforme, Conrad, 1841, (*Avicula cruciformis*.) Ann. Rep. N. Y., p. 54, Ham. Gr.

erectum, Conrad, 1842, (*Avicula erecta*.) Jour. Acad. Nat. Sci., vol. 8, p. 238, and Pal. N. Y., vol. 5, p. 153, Ham. Gr.

erectum var. *obliquum*, Hall, 1883, Pal. N. Y., vol. 5, pt. 1, p. 155, Ham. Gr.

occidentale, Hall, 1883, Pal. N. Y., vol. 5, pt. 1, p. 157, Up. Held. Gr.

subrectum, Whitfield, 1882, (*Actinodesma subrectum*.) Ann. N. Y. Acad. Sci., vol. 2, p. 215, Ham. Gr.



FIG. 827.
Glyptodesma erectum.

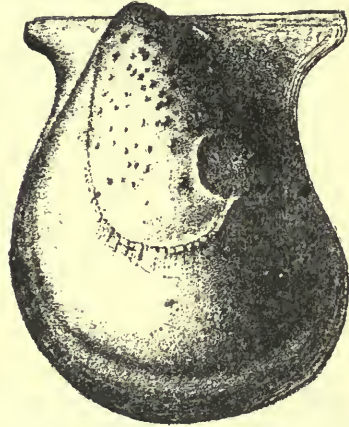


FIG. 828.—*Glyptodesma erectum*. Mold of left valve, showing pallial line, muscular scar, tubercles in the interpallial area representing points of muscular attachment.

GONIOPHORA, Phillips, 1848, Mem. Geo. Sur. Gt. Brit., vol. 2, p. 264. [Ety. *gonia*, an angle; *phoros*, bearing.] *Goniophorus* was used by Agassiz for a genus of Echinoderms in 1840. Equivalve, very inequilateral, rhomboidal or trapezoidal, obliquely truncate behind, rounded in front; cardinal line straight; beaks small, umbo prominent, and slope continued as a ridge to the post-inferior margin; oblique, undefined sinus from anterior to the beaks to basal margin; surface concentrically lined; hinge with an oblique fold or tooth in the left valve beneath the beak, and a corresponding depression in the right valve; ligament external, attached by one or more grooves; anterior muscular impression deep, situated anterior to the beak; posterior muscular impression shallow, situated on the posterior cardinal slope; pallial line simple. Type *G. cymbiformis*.

acuta, Hall, 1870, (*Sanguinolites acutus*.) Prelim. Notice Lam. Shells, p. 37, and Pal. N. Y., vol. 5, pl. 43, figs. 1-3, Ham. Gr.

alata, Hall, 1885, Pal. N. Y., vol. 5, p. 294, Schoharie grit.

bellula, Billings, 1874, Pal. Foss., vol. 2, p. 136, Up. Sil.

carinata, Conrad, 1841, (Cypricardites carinatus,) Ann. Rep. Geo. Sur. N. Y., p. 53, and Pal. N. Y., vol. 5, pl. 44, figs. 6-8, Ham. Gr.
 chemungensis, Vanuxem, 1842, Cypricardites chemungensis, Geo. Rep. N. Y., p. 181, and Pal. N. Y., vol. 5, pl. 44, figs. 18-22, Chemung Gr.
 consimilis, Billings, 1874, Pal. Foss., vol. 2, p. 135, Up. Sil.
 crassa, Whiteaves, 1888, Pal. Foss., vol. 3, p. 9, Guelph Gr.
 glabra, Hall, 1883, Pal. N. Y., vol. 5, pl. 44, figs. 9-17, syn. for *G. glaucus*.
 glaucus, Hall, 1870, (Sanguinolites glaucus,) Prelim. Notice Lam. Shells, p. 38, and Pal. N. Y., vol. 5, p. 299, Ham. Gr.
 hamiltonensis, Hall, 1870, (Sanguinolites hamiltonensis,) Prelim. Notice Lam. Shells, p. 30, and Pal. N. Y., vol. 5, pl. 43, figs. 8-21, Ham. Gr.
 mediocris, Billings, 1874, Pal. Foss., vol. 2, p. 137, Up. Sil.
 minor, Hall, 1885, Pal. N. Y., vol. 5, p. 305, Chemung Gr.
 perangulata, Hall, 1870, (Sanguinolites perangulatus,) Prelim. Notice Lam. Shells, and Pal. N. Y., vol. 5, pl. 34, figs. 1-7, Up. Held. Gr.



FIG. 829.—*Gonlophora chemungensis*.

plicata, Hall, 1858, (Cypricardella plicata,) Trans. Alb. Inst., vol. 4, p. 18, and Bull. Am. Mus. Nat. Hist., p. 66, Warsaw Gr.
 rugosa, Conrad, 1841, (Cypricardites rugosus,) Ann. Rep. N. Y., p. 53, and Pal. N. Y., vol. 5, p. 297, Ham. Gr.
 speciosa, Hall, 1879, Desc. New. Spec. Foss., p. 17, and 11th Rep. Geol. Indiana, p. 317, Niagara Gr.
 subrecta, Hall, 1885, Pal. N. Y., vol. 5, p. 304, Chemung Gr.
 transiens, Billings, 1874, Pal. Foss., vol. 2, p. 134, Up. Sil.
 trigona, Hall, 1885, Pal. N. Y., vol. 5, p. 302, Chemung Gr.
 truncata, Hall, 1883, Pal. N. Y., vol. 5, pl. 44, fig. 15, Ham. Gr.
 GOSSELETTIA, Barrois, 1881, Ann. Soc. Geol. du Nord, vol. 8, p. 176. [Ety. proper name.] Shell subtriangular, truncate on the anterior side, subulate posteriorly; ligamental area wide, longitudinally striate; cardinal teeth below the beak strong; lateral teeth elongate; surface with concentric striae.

retusa, Hall, 1883, Pal. N. Y., vol. 5, pt. 1, p. 266, Ham. Gr.

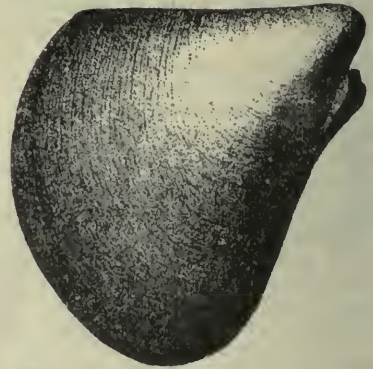


FIG. 830.—*Gosselletia triquetra*. Right valve.

triquetra, Conrad, 1838, (Pterinea triquetra,) Ann. Rep. Geo. N. Y., p. 116, and Pal. N. Y., vol. 5, pt. 1, p. 265, Ham. Gr.

GRAMMYSIA, DeVerneuil, 1847, Bull. Soc. Geo. France, 2d ser., vol. 4, p. 696.

[Ety. *gramme*, a line of writing; *Mys*, a mussel shell, in allusion to the transverse furrows which cross the valves from the umbones to the middle of the ventral margin.] Equivalve, inequilateral; shell thick, oblong; anterior side short, contracted by a deep oval lunette beneath the beak; posterior end elliptically rounded; hinge-line straight; two large adductor impressions in each valve, anterior

rounded, posterior pear-shaped; pallial scar entire; cartilage external, short, in the anterior part of a deep depression formed by the inflexion of the hinge margins; an oblique furrow extends from the beak to about the middle of the ventral margin. Type *G. bisulcata*.
 acadica, Billings, 1874, Pal. Foss., vol. 2, p. 140, Up. Sil.

alveata, Conrad, 1841, (Posidonia alveata,) Ann. Rep. N. Y., p. 53, and Pal. N. Y., vol. 5, pl. 57, figs. 1-2, and pl. 60, Ham. Gr.

arcuata, Conrad, 1841, (Posidonia arcuata,) Ann. Rep. N. Y., p. 53, and Pal. N. Y., vol. 5, p. 373, Ham. Gr.

bisulcata, Conrad, 1838, (Pterinea bisulcata,) 1841, (Cypricardites bisulcata,) Ann. Rep. N. Y., p. 116, and Pal. N. Y., vol. 5, pl. 51, figs. 1-16, Ham. Gr.

canadensis, Billings, 1874, Pal. Foss., vol. 2, p. 51, Gaspé sandstone, Up. Sil.

caswelli, Foerste, 1885, Bull. Sci. Lab. Denison University, p. 92. Not properly defined.

chemungensis, Pitt, 1874, Bul. Buff. Soc. Nat. Hist., Chemung Gr.
 circularis, Hall, 1870, Prelim. Notice Lam. Shells, p. 51, and Pal. N. Y., vol. 5, pl. 57, figs. 3-6, Ham. and Chemung Grs.
 communis, Hall, 1885, Pal. N. Y., vol. 5, p. 378, Chemung Gr.
 constricta, Hall, 1870, Prelim. Notice Lam. Shells, p. 58, and Pal. N. Y., vol. 5, pl. 59, figs. 13-20, Ham. Gr.
 cuneata, Hall, 1883, Pal. N. Y., vol. 5, pl. 62, figs. 1-9, Ham. Gr.
 duplicata, Hall, 1885, Pal. N. Y., vol. 5, p. 380, Chemung Gr.
 elliptica, Hall, 1870, Prelim. Notice Lam. Shells, p. 53, and Pal. N. Y., vol. 5, pl. 58, figs. 1-12, Chemung Gr.
 erecta, Hall, 1870, Prelim. Notice Lam. Shells, p. 52, and Pal. N. Y., vol. 5, p. 363, Ham. Gr.
 glabra, Hall, 1885, Pal. N. Y., vol. 5, p. 369, Chemung Gr.
 globosa, Hall, 1870, Prelim. Notice Lam. Shells, p. 57, and Pal. N. Y., vol. 5, p. 372, Ham. Gr.
hamiltonensis, syn. for *G. bisculcata*.



FIG. 831.—*Grammysia hannibalensis*. Dorsal view.

lirata, Hall, 1870, Prelim. Notice Lam. Shells, p. 57, and Pal. N. Y., vol. 5, pl. 59, figs. 6-12, Ham. Gr.
 magna, Hall, 1870, Prelim. Notice Lam. Shells, p. 50, and Pal. N. Y., vol. 5, p. 362, Ham. Gr.
 minor, Walcott, 1885, Monogr. U. S. Geo. Sur., vol. 8, p. 174, Up. Devonian.

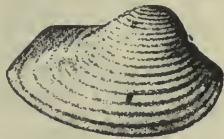


FIG. 832.—*Grammysia hannibalensis*. Right side view.

nodocostata, Hall, 1870, Prelim. Notice Lam. Shells, p. 50, and Pal. N. Y., vol. 5, pl. 55, figs. 1-11, Ham. Gr.
 obsoleta, Hall, 1870, Prelim. Notice Lam. Shells, p. 60, and Pal. N. Y., vol. 5, pl. 59, figs. 21-27, Ham. Gr.
 ovata, Hall, 1885, Pal. N. Y., vol. 5, p. 358, Up. Held. Gr.
 parallela, Hall, 1870, Prelim. Notice Lam. Shells, p. 59, Ham. Gr.
 plena, Hall, 1885, Pal. N. Y., vol. 5, p. 382, Waverly Gr.
 præcursor, Hall, 1870, Prelim. Notice Lam. Shells, p. 54, and Pal. N. Y., vol. 5, pl. 59, fig. 1, Schoharie grit.
 remota, Billings, 1874, Pal. Foss., vol. 2, p. 139, Up. Sil.
 rhomboidalis, Meek & Worthen, 1865, Proc. Acad. Nat. Sci. Phil., p. 248, and Geo. Sur. Ill., vol. 3, p. 439, Ham. Gr.

hannibalensis, Shumard, 1855, (Allo-risma hannibalense,) Geo. Sur. Mo., p. 206, Choteau and Kinderhook Grs.

rhomboides, Meek, 1871, Proc. Acad. Nat. Sci. Phil., p. 72, and Ohio Pal., vol. 2, p. 302, Waverly Gr.
 rustica, Billings, 1874, Pal. Foss., vol. 2, p. 139, Up. Sil.
 secunda, Hall, 1870, Prelim. Notice Lam. Shells, p. 54, and Pal. N. Y., vol. 5, pl. 59, figs. 2-5, Up. Held. Gr.
 subarcuata, Hall, 1870, Prelim. Notice Lam. Shells, p. 61, and Pal. N. Y., vol. 5, pl. 61, figs. 10-22, Chemung Gr.
 undata, Hall, 1883, Pal. N. Y., vol. 5, p. 379, Chemung Gr.
 ventricosa, Meek, 1871, Proc. Acad. Nat. Sci. Phil., p. 73, and Ohio Pal., vol. 2, p. 303, Waverly Gr.
Gryphorhynchus, Meek, 1864, Am. Jour. Sci. and Arts. Not. defined.

ILIONIA, Billings, 1875, Can. Nat. and Geol., vol. 8, p. 301. [Ety. proper name.] Irregularly ovate, compressed; one extremity larger than the other, with beaks turned toward the larger end; concave depression from the umbones to the posterior ventral margin; sub-ovate muscular impression in the upper half of the posterior extremity. Type *I. canadensis*.
canadensis, Billings, 1875, Can. Nat. and Geol., vol. 8, p. 301, Corniferous Gr.
costulata, Whiteaves, 1884, Pal. Foss., vol. 3, p. 15, Guelph Gr.
galtensis, Whiteaves, 1884, Pal. Foss., vol. 3, p. 15, Guelph Gr.

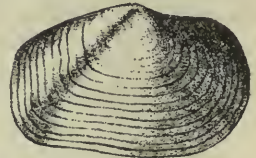


FIG. 833.—*Ilionia galtensis*.

sinuata, Hall, 1859, (Anatina sinuata,) Pal. N. Y., vol. 3, p. 265, Low. Held. Gr.
Inoceramus, Sowerby, 1818, Min. Conch., vol. 2. This genus is unknown in American Palæozoic rocks.

chemungensis, see *Mytilarca chemungensis mytilimeris*, see *Plethomytilus mytilimeris oviformis*, see *Plethomytilus oviformis*.
 ISCHYRINIA, Billings, 1866, Catal. Sil. Foss. Antic., p. 16. [Ety. *ischyros*, strong.] Equivalve, inequilateral; two strong ridges radiating from the beak in the interior of each valve. Type *I. winchelli*.



FIG. 834.—*Ischyria winchelli*.

plicata, Billings, 1866, Catal. Sil. Foss. Antic., p. 52, Anticosti Gr.
winchelli, Billings, 1866, Catal. Sil. Foss. Antic., p. 16, Hud. Riv. Gr.

Isocardia, Klein, 1753, Tent. Meth. Ostr. [Ety. *isos*, like; *kardia*, the heart.] This

is an existing littoral genus that burrows in the sand. It is not known in the Palæozoic rocks.

(?) *curta*, Shumard, 1858, Trans. St. Louis Acad. Nat. Sci., vol. 1, p. 206, Chocteau Gr.

jennæ, Winchell, 1863, Proc. Acad. Nat. Sci., p. 17, Marshall Gr.

unioniformis, see Edmondia unioniformis.
Leda, Schumacher, 1817, syn. for Nuculana.
barrisi, White & Whitfield, syn. for Palæoneilo nuculiformis.

bellistriata, see Nuculana bellistriata.

brevirostris, see Nuculana brevisrostris.

curta, see Nuculana curta.

dens-mamillata, see Nuculana dens-mamillata.

gibbosa, see Yoldia gibbosa.

knoxensis, see Yoldia knoxensis.

levistriata, see Yoldia levistriata.

nuculiformis, see Palæoneilo nuculiformis.

obscura, see Nuculana obscura.

ohioensis, Hall, syn for Nuculana pandoriformis.

oweni, see Yoldia oweni.

pandoriformis, see Nuculana pandoriformis.

polita, see Nuculana polita.

rushensis, see Yoldia rushensis.

saccata, see Nuculana saccata.

subscitula, see Yoldia subscitula.

LIOPTERIA, Hall, 1883, Pal. N. Y., vol. 5, pt. 1, p. 4. (Plates and Explanations.) [Ety. *leios*, smooth; *Pteria*, a genus.] Aviculoid, resembling in form Actinopteria; anterior extremity auriculate; wing large, extremity produced; test without proper rays; ligament external; ligamental area marked by fine parallel longitudinal striæ; hinge with one or two oblique, slender, lateral teeth; the cavity of the beak partially separated from the anterior end by a short partition. Type *L. dekeyi*.

biggsbyi, Hall, 1883, Pal. N. Y., vol. 5, pt. 1, p. 165, Ham. Gr.

chemungensis, Vanuxem, 1842, (Avicula chemungensis,) Geo. Rep. 3d Dist. N. Y., p. 182, and Pal. N. Y., vol. 5, p. 172, Chemung Gr.

conradi, Hall, 1883, Pal. N. Y., vol. 5, pt. 1, p. 159, Ham. Gr.



FIG. 835.—*Liopteria dekeyi*. Cast showing vertical plate anterior to the beaks.

dekeyi, Hall, 1883, Pal. N. Y., vol. 5, pt. 1, p. 164, Ham. Gr.

gabbi, Hall, 1884, Pal. N. Y., vol. 5, pt. 1, p. 169, Ham. Gr.

greeni, Hall, 1883, Pal. N. Y., vol. 5, pt. 1, p. 160, Ham. Gr.

levis, Hall, 1843, (Avicula levis,) Geo. Rep. 4th

Dist. N. Y., p. 181, and Pal. N. Y., vol. 5, p. 158, Marcellus Shale.

leai, Hall, 1884, Pal. N. Y., vol. 5, pt. 1, p. 168, Ham. Gr.

linguiformis, Hall, 1884, Pal. N. Y., vol. 5, pt. 1, p. 173, Chemung Gr.

mitchelli, Hall, 1883, Pal. N. Y., vol. 5, pt. 1, p. 166, Ham. Gr.

nitida, Hall, 1883, syn. for *L. chemungensis*.

oweni, Hall, 1883, Pal. N. Y., vol. 5, pt. 1, p. 170, Ham. Gr.

rafinesquii, Hall, 1883, Pal. N. Y., vol. 5, pt. 1, p. 161, Ham. Gr.

sayi, Hall, 1884, Pal. N. Y., vol. 5, pt. 1, p. 162, Ham. Gr.

torreyi, Hall, Fig. 836.—*Liopteria rafinesquii*.

1884, Pal. N. Y., vol. 5, pt. 1, p. 174, Chemung Gr.

troosti, Hall, 1884, Pal. N. Y., vol. 5, pt. 1, p. 167, Ham. Gr.

LEPTODESMA, Hall, 1883, Pal. N. Y., vol. 5, pt. 1, p. 4. (Plates and Explanations.) [Ety. *leptos*, slender; *desma*, a ligament.]

Like *Liopteria*, except the anterior end is nasute and acute, instead of auriculate and rounded; hinge-line narrow, with a slender, lateral tooth posterior to the beak; ligament external; test with concentric striæ. Type *L. potens*.
acutirostrum, Hall, 1884, Pal. N. Y., vol. 5, pt. 1, p. 234, Chemung Gr.

agassizii, Hall, 1884, Pal. N. Y., vol. 5, pt. 1, p. 182, Chemung Gr.

alatum, Hall, 1884, Pal. N. Y., vol. 5, pt. 1, p. 218, Chemung Gr.

aliforme, Hall, 1884, Pal. N. Y., vol. 5, pt. 1, p. 220, Chemung Gr.

arciforme, Hall, 1884, Pal. N. Y., vol. 5, pt. 1, p. 229, Chemung Gr.

aviforme, Hall, 1884, Pal. N. Y., vol. 5, pt. 1, p. 224, Chemung Gr.

becki, Hall, 1884, Pal. N. Y., vol. 5, pt. 1, p. 185, Chemung Gr.

billingsi, Hall, 1884, Pal. N. Y., vol. 5, pt. 1, p. 192, Chemung Gr.

biton, Hall, 1884, Pal. N. Y., vol. 5, pt. 1, p. 222, Chemung Gr.

cadmus, Hall, 1884, Pal. N. Y., vol. 5, pt. 1, p. 201, Chemung Gr.

clitus, Hall, 1884, Pal. N. Y., vol. 5, pt. 1, p. 210, Chemung Gr.

complanatum, Hall, 1884, Pal. N. Y., vol. 5, pt. 1, p. 227, Chemung Gr.

corydon, Hall, 1884, Pal. N. Y., vol. 5, pt. 1, p. 212, Chemung Gr.

creon, Hall, 1884, Pal. N. Y., vol. 5, pt. 1, p. 202, Chemung Gr.

curvatum, Hall, 1884, Pal. N. Y., vol. 5, pt. 1, p. 196, Up. Chemung Gr.

demus, Hall, 1884, Pal. N. Y., vol. 5, pt. 1, p. 203, Chemung Gr.

disparile, Hall, 1884, Pal. N. Y., vol. 5, pt. 1, p. 186, Up. Chemung Gr.

extenuatum, Hall, 1884, Pal. N. Y., vol. 5, pt. 1, p. 207, Chemung Gr.



flaccidum, Hall, 1884, Pal. N. Y., vol. 5, pt. 1, p. 225, Chemung Gr.
 hector, Hall, 1884, Pal. N. Y., vol. 5, pt. 1, p. 209, Chemung Gr.
 jason, Hall, 1884, Hall, Pal. N. Y., vol. 5, pt. 1, p. 213, Chemung Gr.



FIG. 837.—*Leptodesma hector*.

lesleyi, Hall, 1884, Pal. N. Y., vol. 5, pt. 1, p. 223, Up. Chemung Gr.
 lichen, Hall, 1884, Pal. N. Y., vol. 5, pt. 1, p. 232, Chemung Gr.
 longispinum, Hall, 1843, (*Avicula longispina*.) Geo. Rep. 4th Dist. N. Y., p. 262, and Pal. N. Y., vol. 5, pt. 1, p. 179, Chemung Gr.
 loxias, Hall, 1884, Pal. N. Y., vol. 5, pt. 1, p. 204, Chemung Gr.
 lysander, Hall, 1884, Pal. N. Y., vol. 5, pt. 1, p. 216, Chemung Gr.
 maclurii, Hall, 1884, Pal. N. Y., vol. 5, pt. 1, p. 228, Chemung Gr.
 marcellense, Hall, 1884, Pal. N. Y., vol. 5, pt. 1, p. 175, Marcellus Shale.
 matheri, Hall, 1884, Pal. N. Y., vol. 5, pt. 1, p. 193, Chemung Gr.
 medon, Hall, 1884, Pal. N. Y., vol. 5, pt. 1, p. 197, Chemung Gr.
 mentor, Hall, 1884, Pal. N. Y., vol. 5, pt. 1, p. 205, Chemung Gr.
 mortoni, Hall, 1884, Pal. N. Y., vol. 5, pt. 1, p. 190, Chemung Gr.
 mytiliforme, Hall, 1884, Pal. N. Y., vol. 5, pt. 1, p. 235, Chemung Gr.
 naviforme, Hall, 1884, Pal. N. Y., vol. 5, pt. 1, p. 200, Chemung Gr.
 nereus, Hall, 1884, Pal. N. Y., vol. 5, pt. 1, p. 217, Chemung Gr.
 orcus, Hall, 1884, Pal. N. Y., vol. 5, pt. 1, p. 215, Chemung Gr.
 orodes, Hall, 1884, Pal. N. Y., vol. 5, pt. 1, p. 206, Up. Chemung Gr.
 orus, Hall, 1884, Pal. N. Y., vol. 5, pt. 1, p. 219, Chemung Gr.
 parallela, Simpson, 1889, Dict. of Pa. Foss., p. 332, Chemung Gr.
 patulum, Hall, 1884, Pal. N. Y., vol. 5, pt. 1, p. 226, Chemung Gr.
 pelops, Hall, 1884, Pal. N. Y., vol. 5, pt. 1, p. 214, Up. Chemung Gr.
 phaon, Hall, 1884, Pal. N. Y., vol. 5, pt. 1, p. 230, Chemung Gr.
 potens, Hall, 1884, Pal. N. Y., vol. 5, pt. 1, p. 188, Up. Chemung Gr.

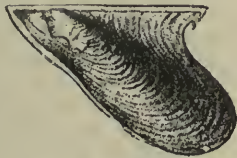


FIG. 838.—*Leptodesma hector*.

potens var. juvene, Hall, 1884, Pal. N. Y., vol. 5, pt. 1, p. 189, Chemung Gr.
 propinquum, Hall, 1884, Pal. N. Y., vol. 5, pt. 1, p. 231, Chemung Gr.
 protextum, Conrad, 1842, (*Avicula protexta*.) Jour. Acad. Nat. Sci. Phil., vol. 8, p. 238, and Pal. N. Y., vol. 5, pt. 1, p. 183, Chemung Gr.
 quadratum, Hall, 1884, Pal. N. Y., vol. 5, pt. 1, p. 233, Chemung Gr.
 robustum, Hall, 1884, Pal. N. Y., vol. 5, pt. 1, p. 181, Chemung Gr.
 rogersi, Hall, 1884, Pal. N. Y., vol. 5, pt. 1, p. 176, Ham. Gr.
 rude, Hall, 1884, Pal. N. Y., vol. 5, pt. 1, p. 221, Chemung Gr.
 shumardi, Hall, 1884, Pal. N. Y., vol. 5, pt. 1, p. 180, Chemung Gr.
 sociale, Hall, 1884, Pal. N. Y., vol. 5, pt. 1, p. 187, Chemung Gr.
 spinigerum, Conrad, 1842, (*Avicula spinigera*.) Jour. Acad. Nat. Sci. Phil., vol. 8, p. 237, and Pal. N. Y., vol. 5, pt. 1, p. 177, Chemung Gr.
 stephani, Hall, 1884, Pal. N. Y., vol. 5, pt. 1, p. 194, Up. Chemung Gr.
 transversum, Walcott, 1885, Monogr. U. S. Geo. Sur., vol. 8, p. 167, Chemung Gr.
 truncatum, Hall, 1884, Pal. N. Y., vol. 5, pt. 1, p. 211, Chemung Gr.
 umbonatum, Hall, 1884, Pal. N. Y., vol. 5, pt. 1, p. 193, Chemung Gr.
 umbonatum var. depressum, Hall, 1884, Pal. N. Y., vol. 5, pt. 1, p. 199, Chemung Gr.

LEPTODOMUS, McCoy, 1844, Synopsis Carb. Foss. Ireland, p. 66. [Ety. *leptos*, slender; *domus*, house.] Shell thin, short, oblong, tumid, subequivalve, inequilateral; beaks large, incurved; anterior side short, obtusely rounded, slightly gaping; deep ovate lunette between the beaks; posterior end broad, rounded, gaping, slope compressed, sides sulcated parallel with the ventral margin; dorsal margin inflected so as to form a lunette as long as the hinge-line; no hinge teeth; muscular impressions faint.
 arata, Hall, 1860, Can. Nat. and Geo., vol. 5, p. 152, Up. Silurian.

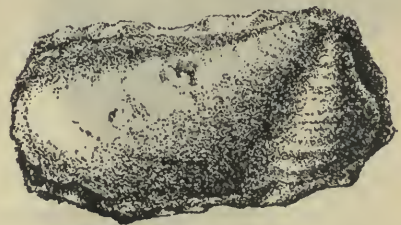
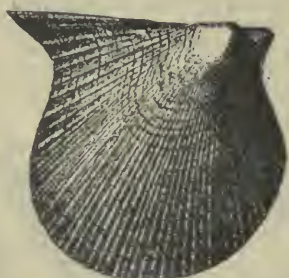


FIG. 839.—*Leptodomus canadensis*.

canadensis, Billings, 1874, Pal. Foss., vol. 2, p. 54, Gaspe limestone No. 8, Devonian.
 clavata, Winchell, 1862, Proc. Acad. Nat. Sci., p. 415, Portage Gr.
 granosus, see *Allorisma granosum*.

- topekensis*, see Sedgwickia topekensis.
undulatus, Whitfield, 1878, Ann. Rep. Geo. Sur. Wis., p. 81, and Geo. Wis., vol. 4, p. 293, Niagara Gr.
mainensis, Billings, 1863, Proc. Port. Soc. Nat. Hist., vol. 1, p. 118, Low. Held. Gr.
pembrokeensis, Billings, 1863, Proc. Port. Soc. Nat. Hist., vol. 1, p. 118, Low. Held. Gr.
percingulatus, Billings, 1863, Proc. Port. Soc. Nat. Hist., vol. 1, p. 119, Low. Held. Gr.
Lima, Brugueire, 1791, Encycl. Meth. and Deshayes, 1824, Descrip. de Coquilles fossiles des environs de Paris. [Ety. *lima*, a file.] Not a Palæozoic genus.
chesterensis, Worthen, not recognized.
glabra, see Crenipecten glaber.
macroptera, see Limoptera macroptera.
obsoleta, see Crenipecten obsoletus.
retifera, see Crenipecten retiferus.
rugistriata, see Aviculopecten rugistriatus.
LIMOPTERA, Hall, 1870, Prelim. Notice Lam. Shells, p. 15, Up. Held. Gr. [Ety. *Lima*, a genus; *pteron*, a wing.] Large, inequivalve, inequilateral, subquadrate, alate posterior, auriculate anterior; ligamental area large, common, longitudinally striate; hinge with an oblique posterior tooth and cardinal folds beneath the beak; anterior impression deep, posterior large, pallial line simple formed of a series of small pits; inter-pallial area pitted for the attachment of umbonal muscles; test radiated. Type *L. pauperata*.
cancellata, Hall, 1870, Prelim. Notice Lam. Shells, p. 16, and Pal. N. Y., vol. 5, pt. 1, p. 244, Ham. Gr.
curvata, Hall, 1870, Prelim. Notice Lam. Shells, p. 18, and Pal. N. Y., vol. 5, pt. 1, p. 250, Ham. Gr.

FIG. 840.—*Limoptera macroptera*.

- macroptera*, Conrad, 1833, (*Lima macroptera*.) Ann. Rep. N. Y., p. 117, and Pal. N. Y., vol. 5, pt. 1, p. 246, Ham. Gr.
obsoleta, Hall, 1870, Prelim. Notice Lam. Shells, p. 18, and Pal. N. Y., vol. 5, pt. 1, p. 249, Ham. Gr.
pauperata, Hall, 1870, Prelim. Notice Lam. Shells, p. 16, and Pal. N. Y., vol. 5, pt. 1, p. 243, Up. Held. Gr.
sarmenticia, Walcott, 1885, Monogr. U. S. Geo. Sur., vol. 8, p. 167, Devonian.

- LITHOPHAGA**, Lamarck, 1812, Hist. An. sans Vert. [Ety. *lithos*, stone; *phago*, I eat.] Not American Palæozoic.
illinoisensis, Worthen, 1882, Bull. No. 1, Ill. St. Mus. Nat. Hist., p. 38, Keokuk Gr. Proposed instead of the form identified as *L. lingualis* of Phillips.
lingualis, Phillips, 1836, (Modiola lingualis,) Geol. Yorkshire, vol. 2, p. 209. Not American.
pertenuis, Meek & Worthen, 1865, Proc. Acad. Nat. Sci. Phil., p. 245, and Geo. Sur. Ill., vol. 5, p. 539, St. Louis Gr.
Littorina wheeleri, see Schizodus wheeleri.
Lucina, Brugueire, 1792, Encyclop. Meth. [Ety. mythological name.] Type *L. pennsylvanica*. Not an American Palæozoic genus.
billingsana, see Paracyclas billingsana.
elliptica, see Paracyclas elliptica.
elliptica var. *occidentalis*, see Paracyclas elliptica var. *occidentalis*.
hamiltonensis, see Paracyclas hamiltonensis.
lirata, see Paracyclas lirata.
occidentalis, Billings, 1859, Assiniboine and Saskatchewan Ex. Exped. This name was preoccupied by Morton for an Eocene species, see Paracyclas billingsana.
ohioensis, see Paracyclas ohioensis.
retusa, see Paracyclas retusa.
varysburgia, see Paracyclas varysburgensis.
wyomingensis, see Paracyclas wyomingensis.
LUNULICARDIUM, Munster, 1840, Beitrage zur Petrefaktenkunde, 3d heft, p. 69. [Ety. *lunula*, a little moon; *Cardium*, a genus.] Equivalve, inequilateral, subelliptical, subcircular, or trigonal; posterior side obliquely truncate, margin often reflexed and produced; beaks pointed; cardinal line marked by a lunate hiatus; surface radiated and concentrically marked; ligament external.
acutirostrum, syn. for *L. ornatum*.

FIG. 841.—*Lunulicardium curtum*.

- curtum*, Hall, 1884, Pal. N. Y., vol. 5, pt. 1, p. 71, figs. 18–23, Up. Held. Gr.

fragile, Hall, 1843, (*Avicula fragilis*), Geo. Rep. 4th Dist. N. Y., p. 222, and Pal. N. Y., vol. 5, pl. 71, figs. 1-14, Genesee Shale.

fragosum, Meek, 1877, (*Posidonomya fragosa*), U. S. Geo. Expl. 40th Parallel, vol. 4, p. 92, Carboniferous.

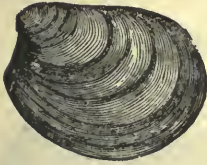


FIG. 842.—*Lunullicardium marcellense*.

marcellense, Vanuxem, 1842, (*Cypricardites marcellensis*), Geo. Rep. 3d Dist. N. Y., p. 146, and Pal. N. Y., vol. 5, pl. 71, figs. 15-16, Marcellus Shale.

orbiculare, Hall, 1885, Pal. N. Y., vol. 5, p. 436, Marcellus Shale.

ornatum, Hall, 1843, (*Pinnopsis ornata*), Geo. Rep. 4th Dist. N. Y., p. 244, and Pal. N. Y., vol. 5, p. 437, Portage Gr.

rude, Hall, 1884, Pal. N. Y., vol. 5, pl. 71, fig. 17, Marcellus Shale.

transversum, Hall, 1885, Pal. N. Y., vol. 5, p. 439, Chemung Gr.

Lyonsia, Turton, 1822. Not found in Palæozoic rocks.

concava, see *Sedgwickia concava*.

LYRIOPECTEN, Hall, 1884, Pal. N. Y., vol. 5, p. 3. (Plates and Explanations.) [Ety. *lyrion*, a lyre; *Pecten*, a genus.] Distinguished from *Aviculopecten* by the shorter hinge-line and very small anterior wing; surface with strong rays. Type *L. magnificus*.

alternatus, Simpson, 1889, Dict. Foss. Pa., p. 366, and Trans. Am. Phil. Soc., p. 446, Chemung Gr.

anomiiformis, Hall, 1884, Pal. N. Y., vol. 5, pt. 1, p. 53, Up. Held. Gr.

cymbalon, Hall, 1884, Pal. N. Y., vol. 5, pt. 1, p. 47, Ham. Gr.

dardanus, Hall, 1884, Pal. N. Y., vol. 5, pt. 1, p. 41, Up. Held. Gr.

fasciatus, Hall, 1884, (*Pernopecten fasciculatus*), Pal. N. Y., vol. 5, pt. 1, p. 55, Chemung Gr.

interradiatus, Hall, 1884, Pal. N. Y., vol. 5, pt. 1, p. 44, Ham. Gr.

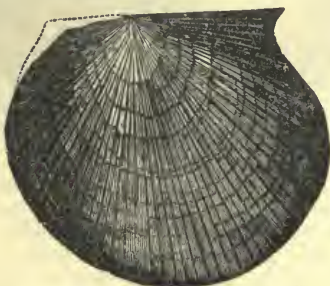


FIG. 843.—*Lyrlopecten orbiculatus*.

macrodonatus, Hall, 1884, Pal. N. Y., vol. 5, pt. 1, p. 46, Up. Held. Gr.

magnificus, Hall, 1884, Pal. N. Y., vol. 5, pt. 1, p. 51, Up. Chemung Gr.

orbiculatus, Hall, 1843, (*Avicula orbiculata*), Geo. Rep. 4th Dist., N. Y., p. 202, and Pal. N. Y., vol. 5, pt. 1, p. 42, Ham. Gr.

parallelodontus, Hall, 1884, Pal. N. Y., vol. 5, pt. 1, p. 40, Up. Held. Gr.

polydorus, Hall, 1884, Pal. N. Y., vol. 5, pt. 1, p. 50, Chemung Gr.

priamus, Hall, 1884, Pal. N. Y., vol. 5, pt. 1, p. 54, Chemung Gr.

solox, Hall, 1884, Pal. N. Y., vol. 5, pt. 1, p. 56, Up. Chemung Gr.

tricostatus, Vanuxem, 1842, (*Avicula tricostata*), Geo. Sur. 3d Dist. N. Y., p. 179, and Pal. N. Y., vol. 5, pt. 1, p. 48, Chemung Gr.

LYRODESMA, Conrad, 1841, Ann. Geo. Rep. N. Y., p. 51. [Ety. *lyra*, a harp; *desma*, a ligament.] Equivalve, inequilateral, semicircular; hinge plate with 6 to 8 angular, crenulated teeth radiating from beneath the beak upon a more or less rounded platform. Type *L. planum*.

cincinnatiense, Hall, 1871, 24th Rep. N. Y. St. Mus. Nat. Hist., p. 227, Hud. Riv. Gr.

planum, Conrad, 1841, Ann. Geo. Rep. p. 51, Hud. Riv. Gr.

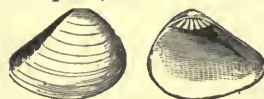
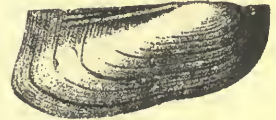


FIG. 844.—*Lyrodesma poststriatum*.

poststriatum, Emmons, 1842, (*Nuculana poststriata*), Geo. Rep. N. Y., p. 399, and Pal. N. Y.,

vol. 1, p. 151, Black Riv. Gr.
pulchellum, Hall, 1847, Pal. N. Y., vol. 1, p. 302, Hud. Riv. Gr.

MACRODON, Lycett, 1845, Murch. Geo. Chelt. [Ety. *macro*, long; *odous*, a tooth.] Shell oblong, very inequilateral, moderately tumid, a byssal sinus in the anterior third of the ventral margin anterior edges of the adductor impressions prominent; hinge teeth at the anterior end



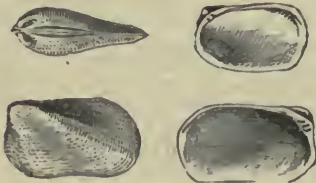
few, slightly oblique or nearly at right angles to the hinge-line beneath the beak, becoming more oblique toward the anterior end; posterior part of the hinge-line, from beak to anal angle, occupied by one to three long lateral teeth.

carbonarius, Cox, 1857, (*Arca carbonarius*), Geo. Sur. Ky., vol. 3, p. 567, Coal Meas.

chemungensis, Hall, 1870, Prelim. Notice Lam. Shells, p. 14, and Pal. N. Y., vol. 5, pl. 51, figs. 11-16, Chemung Gr.

cochlearis, Winchell, 1863, Proc. Acad. Nat. Sci., p. 16, Marshall Gr. Prof. Hall suggests that it is a syn. for *M. parvus*.

curtus, Hartt, 1868, Acad. Geol., p. 302, Carb.
 delicatus, Meek & Worthen, 1870, Proc. Acad. Nat. Sci., p. 40, and Geo. Sur. Ill., vol. 5, p. 575, Up. Coal Meas.
 hamiltoniae, Hall, 1870, Prelim. Notice Lam. Shells, p. 13, and Pal. N. Y., vol. 5, pl. 51, figs. 1-10, Ham. Gr.
 hardingi, Hartt, 1868, Acad. Geol., p. 302, Carb.
 micronema, Meek & Worthen, 1866, Proc. Acad. Nat. Sci., p. 261, Kaskaskia Gr.
 obsoletus, Meek, 1871, Reg. Rep. University W. Va., p. 5, and Pal. Ohio, vol. 2, p. 334, Coal Meas.

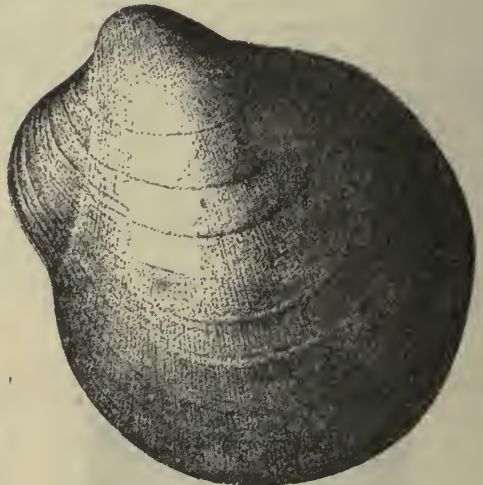
FIG. 846.—*Matheria tener*.

ovatus, Hall, 1870, Prelim. Notice Lam. Shells, p. 15, and Pal. N. Y., vol. 5, p. 351, Waverly Gr.
 parvus, White & Whitfield, 1862, Proc. Bost. Soc. Nat. Hist., vol. 8, p. 299, Kinderhook Gr.
 sangamonensis, Worthen, (in press.) Geo. Sur. Ill., vol. 8, p. 123 Coal Meas.
 shubenacadiensis, Hartt, 1868, Acad. Geo. p. 302, Carb.
 tennisriatus, Meek & Worthen, 1867, Proc. Chi. Acad. Sci., vol. 1, p. 17, Up. Coal Meas.
 truncatus, Walcott, 1885, Monogr. U. S. Geo. Sur., vol. 8, p. 243, Carboniferous.
MATHERIA, Billings, 1858, Can. Nat. and Geo., vol. 3, p. 440. [Ety. proper name.] Equivalve, inequilateral; beaks anterior; two small, obtuse, cardinal teeth in the left valve, and one in the right; no lateral teeth; two muscular impressions; ligament external. Type *M. tener*.
tener, Billings, 1858, Can. Nat. and Geo., vol. 3, p. 440, Trenton Gr.
MEGALOMUS, Hall, 1852, Pal. N. Y., vol. 2, p. 343. [Ety. *megas*, great; *omos*, shoulder.] Large, equivalve, concentrically lined, longitudinal; umbones anterior incurved; shell thick and along the hinge-line thickened on the interior; muscular impression large and deep, with two small circular pits above. Type *M. canadensis*.
canadensis, Hall, 1852, Pal. N. Y., vol. 2, p. 343, Guelph Gr.
compressus, Nicholson & Hinde, 1874, Can. Jour., vol. 14, p. 159, Niagara Gr.
MEGAMBONIA, Hall, 1859, Pal. N. Y., vol. 3, p. 273. [Ety. *megas*, great; *ambon*, the boss of a shield.] Equivalve, inequilateral, subovoid, gibbous in the middle and toward the umbones; anterior side

lobed or auriculate; muscular impression large; posterior cardinal margin expanded or alate; hinge-line crenulated anteriorly; teeth numerous; surface concentrically lined, and sometimes with radiating striae. Type *M. suborbicularis*.

FIG. 847.—*Megatomus canadensis*.

aviculoidea, Hall, 1859, Pal. N. Y., vol. 3, p. 274, Low. Held. Gr.
 bellistriata, Hall, 1859, Pal. N. Y., vol. 3, p. 467, Oriskany sandstone.
 cancellata, Hall, 1860, Can. Nat. and Geo., vol. 5, p. 153, Up. Silurian.
 cardiiformis, Hall, 1843, (Pterinea cardiiformis,) Geo. Rep. 4th Dist. N. Y., p. 172, and Pal. N. Y., vol. 5, p. 515, Cornif. Gr.

FIG. 848.—*Megambonia cardiiformis*.

cordiformis, see *Mytilarca cordiformis*.
jamesi, see *Ambonychia jamesi*.
lamellosa, Hall, 1859, Pal. N. Y., vol. 3, p. 467, Oriskany sandstone.
lata, Hall, 1859, Pal. N. Y., vol. 3, p. 277, Low. Held. Gr.
lyoni, syn. for *Cardiopsis radiata*.
mytiloidea, Hall, 1859, Pal. N. Y., vol. 3, p. 276, Low. Held. Gr.

oblonga, Hall, 1859, Pal. N. Y., vol. 3, p. 277, Low. Held. Gr.
obscura, Hall, 1859, Pal. N. Y., vol. 3, p. 277, Low. Held. Gr.
occidua, Walcott, 1885, Monogr. U. S. Geo. Sur., vol. 8, p. 173, Devonian.
ovata, Hall, syn. for *Plethomytilus mytilimeris*.
ovoidea, Hall, syn. for *Plethomytilus mytilimeris*.
rhomboidea, Hall, 1859, Pal. N. Y., vol. 3, p. 275, Low. Held. Gr.
spinneri, Hall, 1859, Pal. N. Y., vol. 3, p. 274, Low. Held. Gr.
striata, Hall, 1860, Can. Nat. and Geo., vol. 5, p. 153, Up. Silurian.
subcardiiformis, Hall, syn. for *M. cardii-formis*.
suborbicularis, Hall, 1859, Pal. N. Y., vol. 3, p. 273, Low. Held. Gr.

Megaptera, Meek & Worthen, 1866. The name was preoccupied.

Microdon, Conrad, 1842, Jour. Acad. Nat. Sci., vol. 8, p. 247. This name was applied by Agassiz to a genus of fish in 1833, and was also preoccupied for a genus of insects. Hall proposed *Eodon*, in 1877, but Whitfield has shown that *M. bellistriatus* is a *Cypricardella*, and hence the latter name has priority.

bellistriatus, see *Cypricardella bellistriata*.
complanatus, see *Cypricardella complanata*.
gregarius, see *Cypricardella gregaria*.
reservatus, see *Cypricardella reservata*.
tenuistriatus, see *Cypricardella tenuistriata*.

MODIELLA, Hall, 1884, Pal. N. Y., vol. 5, p. 4. (Plates and Explanations.) [Ety. *modus*, a measure; *ellus*, diminutive.] Subrhomboidal, narrowed and auriculate in front, broadly expanding posteriorly; two well-marked muscular impressions connected by a simple pallial line; surface with radiating striae. Type *M. pygmæa*.

pygmæa, Conrad, 1842, (Pterinea pygmæa,) Jour. Acad. Nat. Sci., vol. 8, p. 251, and Pal. N. Y., vol. 5, pl. 76, figs. 9-20, Ham. Gr.

Modiola, Lamarck, 1801, Syst. An. sans Vert. [Eto. *modiolus*, a small measure or drinking vessel.] Oblong, inflated in front, umbones anterior, obtuse, no teeth; pedal impressions three, the central one elongated. Type *M. modiolus*. Not a Palæozoic genus. Species are only left here for want of material to properly determine the generic relations.
avonia, Dawson, 1868, Acad. Geol., p. 301, Subcarboniferous.

concentrica, see *Modiomorpha concentrica*.
illinoisensis, Worthen, 1884, Bull. No. 2, Ill. St. Mus. Nat. Hist., p. 16, and Geo. Sur. Ill., vol. 8, p. 125, St. Louis Gr.
lingualis, see *Lithophaga lingualis*.
metella, see *Mytilops metella*.

minor, Lea, 1852, Jour. Acad. Nat. Sci., 2d series, vol. 2, Coal Meas. Not determinable.

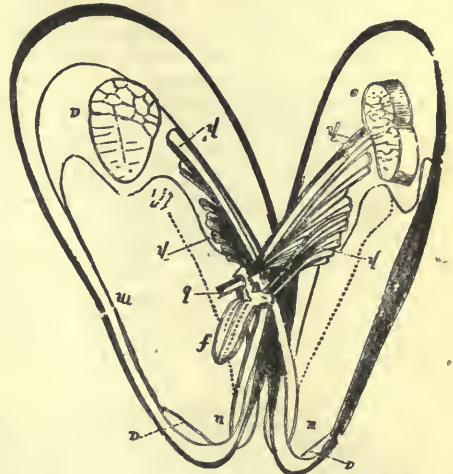


FIG. 850.—*Modiola modiolus*. *aa*, Anterior adductors; *a'a'*, posterior adductors; *uu, p'p'*, pedal muscles; *pp*, byssal muscles; *f*, foot; *b*, byssus; *m*, pallial line.

nevadensis, Walcott, 1885, Monogr. U. S. Geo. Sur., vol. 8, p. 239, Subcarboniferous.

obtusa, see *Modioloopsis obtusa*.

pooli, Dawson, 1868, Acad. Geol., p. 301, Low. Carb. Founded upon a small cast destitute of characters.

præcedens, see *Mytilops præcedens*.

wyomingensis, Lea, 1852, Jour. Acad. Nat. Sci., 2d series, vol. 2, p. 205, Coal Meas. Not recognized, but probably an *Anthraco-myia*.

MODIOLOPSIS, Hall, 1847, Pal. N. Y., vol. 1, p. 157. [Ety. *Modiola*, a genus of shells; *opsis*, appearance; from its resemblance to *Modiola*.] Equivalve, inequilateral, elongated, broader posteriorly; umbones anterior; cardinal teeth short, oblique; single, deep, subcircular anterior muscular impression; ligament external; no area; surface concentrically lined. Type *M. modiolaris*.

adrastia, Billings, 1862, Pal. Foss., vol. 1, p. 45, Black Riv. Gr.

anodontoides, Conrad, 1847, (Cypricardites anodontoides,) Pal. N. Y., vol. 1, syn. for *M. sinuata*.

arcuata, Hall, 1847, Pal. N. Y., vol. 1, p. 159, Trenton Gr.

aviculooides, Hall, 1847, Pal. N. Y., vol. 1, p. 161, Trenton Gr.

cancellata, Walcott, 1879, Trans. Alb. Inst., vol. 10, p. 22, Utica Slate Gr.

capax, n. sp. Shell very large, oblong; cardinal and basal lines behind the beaks subparallel; basal margin slightly contracted by an undefined cincture arising below the beaks; posterior end broadly rounded; depressed in front of

the beaks; anterior end rounded; beaks large, obtuse, and extending beyond the hinge-line; umbones large; surface marked with concentric lines of growth, and with strong transverse lines over the umbonal region, some of which extend nearly to the basal line, the anterior ones curve a little forward in passing over the umbones. Collected by the author in the Hud. Riv. Gr. at Versailles, Indiana.

carinata, Hall, 1847, Pal. N. Y., vol. 1, p. 160, Trenton Gr.

carrollensis, Worthen, 1882, Bull. No. 1, Ill. St. Mus. Nat. Hist., Galena Gr. Proposed instead of *M. subnasuta* of Meek & Worthen, 1870, Proc. Acad. Nat. Sci., p. 41, which was preoccupied.

cincinnatiensis, Hall & Whitfield, 1875, Ohio Pal., vol. 2, p. 88, Utica Slate.

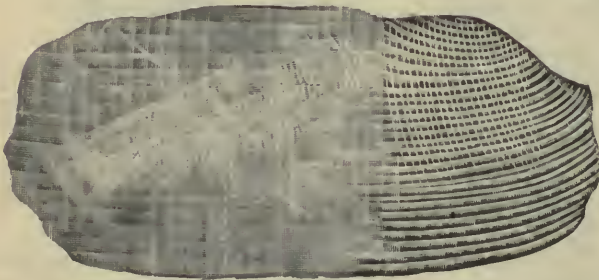


FIG. 851.—*Modiulopsis capax*.

concentrica, Hall & Whitfield, 1872, Ohio Pal., vol. 2, p. 86, Hud. Riv. Gr.

curta, Hall, 1847, Pal. N. Y., vol. 1, p. 297, Hud. Riv. Gr.

dicteus, Hall, 1867, 20th Rep. N. Y. Mus. Nat. Hist., p. 385, Niagara Gr.

(?) *dubia*, Hall, 1859, Pal. N. Y., vol. 3, p. 264, Low. Held. Gr.

exilis, Billings, 1874, Pal. Foss., vol. 2, p. 132, Up. Sil.

faba, Emmons, 1842, Geo. Rep. 2d Dist. N. Y., p. 395, and Pal. N. Y., vol. 1, p. 158, Black Riv., Trenton, and Hud. Riv. Grs.

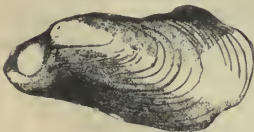


FIG. 852.—*Modiulopsis faberi*. Left valve.

hind the middle, and much contracted in front of the beaks; hinge-line nearly straight from the anterior end to the middle; it then becomes arcuate to near the posterior end, which is abruptly rounded; basal line slightly sinuate at the anterior third from the cincture, directed downward and backward from the anterior part of the umbo; beaks

strong, projecting anteriorly beyond the hinge-line; umbones high, subangular, and gradually declining toward the postero-basal line; anterior muscular impression very large, circular, deep, and situate at the anterior end, in front of and below the beaks; dorsal ligament very large. Distinguished from *M. concentrica* in its general outline, more elongate form, more prominent beaks, and higher and more angular umbones. Hud. Riv. Gr., at Cincinnati, O. The specimen figured is from the collection of Charles Faber.

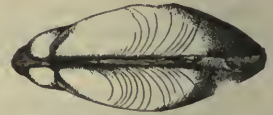


FIG. 853.—*Modiulopsis faberi*. Cardinal view, showing greatest thickness of shell toward the posterior.

gesneri, Billings, 1862, Pal. Foss., vol. 1, p. 43, Trenton and Black Riv. Grs.

latus, see *Cypricardites latus*.

maia, Billings, 1862, Pal. Foss., vol. 1, p. 44, Trenton Gr.

meyeri, Billings, 1862, Pal. Foss., vol. 1, p. 42, Trenton Gr.

modiolaris, Conrad, 1838, (Pterinea *modiolaris*), Ann. Geo. Rep. N. Y., p. 118, and Pal. N. Y., vol. 1, p. 294, Hud. Riv. Gr.

modiuliformis, Meek & Worthen, 1868, Geo. Sur. Ill., vol. 3, p. 294, Trenton Gr.

mytiloides, Hall, 1847, Pal. N. Y., vol. 1, p. 157, Black Riv. and Trenton Grs.

nais, Billings, 1862, Pal. Foss., vol. 1, p. 45, Black Riv. Gr.

nasuta, Conrad, 1841, (Cypricardites *nasutus*), Ann. Rep. N. Y., p. 52, and Pal. N. Y., vol. 1, p. 159, Trenton and Hud. Riv. Grs.

nuculiformis, see *Tellinomya nuculiformis*.

obtusa, Hall, 1847, (Modiola *obtusa*), Pal. N. Y., vol. 1, p. 40, Birdseye Gr.

occidens, Walcott, 1885, Monogr. U. S. Geo. Sur., vol. 8, p. 77, Trenton Gr.

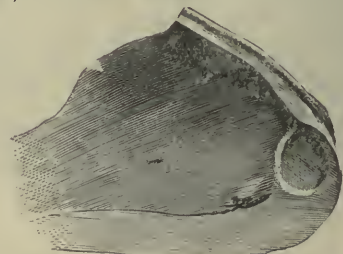


FIG. 854.—*Modiulopsis modiolaris*. Hinge and pallial line and muscular impression.

nasuta, Conrad, 1841, (Cypricardites *nasutus*), Ann. Rep. N. Y., p. 52, and Pal. N. Y., vol. 1, p. 159, Trenton and Hud. Riv. Grs.

nuculiformis, see *Tellinomya nuculiformis*.

obtusa, Hall, 1847, (Modiola *obtusa*), Pal. N. Y., vol. 1, p. 40, Birdseye Gr.

occidens, Walcott, 1885, Monogr. U. S. Geo. Sur., vol. 8, p. 77, Trenton Gr.

orthonota, Conrad, 1839, (Unio orthonotus,) Ann. Rep. N. Y., p. 66, and Geo. Rep. 4th Dist. N. Y., pl. 2, figs. 8 and 9, Medina sandstone.

orthonota, Meek & Worthen, 1868, Geo. Sur. Ill., vol. 3. This name was preoccupied. See *M. rectiformis*.

ovata, Hall, 1852, Pal. N. Y., vol. 2, p. 101, Clinton Gr.

parallela, see *Orthodesma parallelum parviuscula*, Billings, 1859, Can. Nat. and Geo., vol. 4, p. 446, Chazy Gr.

perlata, Hall, 1876, 28th Rep. N. Y. Mus. Nat. Hist., p. 172, Niagara Gr.

perovata, see *Modiomorpha perovata*.

pholadiformis, Hall, 1851, Lake Sup. Land Dist., vol. 2, p. 213, Hud. Riv. Gr.

plana, Hall, 1861, Geo. Rep. Wis., p. 30, Trenton Gr.

pogonipensis, Walcott, 1885, Monogr. U. S. Geo. Sur., vol. 8, p. 78, Trenton Gr.

prisca, Walcott, 1887, Am. Jour. Sci. and Arts, 3d ser., vol. 34, p. 191, Up. Taconic. Not a *Modiolopsis*.

primigenia, Conrad, 1838, (Unio primigenius,) Ann. Rep. N. Y., p. 66, and Geo. Rep. 4th Dist. N. Y., pl. 2, fig. 3, Medina sandstone.

recta, Hall, 1867, 20th Rep. N. Y. Mus. Nat. Hist., p. 386, Niagara Gr.

rectiformis, Worthen, 1882, Bull. No. 1, Ill. St. Mus. Nat. Hist., p. 38, Trenton Gr. Proposed instead of *M. orthonota*, Meek & Worthen, 1868, Geo. Sur. Ill., vol. 3, p. 295, which was preoccupied.

rhomboidea, Hall, 1860, Can. Nat. and Geo., vol. 5, p. 148, Up. Sil.

rudis, Billings, 1874, Pal. Foss., vol. 2, p. 133, Up. Sil.

sinuata, Emmons, 1842, (Cypricardites sinuatus,) Geo. Rep. 2d Dist. N. Y., p. 399, and Pal. N. Y., vol. 1, p. 298, Hud. Riv. Gr.

striata, Billings, 1866, Catal. Sil. Foss. Antic., p. 48, Anticosti Gr.

subalata, Hall, 1852, Pal. N. Y., vol. 2, p. 84, Clinton and Niagara Grs.

subcarinata, Hall, 1852, Pal. N. Y., vol. 2, p. 601, Clinton Gr.

subnasuta, Hall, 1860, Can. Nat. and Geo., vol. 5, p. 148, Up. Sil.

subnasuta, Meek & Worthen. See *M. cancellata*.

subrhomboidea, Simpson, 1889, Trans. Am. Phil. Soc., p. 450, and Dict. Foss., Pa., p. 411, Clinton Gr.

subspatulata, see *Cypricardites subspatulatus*.

superba, Hall, 1861, Geo. Rep. Wis., p. 31, Trenton Gr.

terminalis, Hall, 1847, Pal. N. Y., vol. 1, p. 318, Hud. Riv. Gr.

trentonensis, Hall, 1847, Pal. N. Y., vol. 1, p. 161, Trenton Gr.

truncata, Hall, 1847, Pal. N. Y., vol. 1, p. 296, Hud. Riv. Gr.

undulostriata, Hall, 1852, Pal. N. Y., vol. 2, p. 284, Niagara Gr.

unionoides, Meek, 1871, (Anodontopsis unionoides,) Am. Jour. Sci. and Arts, 3d ser., vol. 2, p. 299, and Ohio Pal., vol. 1, p. 141, Hud. Riv. Gr.

varia, Billings, 1874, Pal. Foss., vol. 2, p. 56, Low. Held. Gr.

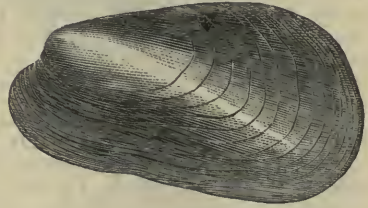


FIG. 855.—*Modiolopsis versaillesensis*. Left valve.

versaillesensis, S. A. Miller, 1874, Cin. Quar. Jour. Sci., p. 150, Hud. Riv. Gr.

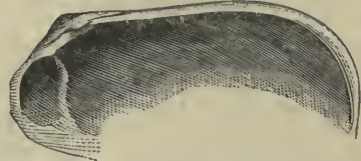


FIG. 856.—*Modiolopsis versaillesensis*. Hinge-line and muscular impression.

MODIOMORPHA, Hall, 1870, Prelim. Notice Lam. Shells, p. 72. [Ety. contracted from *Modiola*, a genus; *morphe*, form.] Equivalve, subovate, larger posteriorly, compressed; beaks small; sinus oblique and constricting the base; surface concentrically undulated; single tooth in the left valve, and corresponding socket in the other; no lateral teeth; ligament external. Type *M. concentrica*.

affinis, Hall, 1885, Pal. N. Y., vol. 5, p. 284, Ham. Gr.

alta, Conrad, 1841, (Cypricardites *alta*.) Ann. Rep. N. Y., p. 52, and Pal. N. Y., vol. 5, pl. 37, figs. 1-16, Ham. Gr.

altiformis, Walcott, 1885, Monogr. U. S. Geo. Sur., vol. 8, p. 169, Devonian.

ambigua, Walcott, 1885, Monogr. U. S. Geo. Sur., vol. 8, p. 239, Carboniferous.

arcuata, Hall, 1884, Pal. N. Y., vol. 5, pl. 36, fig. 21, Ham. Gr.

chemos, Clarke, 1885, Bull. U. S. Geo. Sur., No. 16, p. 30, Genesee shales.

clarens, Hall, 1885, Pal. N. Y., vol. 5, p. 273, Up. Held. Gr.

complanata,

Hall, 1870,

Prelim. Notice

Lam. Shells, p.

73, and Pal.

N. Y., vol. 5,

p. 272, Up.

Held. Gr.

concentrica, Conrad, 1838, (Pterinea *concentrica*.) Ann. Rep. Geo. Sur. N. Y., p. 116, and Pal. N. Y., vol. 5, pl. 34, figs. 9-10, Ham. Gr.



FIG. 857.—*Modiomorpha concentrica*.

cymbula, Hall, 1870, Prelim. Notice Lam. Shells, p. 75, and Pal. N. Y., vol. 5, pl. 36, figs. 19-20, Ham. Gr.

desiderata, Walcott, 1885, Monogr. U. S. Geo. Sur., vol. 8, p. 240, Carboniferous.

hyalea, Hall, 1870, Prelim. Notice Lam. Shells, p. 79, and Pal. N. Y., vol. 5, pl. 41, figs. 28-30, Waverly Gr.

inornata, Billings, 1874, Pal. Foss., vol. 2, p. 52, Devonian.

linguiformis, Hall, 1883, Pal. N. Y., vol. 5, pl. 34, figs. 15-17, Up. Held. Gr.

macilenta, Hall, 1870, Prelim. Notice Lam. Shells, p. 76, and Pal. N. Y., vol. 5, pl. 37, fig. 17, and pl. 39, figs. 17-21, Ham. Gr.

mytiloides, Conrad, 1841, (Cypricardites mytiloides,) Ann. Rep. Geo. N. Y., p. 52, and Pal. N. Y., vol. 5, p. 277, Ham. Gr.

neglecta, Hall, 1883, Pal. N. Y., vol. 5, pl. 41, figs. 12-13, Chemung Gr.

oblonga, Walcott, 1885, Monogr. U. S. Geo. Sur., vol. 8, p. 170, Devonian.

obtusa, Walcott, 1885, Monogr. U. S. Geo. Sur., vol. 8, p. 171, Devonian.

perovata, Meek & Worthen, 1865, (Modiolopsis perovata,) Proc. Acad. Nat. Sci. Phil., p. 246, and Geo. Sur. Ill., vol. 3, p. 438, Ham. Gr.

pintoensis, Walcott, 1885, Monogr. U. S. Geo. Sur., vol. 8, p. 240, Carboniferous.

planulata, Hall, 1870, Prelim. Notice Lam. Shells, p. 74, syn. for *M. mytiloides*.

ponderosa, Hall, 1870, (Sanguinolites ponderosus,) Prelim. Not. Lam. Shells, p. 35, and Pal. N. Y., vol. 5, pl. 34, fig. 11, Up. Held. Gr.

putillus, Hall, 1883, Pal. N. Y., vol. 5, pl. 41, figs. 1-2, Schoharie grit.

quadrula, Hall, 1870, Prelim. Notice Lam. Shells, p. 77, and Pal. N. Y., vol. 5, pl. 41, figs. 18-26, Chemung Gr.

recta, Hall, 1885, Pal. N. Y., vol. 5, p. 286, Ham. Gr.

recurva, Hall, 1883, Pal. N. Y., vol. 5, pl. 41, fig. 17, Chemung Gr.

regularis, Hall, 1885, Pal. N. Y., vol. 5, p. 270, Schoharie grit.

rigida, Hall, 1883, Pal. N. Y., vol. 5, pl. 41, figs. 10, 11, 14-16, Chemung Gr.

rigidula, Simpson, 1889, Trans. Am. Phil. Soc., p. 449, and Dict. Foss. Pa., p. 415, Chemung Gr.

schoharie, Hall, 1884, Pal. N. Y., vol. 5, p. 269, pl. 34, fig. 13, Schoharie grit.

subalata, Conrad, 1841, (Cypricardites subalatus,) Ann. Rep. N. Y., p. 83, and Pal. N. Y., vol. 5, pl. 39, figs. 1-16, Ham. Gr.

subalata var. chemungensis, Hall, 1885, Pal. N. Y., vol. 5, p. 284, Chemung Gr.

subangulata, Hall, 1885, Pal. N. Y., vol. 5, p. 287, Chemung Gr.

tioga, Hall, 1885, Pal. N. Y., vol. 5, p. 291, Chemung Gr.

MONOPTERIA, Meek & Worthen, 1866, Proc. Chi. Acad. Nat. Sci., vol. 1, p. 20. [Ety. *monos*, single; *pteron*, a wing.] Avicularoid, obliquely produced, angular pos-

teriorly, rounded in front, subequivalve, both valves convex; posterior wing slender, produced, anterior one obsolete or drawn back between the beaks, in a deep lunule; no byssal emargination, but a little gaping in the lunule; muscular impressions faint; cardinal area narrow, with few longitudinal cartilage furrows; hinge edentulous. Type *M. longispina*.

auricula, Stevens, 1858, (Gervillia auricula,) Am. Jour. Sci. and Arts, 2d ser., vol. 25, p. 265, Coal Meas.

gibbosa, Meek & Worthen, 1866, Proc. Chi. Acad. Sci., p. 20, Coal Meas.

longispina, Cox, 1857, (Gervillia longispina,) Geo. Sur. Ky., vol. 3, p. 568, Coal Meas.

marian, White, 1874, Rep. Invent. Foss., p. 22, and Geo. Sur. W. 100th Mer., vol. 4, p. 151, Carboniferous.

MONOTIS, Bronn, 1824, System Urweltlicher Conchylien. [Ety. *monos*, one; *otos*, ear.] Obliquely oval, compressed, radiated; anterior side short, rounded; posterior slightly cared. Type *M. salinaria*.

elevata, see Panenka *elevata*.
gregaria, Meek & Worthen, 1870, Proc. Acad. Nat. Sci. Phil., p. 38, and Geo. Sur. Ill., vol. 5, p. 573, Coal Meas.

halleri, Swallow, 1858, Trans. St. Louis Acad. Sci., vol. 1, p. 185, Permian Gr.

hawni, see Pseudomonotis *hawni*.

poulsoni, see Panenka *poulsoni*.

princeps, see Aviculopecten *princeps*.

radialis, Phillips, 1834, (Pecten *radialis*), see Pseudomonotis *radialis*.

radians, see Panenka *radians*.

septentrionalis, Haughton, 1857, Jour. Roy. Dub. Soc., vol. 1, (?) Gr.

speluncaria, Schlotheim, 1816, Denkschriften d. k. Ac. d. Wiss. zu Munchen, p. 30, (Gryphites *speluncarius*.) Permian Gr. Probably not American.

variabilis, Swallow, 1858, Trans. St. Louis Acad. Sci., vol. 1, p. 187, Permian Gr.

MYALINA, DeKoninck, 1844, Desc. Anim. Foss. Carb. Belg., p. 125. [Ety. *Mya*, a genus of shells; *inus*, like.] Subrhomboidal, inequilateral, inequivalve, oblique, slightly sinuous in front for the passage of the byssus; beaks pointed, nearly terminal; surface smooth or concentrically marked; hinge edentulous; ligamental area broad and furrowed parallel to the hinge-line; muscular and pallial impressions apparently as in *Pterea*; shell structure prismatic. Type *M. lamellosa*.



FIG. 858.—*Monopteria gibbosa*.

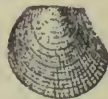


FIG. 859.—*Monotis gregaria*.

angulata, Meek & Worthen, 1860, Proc. Acad. Nat. Sci. Phil., p. 455, and Geo. Sur. Ill., vol. 2, p. 300, Kaskaskia Gr.
 apachesi, Marcou, 1858, Geol. North America, p. 44, Subcarboniferous.
 aviculoides, Meek & Hayden, 1860, Proc. Acad. Nat. Sci. Phil., p. 184, and Pal. Up. Mo., p. 51, Permian Gr.
 aviculoides, Winchell, see *M. rara*.
 concava, Swallow, 1858, (*Mytilus concavus*.) Trans. St. Louis Acad. Sci., vol. 1, p. 188, Permian Gr.
 concentrica, Meek & Worthen, 1860, Proc. Acad. Nat. Sci. Phil., p. 456, and Geo. Sur. Ill., vol. 2, p. 281, Warsaw Gr.
 congeneris, Walcott, 1885, U. S. Geo. Sur., vol. 8, p. 237, Subcarboniferous.
 cuneiformis, Gurley, 1883, New Carb. Foss., p. 4. Publication invalid.
 deltoidea, Gabb, 1859, Proc. Acad. Nat. Sci. Phil., p. 297, Subcarboniferous.
 imbricaria, Winchell, 1862, Proc. Acad. Nat. Sci., p. 412, Marshall Gr.
 iowensis, Winchell, 1865, Proc. Acad. Nat. Sci., p. 127, Chemung Gr.
 kansasensis, Shumard, 1858, Trans. St. Louis Acad. Sci., vol. 1, p. 213, Coal Meas.
 keokuk, Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 524, Keokuk Gr.
 meliniformis, Meek & Worthen, 1866, Proc. Chi. Acad. Sci., vol. 1, p. 19, Coal Meas.
 michiganensis, Winchell, 1862, Proc. Acad. Nat. Sci., p. 411, Marshall Gr.
 monroensis, Worthen, 1884, Bull. No. 2, Ill. St. Mus. Nat. Hist., p. 15, and Geo. Sur. Ill., vol. 8, p. 127, St. Louis Gr.
 mytiliformis, Hall, 1852, Pal. N. Y., vol. 2, p. 100, Clinton Gr.
 nemesis, Walcott, 1885, Monogr. U. S. Geo. Sur., vol. 8, p. 237, Subcarboniferous.
 nessus, Walcott, 1885, Monogr. U. S. Geo. Sur., vol. 8, p. 238, Subcarboniferous.
 perattenuata, Meek & Hayden, 1858, Trans. Alb. Inst., vol. 4, p. 77, and Geo. Sur. Ill., vol. 5, p. 582, Coal Meas.
 permiana, Swallow, 1858, (*Mytilus permianus*.) Trans. St. Louis Acad. Sci., vol. 1, p. 187, and Pal. Up. Mo., p. 52, Permian Gr.
 perniformis, Cox, 1857, Geo. Sur. Ky., vol. 3, p. 569, Coal Meas.
 pterineiformis, Winchell, 1862, Proc. Acad. Nat. Sci., p. 412, Marshall Gr.
 rara, Winchell, 1870, Proc. Am. Phil. Soc., p. 390, Marshall Gr. Proposed instead of *M. aviculoides*, Winchell, 1862, which was preoccupied.
 recta, Shumard, 1858, Trans. St. Louis Acad. Sci., vol. 1, p. 212, Permian Gr.
 recurvirostris, Meek & Worthen, 1860, Proc. Acad. Nat. Sci. Phil., p. 456, and Geo. Sur. Ill., vol. 2, p. 344, Up. Coal Meas.

squamosa, Sowerby, 1827, Trans. Geo. Soc. Lond., 2d ser., vol. 3, Permian Gr. subquadrata, Shumard, 1855, Geo. Rep. Mo., p. 207, Coal Meas.



FIG. 860.—*Myalina recurvirostris*.

stludovici, Worthen, 1873, Geo. Sur. Ill., vol. 5, p. 540, St. Louis Gr.
 swallowi, McChesney, 1860, New Pal. Foss., p. 57, and Geo. Sur. Ill., vol. 2, p. 341, Coal Meas.

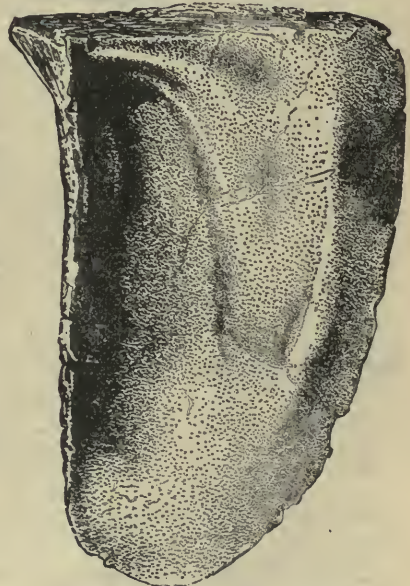


FIG. 861.—*Myalina subquadrata*.

MYTILARCA, Hall, 1870, Prelim. Notice Lam. Shells, p. 19. [Ety. from the two genera *Mytilus* and *Arca*.] Equivalve, inequilateral, mytiliform; beaks terminal; hinge short; ligamental area striated; cardinal teeth beneath the beak small, oblique; posterior teeth small, oblique, and at the extremity of the hinge; anterior muscular scar umbonal, and posterior one near the postero-basal margin; pallial line entire, simple; surface not unfrequently with fine, obscure radiating striae. Type *M. chemungensis*.

arenacea, see *Plethomytilus arenaceus*.
attenuata, Hall, 1870, Prelim. Notice Lam. Shells, p. 23, and Pal. N. Y., vol. 5, pt. 1, p. 260, Chemung Gr.
canadensis, Billings, 1874, Pal. Foss., vol. 2, p. 52, Gaspé limestone No. 8, Devonian.
carinata, Hall, 1884, Pal. N. Y., vol. 5, pt. 1, p. 259, Chemung Gr.
chemungensis, Conrad, 1842, (*Inoceramus chemungensis*.) Jour. Acad. Nat. Sci. Phil., vol. 8, p. 246, and Pal. N. Y., vol. 5, pt. 1, p. 258, Chemung Gr.



FIG. 862.—*Mytilarca chemungensis*.

cordiformis, Hall, 1859, (*Megambonia cordiformis*.) Pal. N. Y., vol. 3, p. 278, Low. Held. Gr.
dubia, Walcott, 1885, Monogr. U. S. Geo. Sur., vol. 8, p. 168, Devonian.
fibristriata, White & Whitfield, 1862, (*Mytilus fibristriatus*.) Proc. Bost. Soc. Nat. Hist., vol. 8, p. 296, and Pal. N. Y., vol. 5, pt. 1, p. 264, Kinderhook Gr.
gibbosa, Hall, 1884, Pal. N. Y., vol. 5, pt. 1, p. 262, Up. Chemung Gr.
knappi, see *Plethomytilus knappi*.
lata, Hall, 1884, (*Mytilops lata*.) Pal. N. Y., vol. 5, pt. 1, p. 262, Chemung Gr.
mytilimeris, see *Plethomytilus mytilimeris*.
nitida, Billings, 1874, Pal. Foss., vol. 2, p. 53, Gaspé limestone No. 8, Devonian.
occidentalis, White & Whitfield, 1862, (*Mytilus occidentalis*.) Proc. Bost. Soc. Nat. Hist., vol. 8, p. 297, and Pal. N. Y., vol. 5, pt. 1, p. 263, Kinderhook Gr.
oviformis, see *Plethomytilus oviformis*.
percarinata, Whitfield, 1882, Ann. N. Y. Acad. Sci., vol. 2, p. 202, Up. Held. Gr.
ponderosa, see *Plethomytilus ponderosus*.
pyramidata, Hall, 1884, Pal. N. Y., vol. 5, pt. 1, p. 256, Schoharie grit.
radiata, see *Byssopteria radiata*.
regularis, Hall, 1884, Pal. N. Y., vol. 5, pt. 1, p. 260, Chemung Gr.
sigillum, Hall, 1876, 28th Rep. N. Y. Mus. Nat. Hist., p. 174, Niagara Gr.
simplex, Hall, 1884, (*Mytilops simplex*.) Pal. N. Y., vol. 5, pt. 1, p. 261, Chemung Gr.
umbonata, Hall, 1884, Pal. N. Y., vol. 5, pt. 1, p. 257, Chemung Gr.
MYTILOPS, Hall, 1884, Pal. N. Y., vol. 5, pt. 1, p. 4. [Ety. from resemblance to

Mytilus.] Resembles externally *Modiola* and *Lithodomus*. Hinge-line narrow, oblique, extending about half the length of the shell, beaks terminal. Type *M. præcedens*.

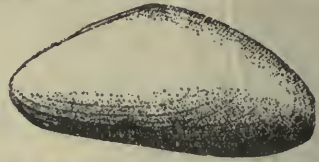


FIG. 863.—*Mytilops præcedens*. Left valve.

lata, see *Mytilarca lata*.
metella, Hall, 1870, Prelim. Notice Lam. Shells, p. 1, and Pal. N. Y., vol. 5, pt. 1, p. 268, Chemung Gr.

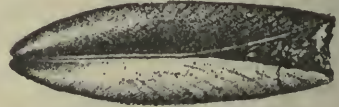


FIG. 864.—*Mytilops præcedens*.

præcedens, Hall, 1870, (*Modiola præcedens*.) Prelim. Not. of Lam. Shells, p. 1, and Pal. N. Y., vol. 5, pt. 1, p. 267, Chemung Gr.
simplex, see *Mytilarca simplex*.
Mytilus, Linnæus, 1758, Syst. Nat., 10th ed. [Ety. *Mytilus*, the fish mussel.] This genus does not, so far as known, exist in Palæozoic rocks. Most of the species referred to it belong to *Myalina* and *Mytilarca*.
concava, see *Myalina concava*.
fibristriatus, see *Mytilarca fibristriatus*.
occidentalis, see *Mytilarca occidentalis*.
ottawensis, Shumard, 1858, Trans. St. Louis Acad. Sci., vol. 1, p. 211, Up. Coal Meas.
permianus, see *Myalina permiana*.
squamosus, Sowerby, 1839, Trans. Geol. Soc. Lond., vol. 4, Permian Gr. Probably not American.
tenuiradiatus, Shumard, 1858, Trans. St. Louis Acad. Sci., vol. 1, p. 211, Up. Coal Meas.
whitfieldanus, Winchell, 1862, Proc. Acad. Nat. Sci., p. 413, syn. for *Mytilarca fibristriata*.
Naiadites, Dawson, 1860, Acad. Geol., but not defined. The name was used for a genus of plants by Buckman in 1843. The fossils were defined by Salter in 1861, under the name of *Anthracomya*.
angulatus, see *Anthracomya angulata*.
arenaceus, see *A. arenacea*.
carbonarius, see *A. carbonaria*.
elongatus, see *A. elongata*.
lævis, see *A. lævis*.
obtusus, see *A. obtusa*.
ovalis, see *A. ovalis*.
NUCULA, Lamarck, 1801, Syst. An. sans Vert., p. 87. [Ety. *nucula*, a little nut.] Equivalve, inequilateral oval, or oblong

closed all round, without external ligamentary facets; beak directed backward; cartilage internal, placed in a pit under the beak; teeth numerous, very long. Type *N. nucleus*.
anodontoides, Meek, 1871, Reg. Rep. University W. Va., Coal Meas.
arata, see *Nuculana arata*.
bellatula, Hall, 1843, syn. for *N. bellistriata*.
bellistriata, Conrad, 1841, (*Nuculites bellistriatus*.) Ann. Rep. N. Y., p. 40, and Geo. Rep. 4th Dist. N. Y., p. 197, Ham. Gr.
beyrichia, Schlotheim, as identified by Geinitz. See *Nucula parva*.
corbuliformis, Hall, 1870, Prelim. Notice Lam. Shells, p. 2, and Pal. N. Y., vol. 5, pl. 46, figs. 24-37, Ham. and Chemung Grs.



FIG. 865.—*Nucula cobboldiae*.

cylindricus, syn. for *Cardiomorpha missouriensis*.
diffidens, Hall, 1885, Pal. N. Y., vol. 5, p. 322, Chemung Gr.
donaciformis, see *Tellinomya donaciformis*.
globularis, Hall, 1885, Pal. N. Y., vol. 5, p. 322, Chemung Gr.
fabula, see *Clidophorus fabula*.
hians, Hall, 1860, 13th Rep. N. Y. Mus. Nat. Hist., p. 110, Kinderhook Gr.
houghtoni, see *Tellinomya houghtoni*.
hubbardi, Winchell, 1862, Proc. Acad. Nat. Sci., p. 417, Marshall Gr. Syn. for *Nuculites sulcatinus*.
illinoisensis, Worthen, 1884, Bull. No. 2, Ill. St. Mus. Nat. Hist., p. 15, and Geo. Sur. Ill., vol. 8, p. 123, St. Louis Gr.
insularis, Walcott, 1885, Monogr. U. S. Geo. Sur., vol. 8, p. 241, Carboniferous.
iowensis, White & Whitfield, 1862, Proc. Acad. Nat. Sci., vol. 8, p. 298. Syn. for *Tellinomya houghtoni*.
kazamensis, as identified by Geinitz is *Nuculana bellistriata*.
lamellata, Hall, 1883, Pal. N. Y., vol. 5, pl. 51, figs. 18-20, Ham. Gr.
levata, see *Tellinomya levata*.
levatiformis, Walcott, 1885, Monogr. U. S. Geo. Sur., vol. 8, p. 241, Carboniferous.
lineata, see *Tellinomya lineata*.
lineolata, Hall, 1843, Geo. Rep. 4th Dist. N. Y., p. 246, Portage Gr.
lirata, Conrad, 1842, (*Nuculites liratus*.) Jour. Acad. Nat. Sci., vol. 8, p. 250, and Pal. N. Y., vol. 5, pl. 45, figs. 17-27, Ham. Gr.
machæriiformis, see *Tellinomya machæriiformis*.
mactriiformis, see *Tellinomya mactriiformis*.
mercereusis, syn. for *Cardiomorpha missouriensis*.
microdonta, Winchell, 1863, Proc. Acad. Nat. Sci., p. 16, Marshall Gr.

minima, Foerste, 1885, Bull. Sci. Lab. Denison Univ., p. 93. Not properly defined.
minuta, Owen, 1840, Rep. on Min. Lands, Devonian. The name was preoccupied by De France in 1825.
nasuta, see *Nuculana nasuta*.
neda, Hall & Whitfield, 1872, 24th Rep. N. Y. Mus. Nat. Hist., p. 191, Up. Held. Gr.
notica, Hall & Whitfield, 1872, 24th Rep. N. Y. Mus. Nat. Hist., p. 190, Ham. Gr.
obliqua, see *Palæoconcha obliqua*.
oblonga, Hall, syn. for *Nuculites oblongatus*.
obsoleta, McChesney, 1860, Pal. Foss., p. 89, Coal Meas. Not recognized.
parva, McChesney, 1860, New Pal. Foss., p. 54, and Geo. Sur. Ill., vol. 5, p. 589, Coal Meas.
perumbonata, White, 1879, Bull. U. S. Geo. Sur., vol. 5, No. 2, p. 217, and Cont. to Pal., No. 6, p. 136, Carboniferous.
poststriata, see *Lyrodesma poststriatum*.
randalli, Hall, 1870, Prelim. Notice Lam. Shells, p. 3, and Pal. N. Y., vol. 5, pl. 45, figs. 5-16, Ham. and Chemung Grs.
rectangula, McChesney, 1860, Desc. New Pal. Foss., p. 74, Ham. Gr.
rescuensis, Walcott, 1885, Monogr. U. S. Geo. Sur., vol. 8, p. 172, Devonian.
sectoralis, Winchell, 1862, Proc. Acad. Nat. Sci., p. 418, Marshall Gr.
shumardana, Hall, 1858, Trans. Alb. Inst., vol. 4, p. 16, and Bull. Am. Mus. Nat. Hist., p. 57, Warsaw Gr.
stella, see *Tellinomya stella*.
subelliptica, Hall, 1883, Pal. N. Y., vol. 5, pl. 45, fig. 23, Ham. Gr.
umbonata, Hall, 1883, Pal. N. Y., vol. 5, pl. 47, figs. 51 and 52, Chemung Gr.



FIG. 866.—*Nucula ventricosa*.

varicosa, Hall, 1870, Prelim. Notice Lam. Shells, p. 2, and Pal. N. Y., vol. 5, pl. 46, figs. 12-23, Ham. Gr.
ventricosa, Hall, 1858, Geo. Sur. Iowa, p. 716, Coal Meas.
NUCULANA, Link, 1807, Rost. Samml., vol. 3, p. 155. [Ety. like a shell of the genus *Nucula*.] Equivalve, inequilateral, produced behind; beaks sometimes directed posteriorly; lunule often present; rounded in front; post-umbonal slope defined; surface concentrically lined; hinge with a line of small teeth interrupted by a triangular cartilage pit beneath the beak; muscular impressions two, small; pallial line, simple, or slightly sinuous. Type *N. emarginata*.
arata, Hall, 1852, (*Nucula arata*.) Stausb. Exped. to Gt. Salt Lake, p. 413, Coal Meas.

bellistriata, Stevens, 1858, (*Leda bellistriata*.) Am. Jour. Sci., vol. 25, p. 261, and Geo. Sur. Iowa, p. 717, Coal Meas.

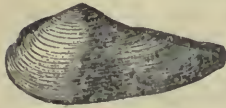


FIG. 867.—*Nuculana bellistriata*. Left valve.

bellistriata var. *attenuata*, Meek, 1872, Pal. E. Neb., p. 206, Coal Meas.

brevirostris, Hall, 1870, (*Leda* (?) *brevirostris*.) Prelim. Notice Lam. Shells, p. 6, and Pal. N. Y., vol. 5, pls. 38, 39, Ham. Gr.

curta, Meek, 1861, (*Leda curta*.) Proc. Acad. Nat. Sci. Phil., p. 144, and Geo. Sur. Ill., vol. 2, p. 283, St. Louis Gr.



FIG. 868.—*Nuculana bellistriata*. Cardinal view.

densmamillata, Stevens, 1858, (*Leda densmamillata*.) Am. Jour. Sci., vol. 25, p. 261, Marshall Gr.

diversa, Hall, 1883, Pal. N. Y., vol. 5, pl. 47, figs. 31-37, Ham. Gr.

nasuta, Hall, 1858, (*Nucula nasuta*.) Trans. Alb. Inst., vol. 4, p. 17, and Bull. Am. Mus. Nat. Hist., p. 57, Warsaw Gr.

nuculiformis, see *Palæoneilo nuculiformis*. *obesa*, White, 1879, Bull. U. S. Geo. Sur., vol. 5, No. 2, p. 216, and Cont. to Pal., No. 6, p. 136, Carboniferous.

obovensis, Hall, syn. for *N. pandoriformis*. *obscura*, Hall, 1885, (*Leda obscura*.) Pal. N. Y., vol. 5, p. 331, Ham. Gr.

pandoriformis, Stevens, 1858, (*Leda pandoriformis*.) Am. Jour. Sci., vol. 25, p. 261, Waverly Gr.

perstriata, Hall, 1883, Pal. N. Y., vol. 5, pl. 47, figs. 42-44, syn. for *N. rostellata*.

rostellata, Conrad, 1841, (*Nuculites rostellatus*.) Ann. Rep. Geo. N. Y., p. 50, Ham. Gr.

saccata, Winchell, 1863, (*Leda saccata*.) Proc. Acad. Nat. Sci., p. 16, Marshall Gr.

vaseyana, McChesney, 1860, (*Nuculites vaseyanus*.) Desc. New Pal., Foss., p. 73, Ham. Gr.

NUCULITES, Conrad, 1841, Ann. Geo. Rep. N. Y., p. 49. [Ety. *Nucula*, a genus of shells.] Equivalve, inequilateral, transverse; anterior end rounded; posterior truncate or pointed; beak, anterior; cardinal line arcuate; post-umbonal slope rounded or angular; surface concentrically lined, hinge with a row of transverse narrow teeth from the anterior to the posterior muscular scar; ligament external; anterior scar deep and separated from the cavity of the shell by a clavicle; posterior scar elongate; pallial line simple. Type *N. oblongatus*.

altus, Conrad, 1842, Jour. Acad. Nat. Sci., vol. 8, p. 251, Devonian.

appressus, see *Cytherodon appressus*.

bellistriatus, see *Nucula bellistriata*. *carinatus*, Hall, 1860, Can. Nat. and Geol., vol. 5, p. 151, Up. Sil.

chemungensis, see *Cytherodon chemungensis*.

concentricus, Conrad, 1842, Jour. Acad. Nat. Sci., vol. 8, p. 248, Coal Meas.

constrictus, see *Palæoneilo constricta*. *cuneiformis*, Conrad, 1841, Ann. Rep. N. Y., p. 50, and Pal. N. Y., vol. 5, pl. 47, figs. 13-16, Ham. Gr.

emarginatus, see *Palæoneilo emarginata*. *fabæ*, see *Modiolopsis fabæ*.

filosus, see *Palæoneilo filosa*. *inflatus*, see *Cypricardites inflatus*.

lamellosus, Conrad, 1841, Ann. Geo. Rep. N. Y., p. 50, Up. Sil.

liratus, see *Nucula lirata*.

mactroides, Conrad, 1842, Jour. Acad. Nat. Sci., vol. 8, p. 249, Marshall Gr.

maximus, see Fig. 869.—*Nuculites oblongatus*. Interior of large left valve.

multilineatus, Conrad, 1842, Jour. Acad. Nat. Sci., vol. 8, p. 251, Ham. Gr.

nyssa, Hall, 1870, Prelim. Notice Lam. Shells, p. 5, and Pal. N. Y., vol. 5, pl. 47, figs. 25-30, Ham. Gr.

oblongatus, see *Clidophorus oblongus*.

oblongatus, Conrad, 1841, Ann. Geo. Rep. N. Y., p. 50, and Pal. N. Y., vol. 5, pl. 47, figs. 1-12, Ham. Gr.

planulatus, see *Clidophorus planulatus*.

poststriatus, see *Lyradesma poststriatum*.

radiatus, see *Pholadella radiata*.

rostellatus, see *Nuculana rostellata*.

scitula, syn. for *Clidophorus planulatus*.

subemarginatus, see *Tellinopsis subemarginata*.

sulcatus, Conrad, 1842, Jour. Acad. Nat. Sci., vol. 8, p. 250, Marshall Gr.

triangularis, Hall & Whitfield, 1877, U. S. Geo. Expl., 40th parallel, vol. 4, p. 248, Devonian.

triqueter, Conrad, 1841, Ann. Rep. N. Y., p. 50, and Pal. N. Y., vol. 5, pl. 47, figs. 17-24, Ham. Gr.

vaseyanus, see *Nuculana vaseyana*.

yoldiiformis, Ulrich, 1879, Jour. Cin. Soc. Nat. Hist., vol. 2, p. 24, Hud. Riv. Gr.

It is not a *Nuculites*.

NYASSA, Hall, 1870, Prelim. Notice Lam. Shells, but defined by Whitfield, 1882, Ann. N. Y., Acad. Sci., vol. 2, p. 244. [Ety. mythological name.] Shell bivalve, very oblique and transversely ovate in form; posterior hinge plate

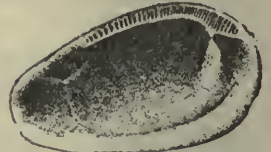


FIG. 870.—*Nuculites oblongatus*. Cast of interior of right valve, showing muscular scars and pallial line.

narrow, bearing from one to four long, slender, ridge-like teeth; anterior plate broad, marked by numerous, small, point-like teeth, with intermediate depressions, arranged somewhat radiating from the middle of its inner border; adductor muscles two, one at each extremity; pallial line entire; ligament internal. Type *N. arguta*.

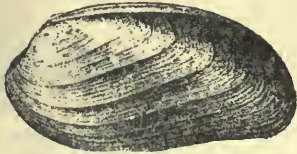


FIG. 871.—*Nyassa arguta*. Left valve.

arguta, Hall, 1870, Prelim. Notice Lam. Shells, p. 28, and Pal. N. Y., vol. 5, pl. 53, figs. 9-20, Ham. Gr.

elliptica, Hall, 1870, Prelim. Notice Lam. Shells, p. 30, and Pal. N. Y., vol. 5, pl. 34, fig. 8, Up. Held. Gr.



FIG. 872.—*Nyassa arguta*. Interior of right valve.

parva, Walcott, 1885, Monogr. U. S. Geo. Sur., vol. 8, p. 173, Devonian.

recta, Hall, 1870, Prelim. Notice Lam. Shells, p. 29, and Pal. N. Y., vol. 5, pl. 53, figs. 1-8, Ham. Gr.

subalata, Hall, 1870, Prelim. Notice Lam. Shells, p. 29, and Pal. N. Y., vol. 5, pl. 53, figs. 21-26, Ham. Gr.

Opisthoptera, Meek. Not defined.

ORTHODESMA, Hall & Whitfield, 1875, Ohio Pal., vol. 2, p. 93. [Etv. *orthos*, straight; *desma*, a ligament.] Elongated, ventricose; cardinal line straight posterior to the beaks, and contracted anterior; ligament external; posterior scar elongate, anterior smaller; pallial line simple; surface concentrically lined. Type *O. rectum*.

byrnesi, S. A. Miller, 1881, Jour. Cin. Soc. Nat. Hist., vol. 4, p. 76, Hud. Riv. Gr.

contractum, Hall, 1847, (*Orthonota contracta*), Pal. N. Y., vol. 1, p. 300, Hud. Riv. Gr.

cuneiforme, S. A. Miller, 1880, Jour. Cin. Soc. Nat. Hist., vol. 3, p. 314, Hud. Riv. Gr.

curvatum, Hall & Whitfield, 1875, Ohio Pal., vol. 2, p. 95, Hud. Riv. Gr.

faberi, n. sp. Shell large, posterior part of the cardinal line very slightly elevated, and anterior part contracted in front of the beaks; anterior end rounded, posterior end more abrupt;

basal line contracted in the central part by an undefined cincture arising below the umbones; beaks anterior, obtuse; umbones low and poorly defined; shell unusually high and thin for species in this genus; surface concentrically furrowed. This species bears some resemblance to a *Modiolopsis*, but it is doubtless an *Orthodesma*. Collected by Mr. Charles Faber in the upper part of the Hud. Riv. Gr., at Versailles, Indiana.

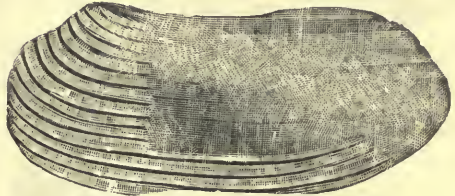


FIG. 873.—*Orthodesma faberi*.

mickelboroughi, Whitfield, 1878, Jour. Cin. Soc. Nat. Hist., vol. 1, p. 139, Hud. Riv. Gr.

occidentale, S. A. Miller, 1880, Jour. Cin. Soc. Nat. Hist., vol. 3, p. 316, Hud. Riv. Gr.

paralleum, Hall, 1847, (*Modiolopsis parallela*), Pal. N. Y., vol. 1, p. 158, Hud. Riv. Gr.

rectum, Hall & Whitfield, 1875, Ohio Pal., vol. 2, p. 94, Hud. Riv. Gr.

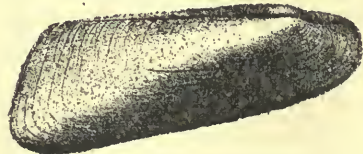


FIG. 874.—*Orthodesma rectum*.

subovale, Ulrich, 1879, Jour. Cin. Soc. Nat. Hist., vol. 2, p. 82, Hud. Riv. Gr.

ORTHONOTA, Conrad, 1841, Ann. Rep. N. Y., p. 50. [Etv. *orthos*, straight; *notos*, the back.] Transversely elongate; margins subparallel; cardinal line straight; two cardinal teeth; no lateral teeth; ligament external; umbonal ridge oblique. Type *O. undulata*.

angulifera, (?) McCoy, 1850, Brit. Pal. Rocks, p. 276, Up. Sil.

carinata, Conrad, 1841, Ann. Rep. N. Y., p. 51, and Pal. N. Y., vol. 5, pl. 78, figs. 34-35, Ham. Gr.

contracta, see *Orthodesma contractum*.

curta, Hall, 1843, Geo. Rep. 4th Dist. N. Y., p. 76, and Pal. N. Y., vol. 2, p. 86, Clinton and Niagara Gr.

ensiformis, Hall, 1870, Prelim. Notice Lam. Shells, p. 89, and Pal. N. Y., vol. 5, pl. 78, fig. 36, Ham. Gr.

incerta, Billings, 1874, Pal. Foss., vol. 2, p. 130, Up. Sil.

parallela, see *Orthodesma paralleum*.

parvula, Hall, 1870, Prelim. Notice Lam. Shells, p. 88, and Pal. N. Y., vol. 5, pl. 78, figs. 29-32, Ham. Gr.
 phaselina, Winchell, 1863, Proc. Acad. Nat. Sci., p. 12, Marshall Gr.
 pholadis, Conrad, 1838, (Pterinea pholadis,) Ann. Geo. Rep. N. Y., p. 118, Hud. Riv. Gr.
 rectidorsalis, Winchell, 1862, Proc. Acad. Nat. Sci., p. 412, Marshall Gr.
 rigida, Hall, 1885, Pal. N. Y., vol. 5, p. 481, Chemung Gr.
 siliquoidea, see *Palaeosolen siliquoideus*.
 simulans, Billings, 1874, Pal. Foss., vol. 2, p. 131, Up. Sil.
 (?) speciosa, Billings, 1874, Pal. Foss., vol. 2, p. 130, Up. Sil.
 undulata, Conrad, 1841, Ann. Rep. N. Y., p. 51, and Pal. N. Y., vol. 5, pl. 78, figs. 37-42, Ham. Gr.

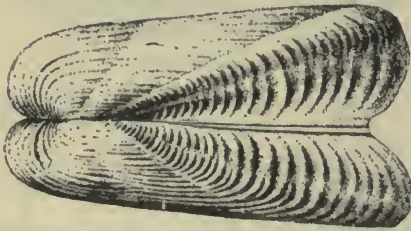


FIG. 875.—*Orthonota undulata*.

ventricosa, see *Spathella ventricosa*.
venusta, Billings, 1874, Pal. Foss., vol. 2, p. 129, Up. Sil.

ORTHONOTELLA, S. A. Miller, 1882, Jour. Cin. Soc. Nat. Hist., vol. 5, p. 117. [Ety *orthos*, straight; *notos*, back; *ellus*, diminutive.] Very small, inequilateral, inequivalve, more or less elliptical; beak anterior; surface smooth or concentrically lined; hinge straight behind the beaks; ligament external. Type *O. faberi*.



FIG. 876.—*Orthonotella faberi*. Greatly enlarged.

faberi, S. A. Miller, 1882, Jour. Cin. Soc. Nat. Hist., vol. 5, p. 117, Hud. Riv. Gr.
Ostrea, Linnaeus, 1758, Syst. Nat. 10th ed., p. 696. [Ety *ostrea*, an oyster.] Inequivalve, irregular in shape, with a single adductor muscle. Not a Palaeozoic genus, though a species has been founded upon a single valve and called *O. patercula*.

patercula, Winchell, 1865, Proc. Acad. Nat. Sci., p. 124, and 4th Ann. Rep. U. S. Geo. Sur., p. 288, Burlington Gr.

PALAEANATINA, Hall, 1870, Prelim. Notice Lam. Shells, p. 84. [Ety. *palaaios*, ancient; *Anatina*, a genus.] Transversely elongate; gaping; left valve the larger; oblique constriction; hook-like process anterior to the beaks; no lateral

teeth; surface concentrically lined. Type *P. typus*.

angusta, Hall, 1885, Pal. N. Y., vol. 5, p. 490, Chemung Gr.

quadrata, see *Prorhynchus quadratum*.

sinuata, Hall, 1885, Pal. N. Y., vol. 5, p. 491, Chemung Gr.

solenoides, Hall, 1885, Pal. N. Y., vol. 5, p. 489, Chemung Gr.

typus, Hall, 1870,



FIG. 877.—*Palaeoanatina typus*.

Palaearca, syn. for *Cypricardites*.

saffordi, see *Cypricardites saffordi*.

ventricosa, see *Cypricardites ventricosus*.

PALEOCARDIA, Hall, 1867, 20th Rep. N. Y. Mus. Nat. Hist., p. 389. [Ety. *palaaios*, ancient; *kardia*, a heart.] Cordiform, obliquely subovate, ventricose; umbones gibbous; beaks prominent incurved; hinge-line very short; surface marked with radiating striae. Type *P. cordiformis*.

cordiformis, Hall, 1867, 20th Rep. N. Y. Mus. Nat. Hist., p. 389, Niagara Gr.

PALEOCONCHA, n. gen. [Ety. *palaaios*, ancient; *conche*, shell.] Shell small, equivalve, inequilateral, oblique, varying from subcircular or subovoid to mytiliform; height equal to or greater than length; closed all around; without external evidence of ligaments; anterior side more or less truncated and rounding into the base below; beaks elevated, projecting beyond cardinal line without incurving; cardinal line straight or slightly arching; some evidence points to an anterior and posterior muscular scar near the ends of the cardinal line; pallial line simple; no lateral teeth and probably edentulous; surface smooth. Type *P. faberi*.

faberi, n. sp. Shell small, height greater than length, very slightly oblique, closed all around; beaks projecting high above the hinge-line without

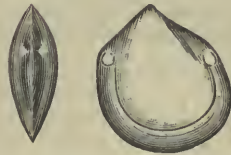


FIG. 878.—*Palaeoconcha faberi*. magnified 5 diam.

incurving; surface smooth, variable in size; a large specimen has a height of 0.20 inch, and length 0.14 inch, a small specimen is about two-

thirds less. This species is distinguished from *P. obliqua* by its greater proportional height, more prolonged beak, less oblique form, and generally larger size. Collected in the upper part of the Hud. Riv. Gr., at Versailles, Indiana, and in Butler County, Ohio.

obliqua, Hall, 1845, (*Nucula obliqua*), Am. Jour. Sci., vol. 48, p. 292, and Ohio Pal., vol. 1, p. 139, Hud. Riv. Gr.

PALÆONEILO, Hall, 1870, Prelim. Notice Lam. Shells, p. 6. [Ety. *palaïos*, ancient; *Neilo*, a genus.] Nuculiform, posterior end extended, sulcus along the umbonal slope; surface concentrically striated or ribbed; hinge-line arcuate, crenulate, not interrupted beneath the beak by a ligamental pit; ligament external; anterior and posterior adductor scars distant; pedal scars within the umbonal cavity. Type *P. constricta*.



FIG. 879.—*Palæoneilo bedfordensis*.

attenuata, Hall, 1870, Prelim. Notice Lam. Shells, p. 12, and Pal. N. Y., vol. 5, pl. 50, figs. 34–39, Waverly Gr.

barrisi, White & Whitfield, 1862, (*Leda barrisi*), Proc. Bost. Soc. Nat. Hist., vol. 8, p. 298, syn. for *P. nuculiformis*.

bedfordensis, Meek, 1875, Pal. Ohio, vol. 2, p. 298, Waverly Gr.

bisulcata, Hall, 1870, Prelim. Notice Lam. Shells, p. 10, and Pal. N. Y., vol. 5, pl. 50, figs. 13–14, Ham. Gr.

brevis, Hall, 1870, Prelim. Notice Lam. Shells, p. 10, and Pal. N. Y., vol. 5, pl. 50, figs. 24–33, Chemung Gr.

carbonaria, see *Yoldia carbonaria*.

constricta, Conrad, 1842, (*Nuculites constrictus*),

angusta, Hall, 1885, Pal. N. Y., vol. 5, p. 344, Chemung Gr.

arata, Hall, 1883, Pal. N. Y., vol. 5, pl. 50, fig. 23, Ham. Gr.

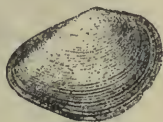


FIG. 880.—*Palæoneilo bedfordensis*. Magnified.

filosa, Conrad, 1842, (*Nuculites filosus*), Jour. Acad. Nat. Sci., vol. 8, p. 250, and Pal. N. Y., vol. 5, pl. 49, figs. 33–38, Chemung Gr.

fœcunda, Hall, 1870, Prelim. Notice Lam. Shells, p. 8, and Pal. N. Y., vol. 5, pl. 49, figs. 13–24, Ham. Gr.

maxima, Conrad, 1841, (*Nuculites maximus*), Ann. Rep. N. Y., p. 50, and Pal. N. Y., vol. 5, pl. 48, figs. 29–38, Ham. Gr.



muta, Hall, 1870, Prelim. Notice Lam. Shells, p. 8, and Pal. N. Y., vol. 5, pl. 49, figs. 25–32, Ham. Gr.

nuculiformis, Stevens, 1858, (*Leda nuculiformis*), Am. Jour. Sci. and Arts, 2d ser., vol. 25, p. 262, Waverly Gr.

parallela, Hall & Whitfield, 1870, 23d Rep. N. Y. Mus. Nat. Hist., p. 241, Waverly Gr.

perplana, Hall, 1870, Prelim. Notice Lam. Shells, p. 12, and Pal. N. Y., vol. 5, pl. 50, figs. 15–22, Ham. Gr.

plana, Hall, 1870, Prelim. Notice Lam. Shells, p. 7, and Pal. N. Y., vol. 5, pl. 48, figs. 21–28, Ham. Gr.

similis, Whitfield, 1882, Ann. N. Y. Acad. Sci., vol. 2, p. 217, Erie shale, Portage (?) Gr.

tenuistriata, Hall, 1870, Prelim. Notice Lam. Shells, p. 9, and Pal. N. Y., vol. 5, pl. 49, figs. 1–12, Ham. Gr.

truncata, Hall, 1883, Pal. N. Y., vol. 5, pl. 50, figs. 40–41, Chemung Gr.

virginica, Hall, 1885, Pal. N. Y., vol. 5, p. 340, Ham. Gr.

PALÆOPINNA, Hall, 1883, Pal. N. Y., vol. 5, pt. 1, p. 4. (Plates and Explanations.)

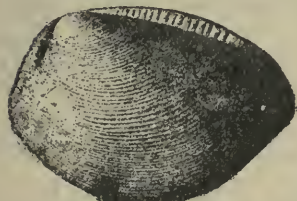


FIG. 881.—*Palæoneilo constricta*. Left valve enlarged, showing crenulations of hinge-line.

Jour. Acad. Nat. Sci., vol. 8, p. 249, and Pal. N. Y., vol. 5, pl. 48, figs. 1–15, Chemung Gr.

constricta var. *flexuosa*, Hall, 1883, Pal. N. Y., vol. 5, pl. 48, figs. 16–20, Ham. Gr.

dubia, Hall, 1885, Pal. N. Y., vol. 5, p. 348, Up. Held. Gr.

elongata, Hall, 1883, Pal. N. Y., vol. 5, pl. 48, fig. 39, Chemung Gr.

emarginata, Conrad, 1841, (*Nuculites emarginata*), Ann. Rep. N. Y., p. 50, and Geo. Wis., vol. 4, p. 337, Ham. Gr.

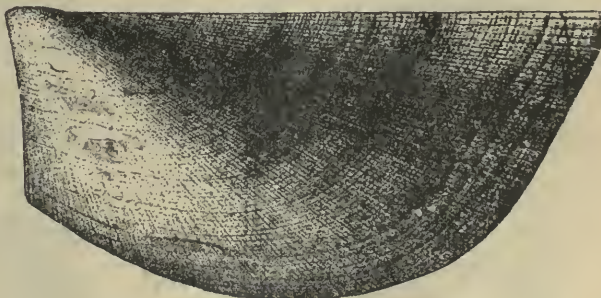


FIG. 883.—*Palæopinna flabellum*.

[Ety. *palaïos*, ancient; *Pinna*, a genus.] Shells large, gaping in front; hinge-line straight, ligamental area narrow, longitudinal groove and slight oblique furrow extending backward from the beak; beak anterior, terminal, directed forward; test more convex, and with finer rays than on the ordinary *Pinna*, and also finely marked with concentric striæ of growth. Type *P. flabellum*.

- flabellum, Hall, 1884, Pal. N. Y., vol. 5, pt. 1, p. 240, Oriskany Gr.
- recurva, Hall, 1884, Pal. N. Y., vol. 5, pt. 1, p. 241, Up. Held. Gr.
- PALÆOSOLEN, Hall, 1885, Pal. N. Y., vol. 5, p. 46. [Ety. *palaios*, ancient; *Solen*, a genus.] Shell in form like *Solen*; dorsal and ventral margins subparallel; anterior end short, rounded; posterior end elongate, truncate; gaping; beaks small, appressed; cardinal line straight; umbonal slope prominent; surface concentrically marked. Type *P. siliquoideus*.
- siliquoideus, Hall, 1870, (Orthonota siliquoidea,) Prelim. Not. Lam. Shells, p. 89, and Pal. N. Y., vol. 5, p. 483, Ham. Gr.
- PANENKA, Barrande, 1881, Syst. Sil. d. l. Boheme, vol. 6, p. 128. Equivalve, inequilateral, elliptical or subcircular, beaks prominent, incurved; cardinal line straight or arcuate; test thin; surface concentrically lined.
- abrupta, Hall, 1885, Pal. N. Y., vol. 5, p. 423, Ham. Gr.
- alternata, Hall, 1885, Pal. N. Y., vol. 5, p. 416, Up. Held. Gr.
- costata, Hall, 1885, Pal. N. Y., vol. 5, p. 419, Marcellus Shale.
- degener, Hall, 1885, Pal. N. Y., vol. 5, p. 424, Ham. Gr.
- dichotoma, Hall, 1885, Pal. N. Y., vol. 5, p. 416, Schoharie grit.
- elevata, Conrad, 1848, (Monotis elevata,) Proc. Acad. Nat. Sci., vol. 3, p. 23, Chemung Gr.
- equilatera, Hall, 1885, Pal. N. Y., vol. 5, p. 419, Marcellus Shale.
- hero, Hall, 1885, Pal. N. Y., vol. 5, p. 418, Marcellus Shale.
- lincklæni, Hall, 1885, Pal. N. Y., vol. 5, p. 420, Marcellus Shale.
- mollis, Hall, 1885, Pal. N. Y., vol. 5, p. 420, Marcellus Shale.
- multiradiata, Hall, 1885, Pal. N. Y., vol. 5, p. 417, Up. Held. Gr.
- potens, Hall, 1885, Pal. N. Y., vol. 5, p. 422, Ham. Gr.
- poulsoni, Conrad, 1848, (Monotis poulsoni,) Proc. Acad. Nat. Sci., vol. 3, p. 23, Chemung Gr.
- radians, Conrad, 1842, (Pterinea radians,) Jour. Acad. Nat. Sci., p. 252, and Pal. N. Y., vol. 5, p. 422, Ham. Gr.
- retusa, Hall, 1885, Pal. N. Y., vol. 5, p. 421, Ham. Gr.
- robusta, Hall, 1885, Pal. N. Y., vol. 5, p. 424, Portage Gr.
- speciosa, Hall, 1843, (Avicula speciosa,) Geo. Rep. 4th Dist. N. Y., p. 243, Portage Gr.
- ventricosa, Hall, 1885, Pal. N. Y., vol. 5, p. 417, Marcellus Shale.
- Panopæa*, Menard de la Groye, 1807, Ann. du Mus. 9. [Ety. mythological name.] *cooperi*, see *Chænomya cooperi*.
- PARACARDIUM, Barrande, 1881, Syst. Sil. de la Boheme, vol. 6, p. 137. [Ety. *para*, allied to; *Cardium*, a genus.] Equivalve, inequilateral, subcircular or subelliptical; posterior side subtruncate; surface marked with fine radii and concentric striæ; the margin of a small cardinal area under the beaks is crenulated.
- doris, Hall, 1885, (Cardiola doris,) Pal. N. Y., vol. 5, p. 428, Portage Gr.
- PARARCA, Hall, 1885, Pal. N. Y., vol. 5, p. 36. [Ety. *para*, allied to; *Arca*, a genus.] Equivalve, inequilateral, transversely subelliptical or rhomboidal; anterior end short, rounded; cardinal line about half the length of the valves, arching at the beaks; surface marked by radii and concentric striæ; hinge narrow, with a series of minute crenulations. Type *P. venusta*.
- erecta, Hall, 1885, (Cardiola erecta,) Pal. N. Y., vol. 5, p. 432, Waverly Gr.
- neglecta, Hall, 1885, Pal. N. Y., vol. 5, p. 432, Waverly Gr.
- precedens, Hall, 1885, Pal. N. Y., vol. 5, p. 429, Up. Held. Gr.
- sao, Hall, 1885, (Cardiola sao,) Pal. N. Y., vol. 5, p. 430, Chemung Gr.
- transversa, Hall, 1885, (Cardiola transversa,) Pal. N. Y., vol. 5, p. 429, Chemung Gr.
- venusta, Hall, 1885, Pal. N. Y., vol. 5, p. 431, Chemung Gr.
- PARACYCLAS, Hall, 1843, Geo. Rep. 4th Dist. N. Y., p. 171. [Ety. *para*, allied to; *Cyclas*, a genus.] Equivalve, subequilateral, suborbicular or subelliptical; anterior end regularly rounded; posterior end rounded or subtruncate, more produced than the anterior; beaks small and low; hinge-line short, post-cardinal slope sometimes subalate; surface marked concentrically; ligament supported internally on each side by a narrow plate, which leaves in the cast two diverging grooves directed forward from the beak; muscular impression on the post-umbonal slope; pallial line a little within the margin of the shell. Type *P. elliptica*.
- billingsana, S. A. Miller, 1883, 2d Ed. Am. Pal. Foss., p. 311, Devonian. Proposed instead of *Lucina occidentalis*, Billings, 1859, Assiniboine and Sas. Ex. Exped., p. 187, figs. b and c, which name was preoccupied.
- chemungensis, Hall, 1885, Pal. N. Y., vol. 5, p. 443, Chemung Gr.
- elevata, Hall, 1883, Pal. N. Y., vol. 5, pl. 72, figs. 37 to 41, Schoharie grit.
- elliptica, Hall, 1843, Geo. Rep. 4th Dist. N. Y., p. 171, and Pal. N. Y., vol. 5, pl. 72, figs. 23-30, Cornif. Gr.
- elliptica var. occidentalis, Hall & Whitfield, 1872, 24th Rep. N. Y. Mus. Nat.



FIG. 884.—Panenka speciosa.

Hist., p. 189, and Pal. N. Y., vol. 5, pl. 72, figs. 31-33, Up. Held. Gr.



FIG. 885.—*Paracyclas elliptica* var. *occidentalis*.

erecta, Hall, 1885, Pal. N. Y., vol. 5, p. 445, Chemung Gr.

fissa, Hall, 1883, Pal. N. Y., vol. 5, pl. 72, figs. 35, 36, Schoharie grit.

hamiltonensis, Winchell, 1866, (*Lucina hamiltonensis*), Rep. Low. Pen. Mich., p. 95, Ham. Gr.

ignota, Hall, 1883, Pal. N. Y., vol. 5, pl. 72, fig. 34, Chemung Gr.

lirata, Conrad, 1838, (*Posidonia lirata*), Ann. Rep. N. Y., p. 116, and Pal. N. Y., vol. 5, pl. 72, figs. 1-19, Corniferous Gr.

ohioensis, MEEK, 1871, Proc. Acad. Nat. Sci. Phil., p. 62, and Ohio Pal., vol. 1, p. 248, Cornif. Gr.



FIG. 886.—*Paracyclas peroccidens*, Hall & Ohioensis. Whitfield, 1877,

U. S. Geo. Expl. 40th Parallel, vol. 4, p. 248, Devonian.

retusa, Hall, 1843, (*Lucina ? retusa*), Geo. Rep. 4th. Dist. N. Y., p. 246, Portage Gr.

rotunda, Hall, 1835, Pal. N. Y., vol. 5, p. 444, Chemung Gr.

sabini, White, 1876, Proc. Acad. Nat. Sci., p. 31, Chemung Gr.

tenuis, Hall, 1883, Pal. N. Y., vol. 5, pl. 72, figs. 20-22, Ham. Gr.

varysburgensis, Williams, 1887, (*Lucina varysburgia*), Bull. 41, U. S. Geo. Sur., Portage Gr.



FIG. 887.—*Pernopecten aviculatus*.

wyomingensis, Williams, 1887, Bull. 41, U. S. Geo. Sur., Portage Gr.

Pecten, Mueller, 1776. This genus is unknown in the Palæozoic rocks.

acutialatus, see *Aviculopecten acutialatus*.

armigerus, see *A. armigerus*.

aviculatus, see *Pernopecten aviculatus*.

broadheadi, syn. for *Aviculopecten carboniferus*.

cancellatus, see *Aviculopecten cancellatus*.

carboniferus, see *A. carboniferus*.

clevelandicus, see *A. clevelandicus*.

coloradoensis, see *A. coloradoensis*.

convexus, see *A. convexus*.

crenulatus, see *Crenipecten crenulatus*.

dolabrijormis, see *Aviculopecten dolabrijormis*.

duplicatus, see *A. duplicatus*.

hallianus, D'Orbigny, 1847, syn. for *Aviculopecten cancellatus*.

halli, see *A. halli*.

hawni, Geinitz, 1866, Carb. und Dyas, p. 36, syn. for *A. carboniferus*.

missouriensis, see *A. missouriensis*.

neglectus, see *Euchondria neglecta*.

occidentalis, see *A. occidentalis*.

providencensis, see *A. providencensis*.

radialis, see *Pseudomonotis radialis*.

ringens, see *Aviculopecten ringens*.

striatus, see *A. striatus*.

tenuilineatus, see *Streblopteria tenuilineata*.

utahensis, see *Aviculopecten utahensis*.

Pernachactas, Castelnau, 1843, Syst. Sil., p. 44. Not recognized.



FIG. 888.—*Pernopecten limiformis*. Hinge-line.

PERNOPECTEN, Winchell, 1865, Proc. Acad. Nat. Sci. Phil., p. 125. [Ety. from the shells *Perna* and *Pecten*.] Shell like *Pecten*;

hinge with a central cartilage pit and a crenulated hinge plate on each side below the hinge margin. Type *P. limiformis*.

aviculatus, Swallow, 1858, (*Pecten aviculus*), Trans. St. Louis

Acad. Sci., p. 213, and Geo. Sur. Ill., vol. 5, p. 583, Coal Meas

cooperensis, Shumard, 1885, (*Avicula cooperensis*),

Geo. Rep. Mo., p. 206, Waverly or Choteau Gr.

fasciculatus, see *Lyrripecten fasciatus*.

limiformis, White & Whitfield, 1862, (*Aviculopecten limiformis*), Proc.

FIG. 890.—*Pernopecten shumardanus*.

Bost. Soc. Nat. Hist., vol. 8, p. 295, Marshall Gr.

limatus, Winchell, 1865, Proc. Acad. Nat. Sci., p. 126, Marshall Gr.

shumardanus, Winchell, 1865, Proc. Acad. Nat. Sci. Phil., p. 126, and Geo. Sur. Ill., vol. 2, p. 453, Kinderhook Gr.

PHOLADELLA, Hall, 1870, Prelim. Notice Lam. Shells, p. 63. [Ety. diminutive of the recent genus *Pholas*.] Equivalve, elongated; valves inflated; beaks anterior, incurved; basal margin constricted; escutcheon and lunule; surface ribbed. Type *P. newberryi*.

constricta, Hall, 1883, Pal. N. Y., vol. 5, pl. 78, figs. 26-27, Ham. Gr.

cuneata, see *Promacrus cuneatus*.

decussata, Hall, 1883, Pal. N. Y., vol. 5, pl. 78, fig. 28, syn. for *Promacrus cuneatus*.

newberryi, Hall, 1870, Prelim. Notice Lam. Shells, p. 65, and Pal. N. Y., vol. 5, pl. 78, fig. 25, Waverly Gr.

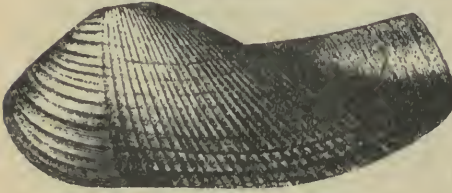


FIG. 891.—*Pholadella newberryi*.

ornata, Hall, 1870, Prelim. Notice Lam. Shells, p. 64, syn. for *P. radiata*.

parallela, Hall, 1883, Pal. N. Y., vol. 5, pl. 78, figs. 22-24, Ham. Gr.

radiata, Conrad, 1842, (*Nuculites radiatus*,) Jour. Acad. Nat. Sci., vol. 8, p. 248, and Pal. N. Y., vol. 5, pl. 78, figs. 15-21, Ham. Gr.

truncata, Hall, 1870, Prelim. Notice Lam. Shells, p. 64, syn. for *P. radiata*.

Pholadomya elongata, see *Allorisma elongatum*.

PHTHONIA, Hall, 1870, Prelim. Notice Lam. Shells, p. 70. Equivalve, elongate-ovate, wider posteriorly; beaks obscure; surface radiated and concentrically marked; no teeth; ligament external. Type *P. sectifrons*.

cylindrica, Hall, 1883, Pal. N. Y., vol. 5, pl. 78, figs. 1-4, Ham. Gr.

lirata, Hall, 1883, Pal. N. Y., vol. 5, pl. 78, fig. 14, Ham. Gr.

nitida, Hall, 1885, Pal. N. Y., vol. 5, p. 477, Chemung Gr.

nodocostata, Hall, 1870, Prelim. Notice Lam. Shells, p. 71, and Pal. N. Y., vol. 5, pl. 78, figs. 5-9, Ham. Gr.

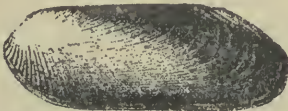


FIG. 892.—*Phthonia sectifrons*. Left valve.

sectifrons, Conrad, 1842, (*Cypricardites sectifrons*,) Jour. Acad. Nat. Sci., vol. 8, p. 245, and Pal. N. Y., vol. 5, pl. 78, figs. 10-13, Ham. Gr.

truncata, Hall, 1885, Pal. N. Y., vol. 5, p. 476, Chemung Gr.

PINNA, Linnæus, 1758, Syst. Nat. 10th Ed. [Ety. *pinna*, a wing.] Shell long, triangular equivalent; beaks terminal, pointed; posterior end broad, truncate, gaping; a subtrigonal, posterior muscular impression, and a small reniform one at the beaks; cartilage long, narrow, internal, supported by a slender ridge close within the cardinal edges; no teeth; shell of one internal laminated layer, and an external vertically fibrous layer. Type *P. squamosa*. A living genus that sometimes attains a length of two feet, and ranges from low water to sixty fathoms. It moves vertically, partly buried in sand, with knife-like edges erect. The byssus has been mixed with silk, spun and knit into gloves.

adamsi, syn. for *Pinna peracuta*.

consimilis, Walcott, 1885, Monogr. U. S. Geo. Sur., vol. 8, p. 230, Subcarboniferous.

hinrichsana, White & St. John, 1868, Trans. Chi. Acad. Sci., p. 122, St. Louis Gr.

inexpectans, Walcott, 1885, Monogr. U. S. Geo. Sur., vol. 8, p. 235, Subcarboniferous.

ludlovi, Whitfield, 1876, in Ludlow's Carroll to Yellowstone Park, p. 143, Coal Meas.

marshallensis, Winchell, 1865, Proc. Acad. Nat. Sci., p. 126, Marshall Gr.



FIG. 893.—*Pinna squamosa*.

maxvillensis, Whitfield, 1882, Ann. N. Y. Acad. Sci., vol. 2, p. 221, Kaskaskia Gr.

missouriensis, Swallow, 1863, Trans. St. Louis Acad. Sci., vol. 2, p. 97, Kaskaskia Gr.

peracuta, Shumard, 1858, Trans. St. Louis Acad. Sci., vol. 1, p. 214, and Pal. E. Neb., p. 198, Coal Meas.

stludovici, Worthen, 1883, Geo. Sur. Ill., vol. 7, p. 326, St. Louis Gr.

subspatulata, Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 524, Warsaw Gr.

Pinnopsis, syn. for *Lunulicardium*.

acutirostra, syn. *Lunulicardium ornatum*.

ornatus, see *Lunulicardium ornatum*.

Placunopsis, Morris & Lycett, 1853, Monogr. Foss. Great Oolite. [Ety. *Placuna*, a genus; *opsis*, resemblance.] Suborbicular, upper valve convex, radiately striated or taking the form of the surface to which it adheres; lower valve flat; ligamental groove submarginal; muscular impression subcentral. Type *P. jurensis*. Not a Palæozoic genus.

Species are left here for want of material to determine their generic relations.

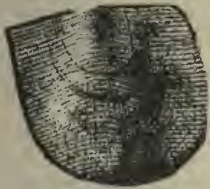


FIG. 894.—*Plethomytilus recticardinalis*. Internal cast of left valve.

carbonaria, Meek & Worthen, 1866, Proc. Chi. Acad. Sci., vol. 1, p. 13, Up. Coal Meas.
recticardinalis, Meek, 1875, Ohio Pal., vol. 2, p. 331, Coal Meas.

PLETHOMYTILUS, Hall, 1883, Pal. N. Y., vol. 5, pt. 1, p. 4.

(Plates and Explanations.) (Ety. *pletho*, to be full; *Mytilus*, a genus.) Mytiloid, gibbous; ligamental area finely striated; no cardinal teeth; lateral teeth small, oblique; test, with concentric striæ; differs from *Mytilacra* in its true hinge-line and the absence of teeth. Type *P. ponderosus*.



FIG. 895.—*Plethomytilus ponderosus*.

arenaceus, Hall, 1870, (*Mytilarca arenacea*.) Prelim. Notice Lam. Shells, p. 20, and Pal. N. Y., vol. 5, pt. 1, p. 253, Schoharie grit.
knappi, Hall, 1884, Pal. N. Y., vol. 5, pt. 1, p. 256, Ham. Gr.
mytilimeris, Conrad, 1842, (*Inoceramus mytilimeris*.) Jour. Acad. Nat. Sci., vol. 8, p. 246, Low. Held. Gr.

oviformis, Conrad, 1842, (*Inoceramus oviformis*.) Jour. Acad. Nat. Sci., vol. 8, p. 246, and Pal. N. Y., vol. 5, pt. 1, p. 255, Ham. Gr.

ponderosus, Hall, 1870, (*Mytilarca ponderosa*.) Prelim. Notice Lam. Shells, p. 21, and Pal. N. Y., vol. 5, pt. 1, p. 254, Up. Held. Gr.

PLEUROPHORUS, King, 1844, Ann. Mag. Nat. Hist., vol. 14, p. 313. [Ety. *pleuron*, a rib; *phoros*, bearing.] Inequilateral, longitudinally oblong or subovate; two cardinal teeth in each valve, alternately interlocking and divergent; one posterior lateral tooth in each valve, the receiving tooth in the left valve; anterior adductor scar deep, and bounded posteriorly by a ridge; pallial line simple. Type *P. costatus*.

angulatus, Meek & Worthen, 1865, Proc. Acad. Nat. Sci. Phil., p. 247, and Geo. Sur. Ill., vol. 6, p. 529, Coal Meas.

calhouni, Meek & Hayden, 1858, (*Edmonia calhouni*.) Trans. Alb. Inst., vol. 4, p. 80, and Pal. Up. Mo., p. 62, Permian Gr.

chesterensis, Worthen, 1884, Bull. No. 2, Ill. St. Mus. Nat. Hist., p. 16, and Geo. Sur. Ill., vol. 8, p. 123, Kaskaskia Gr.

costatiformis, Meek & Worthen, 1865, Proc. Acad. Nat. Sci. Phil., p. 247, and Geo. Sur. Ill., vol. 3, p. 535, Keokuk Gr.

meeki, Walcott, 1885, Monogr. U. S. Geo. Sur., vol. 8, p. 246, Carboniferous.

minimus, Worthen, 1884, Bull. No. 2, Ill. St. Mus. Nat. Hist., p. 17, and Geo. Sur. Ill., vol. 8, p. 124, St. Louis Gr.

monroensis, Worthen, 1884, Bull. No. 2, Ill. St. Mus. Nat. Hist., p. 17, and Geo. Sur. Ill., vol. 8, p. 125, St. Louis Gr.

oblongus, Meek, 1872, Pal. E. Neb., p. 212, Coal Meas.

occidentalis, Meek & Hayden, 1862, Trans. Alb. Inst., vol. 4, p. 80, and Pal. Up. Mo., p. 35, Coal Meas.

pallasi, as identified by Geinitz, is *P. oblongus*.

permianus, Swallow, 1858, Trans. St. Louis Acad. Sci., vol. 1, p. 192, Permian Gr.

quadricostatus, Dawson, 1868, Acad. Geo., p. 304, Carboniferous.

simplus, as identified by Geinitz, is *P. subcuneatus*.

subcostatus, Meek & Worthen, 1865, Proc. Acad. Nat. Sci. Phil., p. 246, and Geo. Sur. Ill., vol. 2, p. 347, Up. Coal Meas.

subcuneatus, Meek & Hayden, 1858, Trans. Alb. Inst., vol. 4, p. 81, and Pal. Up. Mo., p. 61, Permian Gr.

(?) *subellipticus*, Meek, 1867, Am. Jour. Sci., vol. 44, p. 181, and Pal. E. Neb., p. 211, Coal Meas.
tropidophorus, Meek, 1875, Ohio Pal., vol. 2, p. 338, Coal Meas.

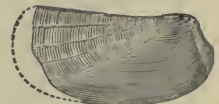


FIG. 896.—*Pleurophorus costatiformis*.

Pleuorhynchus, Phillips, syn. for *Conocardium*.

antiquum, see *Conocardium antiquum*.

attenuatum, see *Conocardium attenuatum*.

crassifrons, see *Conocardium crassifrons*.

cuneus, see *Conocardium cuneus*.

trigonale, Hall, see *Conocardium subtrigonale*.

vomer, see *Conocardium vomer*.

Posidonia, Bronn, see *Posidonomya*.

alata, see *Posidonomya alata*.

alveata, see *Grammysia alveata*.

arcuata, see *Grammysia arcuata*.

clathrata, see *Posidonomya clathrata*.

distans, see *Posidonomya distans*.

lirata, see *Paracyclus lirata*.

moorei, see *Posidonomya moorei*.

perstriata, see *Posidonomya perstriata*.

POSIDONOMYA, Bronn, 1837, Leth. Geogn.

[Ety. *Poseidon*, a mythological name; *Mya*, a genus.] Shell thin, obliquely oval, subtruncate at one end, equivalve, compressed, concentrically furrowed, hinge-line short and straight, edentulous. Type *P. becheri*.

alata, Hall, 1843, (*Posidonia* (?) *alata*.) Geo. 4th Dist. N. Y., p. 72, and Pal. N. Y., vol. 2, p. 87, Clinton Gr.

ambigua, Winchell, 1863, Proc. Acad. Nat. Sci., p. 10, Marshall Gr.

clathrata, Lea, 1853, (*Posidonia clathrata*.) Jour. Acad. Nat. Sci., 2d ser., vol. 2, p. 205, Coal Meas.

devonica, Walcott, 1885, Monogr. U. S. Geo. Sur. vol. 8, p. 179, Devonian.

distans, Lea, 1853, (*Posidonia distans*.) Jour. Acad. Nat. Sci., 2d ser., vol. 2, p. 205, Coal Meas.

fracta, Meek, 1875, Ohio Pal., vol. 2, p. 333, Coal Meas.

fragosa, see *Lunulicardium fragosum*.

lævis, Walcott, 1885, Monogr. U. S. Geo. Sur., vol. 8, p. 178, Devonian.

mesambonata, Winchell, 1862, Proc. Acad. Nat. Sci., p. 420, Marshall Gr.

moorei, Gabb, 1859, (*Posidonia moorei*.) Proc. Acad. Nat. Sci., p. 297, Coal Meas.

perstriata, Lea, 1853, (*Posidonia perstriata*.) Jour. Acad. Nat. Sci., 2d ser., vol. 2, p. 205, Coal Meas.

rhomboidea, Hall, 1852, Pal. N. Y., vol. 2, p. 284, Niagara Gr.

romingeri, Winchell, 1862, Proc. Acad. Nat. Sci., p. 420, Marshall Gr.

striata, Stevens, 1858, Am. Jour. Sci., vol. 25, p. 265, Coal Meas.

whiteana, Winchell, 1862, Proc. Acad. Nat. Sci., p. 420, Marshall Gr.

PRÆCARDIUM, Barrande, 1881, Syst. Sil. de

la Boheme, vol. 6, p. 141. [Ety. *præ*, before; *Cardium*, a genus.] Equivalve, inequilateral, elliptical or trigonal;

beaks prominent, incurved; surface radiated, and concentrically lined; posterior to the beaks a series of vertical nearly parallel teeth.

vetustum, Hall, 1843, (*Cardium vetustum*.) Geo. Rep. 4th Dist. N. Y., p. 245, and Pal. N. Y., vol. 5, p. 427, Portage Gr.



FIG. 899. *Præcardium vetustum*.

PRISCONAIA, Conrad, 1867, Am. Jour. Conch., vol. 3. [Ety. proper name.] Equivalve, inequilateral, and distinguished from *Anthracosia*, which it much resembles, by having lateral teeth. Type *P. ventricosa*.

ventricosa, Conrad, 1867, Am. Jour. Conch., vol. 3, Coal Meas.

PROMACRUS, Meek, 1871, Am. Jour. Conch., vol. 7, p. 4. [Ety. *pro*, forward; *makros*, long.] Similar to *Sanguinolites*; anterior end much produced, narrowly rounded; posterior end produced, obliquely truncate; beaks appressed; cardinal margin nearly straight behind the beaks, and declining in front; umbonal slope angular, extending to the basal extremity; surface concentrically lined, and sometimes plicated anteriorly; ligament external. Type *P. andrewsi*.

andrewsi, Meek, 1871, Am. Jour. Conch., vol. 7, p. 4, Waverly Gr.

cuneata, Hall, 1870, (*Pholadella cuneata*.) Prelim. Not. Lam. Shells, p. 66, and Pal. N. Y., vol. 5, p. 510, Waverly Gr. *missouriensis*, see *Sanguinolites missouriensis*.

nasutus, see *Sanguinolites nasutus*.

PRORHYNCHUS, Hall, 1885, Pal. N. Y., vol. 5, p. 48. [Ety. *pro*, forward; *rhynchus*, beak.] Left valve the larger and more gibbous; anterior end truncate, angular or nasute at the antero-dorsal extremity; posterior end broad, margin truncate or broadly rounded; beaks low; cardinal line straight, extending the entire length of the dorsal margin, and alate at both ends; umbonal slope subangular; surface concentrically lined; strong lateral tooth, ligament external. Type *P. quadratum*.

angulatum, Hall, 1885, Pal. N. Y., vol. 5, p. 493, Chemung Gr.

nasutum, Hall, 1885, Pal. N. Y., vol. 5, p. 493, Chemung Gr.

quadratum, Hall, 1883, (*Palæanatina quadrata*.) Pal. N. Y., vol. 5, p. 492, Chemung Gr.



FIG. 900.—*Prothyris meeki*.

PROTHYRIS, Meek, 1869, Proc. Acad. Nat. Sci. Phil., p. 172. [Ety. *pro*, forward; *thyris*, an orifice.] Equivalve, inequilateral,

extremely elongate; cardinal and basal margins subparallel; anterior

end rounded or subtruncate, with a deep notch in the antero-ventral margin; posterior end rounded, lanceolate, or truncate; cardinal line straight or slightly arcuate; cardinal slope sometimes subalate; umbonal slope rounded, undefined or subangular; surface concentrically lined. Type *P. elegans*.

alata, Hall, 1885, Pal. N. Y., vol. 5, p. 461, Chemung Gr.

elegans, Meek, 1871, Am. Jour. Conch., vol. 7, p. 5, Coal Meas.

exuta, Hall, 1885, Pal. N. Y., vol. 5, p. 462, Chemung Gr.

lanceolata, Hall, 1883, Pal. N. Y., vol. 5, pl. 76, figs. 2 to 8, Ham. Gr.

meeki, Winchell, 1875, Ohio Pal., vol. 2, p. 305, Waverly Gr.

planulata, Hall, 1883, Pal. N. Y., vol. 5, pl. 76, fig. 1, Ham. Gr.

PROTOMYA, Hall, 1885, Pal. N. Y., vol. 5, p. 52. [Ety, *protos*, first; *Mya*, a genus.]

Equivalve, inequilateral, elongate, ovate-elliptical; anterior end broadly rounded; posterior end narrower, rounded; beaks incurved; umbo prominent; cardinal line long, nearly straight; umbonal slope gibbous above, not defined below; surface concentrically lined; ligament external; muscular impressions circular; anterior one strong and near the margin. Type *P. oblonga*.

oblonga, Hall, 1885, (Cardiomorpha oblonga,) Pal. N. Y., vol. 5, p. 509, Ham. Gr.

PSEUDOMONOTIS, Beyrich, 1862, Zeit. der Deutsch., Geol. Gesselsch., vol. 14.

[Ety. *pseudes*, false; *Monotis*, a genus.] Suborbicular, plano-convex, left valve convex, right valve flat or slightly concave; not auriculate; beaks subcentral, slightly oblique, unequal, left elevated, gibbous, incurved, right small; hinge short, narrow, edentulous; cartilage cavity under the beaks; byssal notch of right valve narrow, deep, and separated from the hinge by a small rudimentary ear, which does not project beyond the margin; adductor muscular scar large, subcentral; impressions of retractor muscles, several, small, placed near the beaks; surface radiated, most distinct on the left valve.

hawni, Meek & Hayden, 1858, (Monotis hawni,) Trans. Alb. Inst., vol. 4, p. 76, and Pal. Up. Mo., p. 54, Up. Coal Meas.

hawni var. *ovata*, Meek & Hayden, 1865, (Eumicrotis hawni var. *ovata*,) Pal. Up. Mo., p. 55, Permian Gr.

hawni var. *sinuata*, Meek & Worthen, 1866, (Eumicrotis hawni var. *sinuata*,) Geo. Sur. Ill., vol. 2, p. 338, Up. Coal Meas.

radialis, (?) Phillips, 1834, (Pecten radialis,) Encyc. Meth., vol. 4, Coal Meas.

PTERINEA, Goldfuss, 1826, Germ. Petref. [Ety. *pteron*, a wing.] Transversely trigonal, oblique, inequivalve, very inequilateral, left valve most convex, beaks near the small anterior end; hinge-line long, straight, forming a small anterior and large falciform posterior wing, with a linear, flattened, marginal cartilage facet, longitudinally striated; shell thick, calcareous; two long, slightly diverging, posterior, lateral teeth, beneath the hinge in one valve and one in the other; a few short, cardinal teeth radiating beneath and in front of the beaks; anterior impression very strong just in front of the beak, posterior impression larger, but faintly marked, superficial; pallial scar simple; shallow byssal concavity. Type *P. lævis*.



FIG. 902.—Pterinea demissa.

appressa, Conrad, 1838, Ann. Rep. N. Y. Not defined.

arenacea, Hall, 1877. Proposed, but not defined.

aviformis, Conrad, 1842, (Avicula aviformis,) Jour. Acad. Nat. Sci., vol. 8, p. 243, Trenton Gr.

avis, Hall, 1884, Pal. N. Y., vol. 5, pt. 1, p. 105, Chemung Gr.

bellilineata, Billings, 1866, Catal. Sil. Foss. Antic., p. 15, Hud. Riv. Gr.

bisulcata, see Grammysia bisulcata.

brisa, Hall, 1867, 20th Rep. N. Y. Mus. Nat. Hist., p. 384, syn. for *P. striæcosta*.

cancellata, Barris, 1879, (Avicula cancellata,) Proc. Dav. Acad. Sci., vol. 2, p. 286, Corniferous limestone.



FIG. 901.—Pseudomonotis hawni.

cardiiformis, see *Megambonia cardiiformis*.
cardinata, Winchell, 1862, Proc. Acad. Nat. Sci., p. 412, Marshall Gr.
carinata, Goldfuss, see *Ambonychia carinata*.
chemungensis, Conrad, 1842, (*Avicula chemungensis*.) Jour. Acad. Nat. Sci., vol. 8, p. 243, and Pal. N. Y., vol. 5, pt. 1, p. 98, Chemung Gr.
concentrica, Conrad, 1838, Ann. Rep. N. Y. Not defined.
consimilis, Hall, 1883, Pal. N. Y., vol. 5, pt. 1, p. 100, Chemung Gr.
corrugata, James, 1874, (*Avicula corrugata*.) Cin. Quar. Jour. Sci., vol. 1, p. 239, Hud. Riv. Gr.
crenistriata, Winchell, 1862, (*Cardiopsis crenistriata*.) Proc. Acad. Nat. Sci., p. 417, Marshall Gr.
crenulata, see *Crenipecten crenulatus*.
cuneata, see *Sphenotus cuneatus*.
curiosa, Billings, 1866, Catal. Sil. Foss. Antic., p. 51, Anticosti Gr.
cyrtodontoides, Winchell & Marcy, 1865, Mem. Bost. Soc. Nat. Hist., p. 95, Niagara Gr.
demissa, Conrad, 1842, (*Avicula demissa*.) Jour. Acad. Nat. Sci., vol. 8, p. 242, and Pal. N. Y., vol. 1, p. 292, Hud. Riv. Gr.
dispanda, Hall, 1884, Pal. N. Y., vol. 5, pt. 1, p. 97, Chemung Gr.
elliptica, Hall, 1847, (*Avicula elliptica*.) Pal. N. Y., vol. 1, p. 162, Trenton Gr.

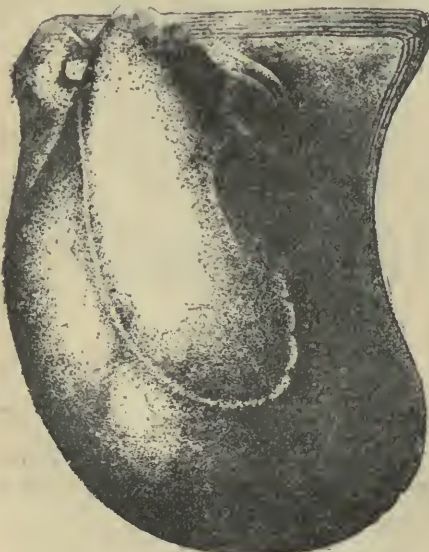


FIG. 903.—*Pterinea flabellum*.

flabellum, Conrad, 1842, (*Avicula flabella*.) Jour. Acad. Nat. Sci., vol. 8, p. 238, and Pal. N. Y., vol. 5, pt. 1, p. 93, Up. Held. and Ham. Grs.
grandis, Hall, 1884, Pal. N. Y., vol. 5, pt. 1, p. 91, Up. Held. Gr.

honeymani, Hall, 1860, (*Avicula honeymani*.) Can. Nat. and Geol., vol. 5, p. 153, and Acad. Geol., p. 604, Up. Sil.
insueta, Emmons, 1842, (*Avicula insueta*.) Geo. Rep. 2d Dist. N. Y., p. 399, and Pal. N. Y., vol. 1, p. 291, Utica Slate and Hud. Riv. Grs.
interstitialis, Hall, 1884, Pal. N. Y., vol. 5, pt. 1, p. 96, Chemung Gr.
modiolaris, see *Modiopsis modiolaris*.
morganensis, see *Avicula morganensis*.
mucronata, Ulrich, 1879, Jour. Cin. Soc. Nat. Hist., vol. 2, p. 24, Hud. Riv. Gr.
neglecta, McChesney, 1861, New Palaeozoic Fossils, p. 88, Niagara Gr.
newarkensis, Walcott, 1885, Monogr. U. S. Geo. Sur., vol. 8, p. 165, Devonian.
orbicularis, see *Ambonychia orbicularis*.
pholadis, see *Orthonota pholadis*.
pinguis, Hall, 1884, Pal. N. Y., vol. 5, pt. 1, p. 92, Up. Held. Gr.
pintoensis, Walcott, 1885, Monogr. U. S. Geo. Sur., vol. 8, p. 234, Subcarboniferous.
planulata, see *Cypricardina planulata*.
prolifera, Billings, 1866, Catal. Sil. Foss. Antic., p. 16, Hud. Riv. Gr.
prora, Hall, 1884, Pal. N. Y., vol. 5, pt. 1, p. 102, Chemung Gr.
punctulata, Conrad. Not defined. See *Cimitaria recurva*.
pygmaea, see *Modiella pygmaea*.
radians, see *Panenka radians*.
reproba, Hall, 1884, Pal. N. Y., vol. 5, pt. 1, p. 106, Chemung Gr.
reversa, Hall, 1884, Pal. N. Y., vol. 5, pt. 1, p. 104, Chemung Gr.
reversa var. *avis*, see *P. avis*.
revoluta, Winchell & Marcy, 1865, Mem. Bost. Soc. Nat. Hist., p. 95, Niagara Gr.
rigida, Hall, 1884, Pal. N. Y., vol. 5, pt. 1, p. 101, Chemung Gr.
rugosa, Conrad, 1841, (*Avicula rugosa*.) Ann. Geo. Rep. N. Y., and Geo. Rep. 4th Dist. N. Y., pl. 26, fig. 2, Waterlime Gr.
similis, Whitfield, 1882, Ann. N. Y. Acad. Sci., vol. 2, p. 214, Marcellus Shale.
spinalata, Winchell, 1865, Proc. Acad. Nat. Sci., p. 124, Burlington (?) Gr.
striacosta, McChesney, 1861, (*Ambonychia striacosta*.) New Pal. Foss., p. 88, Niagara Gr.
strigosa, White & Whitfield, 1862, Proc. Bost. Soc. Nat. Hist., p. 31, Marshall Gr.
suborbicularis, see *Pterinopecten suborbicularis*.
subpapyracea, Meek & Worthen, 1866, Proc. Chi. Acad. Sci., p. 21, Ham. Gr.
thebesensis, Meek & Worthen, 1868, Geo. Sur. Ill., vol. 3, p. 354, Niagara Gr.
thisbe, Billings, 1866, Catal. Sil. Foss. Antic., p. 52, Anticosti Gr.
trentonensis, Conrad, 1842, (*Avicula trentonensis*.) Jour. Acad. Nat. Sci., vol. 8, p. 240, and Pal. N. Y., vol. 1, p. 161, Trenton Gr.
triquetra, see *Gossetletia triquetra*.
undata, see *Ambonychia undata*.

undulata, Meek & Worthen, 1868, Geo. Sur. Ill., vol. 3, p. 456, Kinderhook Gr. varistriata, Billings, 1866, Catal. Sil. Foss. Antic., p. 50, Anticosti Gr. volans, Winchell & Marcy, 1865, Mem. Bost. Soc. Nat. Hist., p. 95, Niagara Gr. PTERINOPECTEN, Hall, 1883, Pal. N. Y., vol. 5, pt. 1, p. 3. (Plates and Explanations.) [Ety. *Pterinea*, a genus; *Pecten*, a genus.] Valves more or less convex; radiated and bearing concentric lines of growth; hinge-line long, straight; wings not well defined, being simple expansions of the upper lateral margins to the hinge-line. Type *P. undosus*.

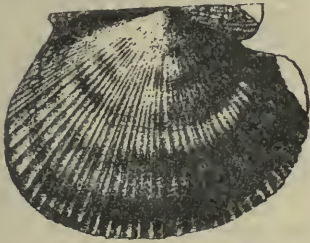


FIG. 904.—*Pterinopecten undosus*.

conspectus, Hall, 1884, Pal. N. Y., vol. 5, pt. 1, p. 66, Ham. Gr. crenicostatus, Hall, 1884, Pal. N. Y., vol. 5, pt. 1, p. 78, Chemung Gr. dignatus, Hall, 1884, Pal. N. Y., vol. 5, pt. 1, p. 62, Marcellus Shale. dispanus, Hall, 1884, Pal. N. Y., vol. 5, pt. 1, p. 76, Chemung Gr. erectus, Hall, 1884, Pal. N. Y., vol. 5, pt. 1, p. 77, Chemung Gr. exfoliatus, Hall, 1884, Pal. N. Y., vol. 5, pt. 1, p. 61, Marcellus Shale. filitextus, Hall, 1884, Pal. N. Y., vol. 5, pt. 1, p. 67, Ham. Gr. hermes, Hall, 1884, Pal. N. Y., vol. 5, pt. 1, p. 64, Ham. Gr. hoosacensis, Walcott, 1885, Monogr. U. S. Geo. Sur., vol. 8, p. 232, Subcarboniferous. imbecilis, Hall, 1884, Pal. N. Y., vol. 5, pt. 1, p. 75, Chemung Gr. insons, Hall, 1884, Pal. N. Y., vol. 5, pt. 1, p. 59, Up. Held. Gr. intermedius, Hall, 1884, Pal. N. Y., vol. 5, pt. 1, p. 68, Ham. Gr. invalidus, see *Aviculopecten invalidus*. lætus, Hall, 1884, Pal. N. Y., vol. 5, pt. 1, p. 63, Marcellus Shale. multiradiatus, Hall, 1884, Pal. N. Y., vol. 5, pt. 1, p. 57, Up. Held. Gr. neptunus, Hall, 1884, Pal. N. Y., vol. 5, pt. 1, p. 79, Chemung Gr. nodosus, Hall, 1884, Pal. N. Y., vol. 5, pt. 1, p. 60, Up. Held. Gr. reflexus, Hall, 1884, Pal. N. Y., vol. 5, pt. 1, p. 58, Up. Held. Gr. regularis, Hall, 1884, Pal. N. Y., vol. 5, pt. 1, p. 70, Ham. Gr.

spio, Walcott, 1885, Monogr. U. S. Geo. Sur., vol. 8, p. 233, Subcarboniferous. spondylus, Hall, 1884, Pal. N. Y., vol. 5, pt. 1, p. 65, Ham. Gr.

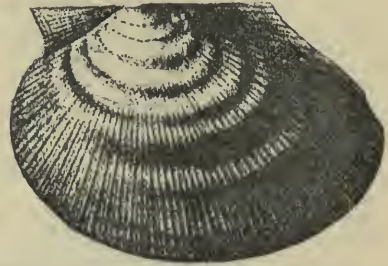


FIG. 905.—*Pterinopecten undosus*.

strictus, Hall, 1884, Pal. N. Y., vol. 5, pt. 1, p. 74, Chemung Gr. suborbicularis, Hall, 1843, (*Pterinea suborbicularis*), Geo. Rep. 4th Dist. N. Y., p. 264, and Pal. N. Y., vol. 5, p. 80, Chemung Gr. terminalis, see *Aviculopecten terminalis*. undosus, Hall, 1884, Pal. N. Y., vol. 5, pt. 1, p. 72, Ham. Gr. vertumnus, Hall, 1884, Pal. N. Y., vol. 5, pt. 1, p. 71, Ham. Gr. PTERONITELLA, Billings, 1874, Pal. Foss., vol. 2, p. 141. [Ety. diminutive of *Pteronites*.] Resembles *Pterinea*, but possesses in front of the beaks several small, anterior, cardinal teeth, and close beneath the hinge-line several more or less elongated posterior teeth. Type *P. venusta*. curta, Billings, 1874, Pal. Foss., vol. 2, p. 143, Low. Held. Gr.

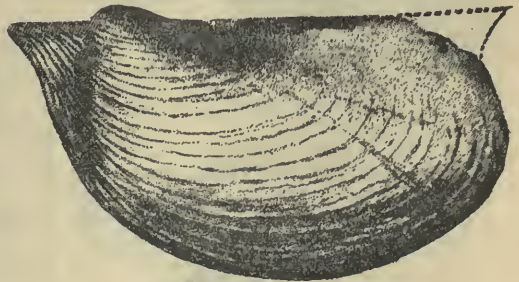


FIG. 906.—*Pteronitella venusta*. b, Hinge-line.

oblonga, Billings, 1874, Pal. Foss., vol. 2, p. 143, Low. Held. Gr. venusta, Billings, 1874, Pal. Foss., vol. 2, p. 142, Low. Held. Gr. PTERONITES, McCoy, 1844, Syn. Carb. Foss. Ireland, p. 81. [Ety. *pteron*, a wing.] Subtriangular, depressed, hinge-line as long as the shell; beaks terminal, or nearly so, forming a very narrow, ob-

tusely pointed anterior end, from which the ventral margin extends to the broad posterior end; left valve most convex; internally a very small tooth under the beak of the right valve, and a very slender, posterior, lateral tooth close to the hinge-line the whole length. Type *P. angustatus*.

gayensis, Dawson, 1868, Acad. Geo., p. 301, Subcarboniferous.

gayensis var. *ornatus*, Dawson, 1883, Rep. on Redpath Mus., No. 2, p. 14, Subcarboniferous.

inoptatus, Hall, 1884, Pal. N. Y., vol. 5, pt. 1, p. 239, Chemung Gr.

newarkensis, Meek, 1871, Proc. Acad. Nat. Sci., p. 162, Waverly Gr.



FIG. 907.—*Pteronites profundus*.

profundus, Hall, 1884, Pal. N. Y., vol. 5, pt. 1, p. 237, Up. Chemung Gr.

rostratus, Hall, 1884, Pal. N. Y., vol. 5, pt. 1, p. 238, Chemung Gr.

spergenensis, Whitfield, 1882, Bull. Am. Mus. Nat. Hist., No. 3, p. 56, Warsaw Gr.



FIG. 908.—*Ptychodesma knappanum*. Right side.

Form modioloid; hinge having a wide ligamental area, grooved by the successive growth of the ligament, as in *pectunculus*. Type *P. knappanum*.

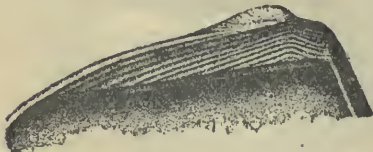


FIG. 909.—*Ptychodesma knappanum*. Enlargement of one side of ligamental area.

knappanum, Hall & Whitfield, 1872, 24th Rep. N. Y. Mus. Nat. Hist., p. 192, Up. Held. Gr.

minor, Hall, 1885, Pal. N. Y., vol. 5, p. 353, Chemung Gr.

nanum, Hall, 1885, Pal. N. Y., vol. 5, p. 353, Chemung Gr.

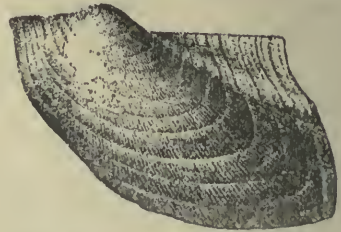


FIG. 910.—*Ptychopteria beecheri*.

PTYCHOPTERIA, Hall, 1884, Pal. N. Y., vol. 5, pt. 1, p. 3. [Ety. *ptyche*, fold; *Pteria*, a genus.] Differs from *Actinopteria* in the nasute anterior extremity, and large, straight wing marked by a strong longitudinal fold. Hinge-line narrow, linear; furnished with one or two linear, oblique, cardinal and lateral teeth; surface with fine rays. It bears about the same relation to *Actinopteria* that *Leptodesma* does to *Liopteria*. Type *P. eugenia*. *alata*, Hall, 1884, Pal. N. Y., vol. 5, pt. 1, p. 139, Chemung Gr.

beecheri, Hall, 1884, Pal. N. Y., vol. 5, pt. 1, p. 143, Chemung Gr.

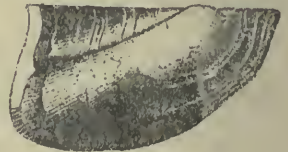


FIG. 911.—*Ptychopteria beecheri*.

elongata, Hall, 1884, Pal. N. Y., vol. 5, pt. 1, p. 141, Chemung Gr.

eucrate, Hall, 1884, Pal. N. Y., vol. 5, pt. 1, p. 133, Chemung Gr.

eudora, Hall, 1884, Pal. N. Y., vol. 5, pt. 1, p. 138, Chemung Gr.

eugenia, Hall, 1883, Pal. N. Y., vol. 5, pl. 23, figs. 17-20, Chemung Gr.

expansa, Hall, 1884, Pal. N. Y., vol. 5, pt. 1, p. 152, Chemung Gr.

falcata, Hall, 1884, Pal. N. Y., vol. 5, pt. 1, p. 136, Up. Chemung Gr.

galene, Hall, 1884, Pal. N. Y., vol. 5, pt. 1, p. 142, Chemung Gr.

gibbosa, Hall, 1884, Pal. N. Y., vol. 5, pt. 1, p. 149, Up. Chemung Gr.

lata, Hall, 1884, Pal. N. Y., vol. 5, pt. 1, p. 145, Up. Chemung Gr.

lobata, Hall, 1884, Pal. N. Y., vol. 5, pt. 1, p. 150, Up. Chemung Gr.

perlata, Hall, 1884, Pal. N. Y., vol. 5, pt. 1, p. 147, Up. Chemung Gr.

proto, Hall, 1884, Pal. N. Y., vol. 5, pt. 1, p. 129, Chemung Gr.

protoformis, Walcott, 1885, Monogr. U. S. Geol. Surv., vol. 8, p. 235, Subcarboniferous.

salamanca, Hall, 1884, Pal. N. Y., vol. 5, pt. 1, p. 131, Chemung Gr.

sao, Hall, 1884, Pal. N. Y., vol. 5, pt. 1, p. 132, Chemung Gr.
 sinuosa, Hall, 1884, Pal. N. Y., vol. 5, pt. 1, p. 130, Up. Chemung Gr.
 spatulata, Hall, 1884, Pal. N. Y., vol. 5, pt. 1, p. 144, Up. Chemung Gr.
 spio, Hall, 1884, Pal. N. Y., vol. 5, pt. 1, p. 137, Chemung Gr.
 thalia, Hall, 1884, Pal. N. Y., vol. 5, pt. 1, p. 148, Up. Chemung Gr.
 thetis, Hall, 1884, Pal. N. Y., vol. 5, pt. 1, p. 135, Chemung Gr.
 trigonalis, Hall, 1884, Pal. N. Y., vol. 5, pt. 1, p. 140, Chemung Gr.
 vanuxemi, Hall, 1884, Pal. N. Y., vol. 5, pt. 1, p. 151, Up. Chemung Gr.

PYANOMYA, S. A. Miller, 1881, Jour. Cin. Soc. Nat. Hist., vol. 4, p. 318. [Ety. *pyanos*, a bean; *Mya*, a genus.] Equivalve, elongate, inequilateral, fragile, edentulous; ligament external. Type *P. gibbosa*.

faberi, n. sp. Shell small, equivalve, inequilateral; length twice as great as height; cardinal and basal lines subparallel; anterior end sharply rounded into the subelliptical base; posterior end broadly rounded; valves ventricose in the middle; beaks obtuse; umbonal ridge prominent, subangular, distinctly defined, and directed to the

postero-basal margin; ligament external; hinge-line straight behind the beaks and inclined in front; no escutcheon or lunule. Surface marked very faintly by concentric lines of growth. Distinguished from *P. gibbosa* by the angular umbonal ridge, less acute anterior end and straight cardinal line behind the beaks, and other particulars. Hud. Riv. Gr., Cincinnati, Ohio. Collected by Charles Faber.

gibbosa, S. A. Miller, 1881, Jour. Cin. Soc. Nat. Hist., vol. 4, p. 318, Hud. Riv. Gr.

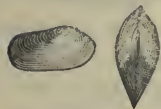


FIG. 912.—*Pyanomya faberi*. Right valve and dorsal view.



FIG. 913.—*Pyanomya gibbosa*. Left valve and dorsal view.

PYRENOMGEUS, Hall, 1852, Pal. N. Y., vol. 2, p. 87. [Ety. *pyrenos*, Nucula; *omoios*, similar; from its resemblance in general form to the shells of the genus Nucula.] Equivalve, inequilateral; umbones prominent, beak elevated; muscular impression near the anterior extremity; general form of Nucula without the teeth that characterize that genus, or the clavicle of a Clidophorus. Type *P. cuneatus*.
cuneatus, Hall, 1852, Pal. N. Y., vol. 2, p. 87, Clinton Gr.

SANGUINOLARIA, Lamarck, 1801, Syst. An. sans Vert. [Ety. from the type *Solen sanguinolentus*.] Oval, compressed, rounded in front, attenuated and slightly gaping behind; hinge teeth $\frac{2}{3}$ small; siphonal inflection deep, connected with the pallial line; ligament external, on very prominent fulcrum. Type *S. sanguinolentus*. Typical species *S. diphos*. Not American Palæozoic. Species left under this name for want of material to determine generic relations.

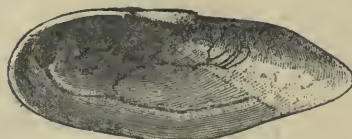


FIG. 914.—*Sanguinolaria diphos*.

leptogaster, Winchell, 1863, Proc. Acad. Nat. Sci., p. 18, Marshall Gr.
rostrata, Winchell, 1865, Proc. Acad. Nat. Sci., p. 129, Marshall Gr.
sectoralis, Winchell, 1862, Proc. Acad. Nat. Sci., p. 422, Marshall Gr.
septentrionalis, Winchell, 1862, Proc. Acad. Nat. Sci., p. 421, Marshall Gr.
similis, Winchell, 1862, Proc. Acad. Nat. Sci., p. 421, Marshall Gr.

SANGUINOLITES, McCoy, 1844, Synop. Carb. Foss., Ireland, p. 47. [Ety. *Sanguinolaria*, a genus; *lithos*, stone.] Subequivalve, oblong, elongated, margins subparallel or a little arched upward; sides compressed or diagonally gibbous from the beak backward; beaks small, anterior; hinge nearly as long as the shell, margin inflected to form a long posterior lunette; surface wrinkled; large, oval adductor impression in front of the beak surmounted by a small retractor; posterior adductor large, superficial; cartilage external; pallial impression entire; shell thin.



FIG. 915.—*Sanguinolites obliquus*.

acutus, see *Goniophora acuta*.
æolus, see *Sphenotus æolus*.
amygdalinus, see *Glossites amygdalinus*.
arciformis, see *Sphenotus arciformis*.
borealis, Winchell, 1862, Proc. Acad. Nat. Sci., p. 415, Marshall Gr.
brookfieldensis, Dawson, 1883, Rep. on Redpath Museum, p. 11, Subcarboniferous.
burlingtonensis, Worthen, 1884, Bull. No. 2, Ill. St. Mus. Nat. Hist., p. 14, and Geo. Sur. Ill., vol. 8, p. 129, Burlington Gr.

clavulus, see *Sphenotus clavulus*.
combensis, Walcott, 1885, Monogr. U. S. Geo. Sur., vol. 8, p. 175, Devonian.
concentricus, Winchell, 1862, (*Cardinia concentrica*,) Proc. Acad. Nat. Sci., p. 413, Marshall Gr.
cylindricus, Winchell, 1863, Proc. Acad. Nat. Sci., p. 13, Marshall Gr.
flavius, see *Sphenotus flavius*.
glaucus, see *Goniophora glaucus*.
gracilis, Walcott, 1885, Monogr. U. S. Geo. Sur., vol. 8, p. 175, Devonian.
hamiltonensis, see *Goniophora hamiltonensis*.
ida, Hall, 1870, Prelim. Notice Lam. Shells, p. 43, and Pal. N. Y., vol. 5, pl. 65, fig. 20, Ham. Gr.
iowensis, Winchell, 1863, Proc. Acad. Nat. Sci., p. 14, Marshall Gr.
jejunus, Winchell, 1863, Proc. Acad. Nat. Sci., p. 15, Marshall Gr.
marshallensis, Winchell, 1862, Proc. Acad. Nat. Sci., p. 415, Marshall Gr.
missouriensis, Swallow, 1860, (*Solen* (?) *missouriensis*,) Trans. St. Louis Acad. Sci., vol. 1, p. 655, Waverly or Chocteau Gr.
multistriatus, Worthen, 1884, Bull. No. 2, Ill. St. Mus. Nat. Hist., p. 14, and Geo. Sur. Ill., vol. 8, p. 129, Keokuk Gr.
nænia, Walcott, 1885, Monogr. U. S. Geo. Sur., vol. 8, p. 249, Subcarboniferous.
naiaiformis, Winchell, 1870, Proc. Am. Phil. Soc., vol. 12, p. 255, Marshall Gr.
nasutus, Meek, 1871, Am. Jour. Conch., vol. 7, Kinderhook Gr.
obliquus, Meek, 1871, Proc. Acad. Nat. Sci., p. 213, and Ohio Pal., vol. 2, p. 306, Waverly Gr.
perangulatus, see *Goniophora perangulata*.
ponderosus, see *Modiomorpha ponderosa*.
randolphensis, Worthen, 1883, (*Cypriocardia randolphensis*,) Geo. Sur. Ill., vol. 7, p. 326, Kaskaskia Gr.
retusus, Walcott, 1885, Monogr. U. S. Geo. Sur., vol. 8, p. 247, Subcarboniferous.
salteri, Walcott, 1885, Monogr. U. S. Geo. Sur., vol. 8, p. 248, Subcarboniferous.
sanduskiensis, Meek, 1871, Proc. Acad. Nat. Sci., p. 68, and Ohio Pal., vol. 1, p. 209, Up. Held. Gr.
securis, Winchell, 1870, Proc. Am. Phil. Soc., vol. 12, p. 255, Marshall Gr.
simplex, Walcott, 1885, Monogr. U. S. Geo. Sur., vol. 8, p. 248, Subcarboniferous.
solenoides, see *Sphenotus solenoides*.
striatus, Walcott, 1885, Monogr. U. S. Geo. Sur., vol. 8, p. 249, Subcarboniferous.
strigatus, Winchell, 1865, Proc. Acad. Nat. Sci., p. 127, Marshall Gr.
subtortuosus, see *Sphenotus subtortuosus*.
subtruncatus, Hall, 1885, Pal. N. Y., vol. 5, p. 508, Chemung Gr.
sulciferus, see *Cypriocardia sulciferus*.
tethys, Billings, 1874, Pal. Foss., vol. 2, p. 50, Gaspé limestone No. 8, Devonian.
undatus, Hall, 1870, Prelim. Notice Lam. Shells, p. 41, and Pal. N. Y., vol. 5, pl. 80, figs. 5, 6, Chemung Gr.

unioniformis, Winchell, 1862, Proc. Acad. Nat. Sci., p. 414, Marshall Gr.
valvulus, see *Sphenotus valvulus*.
Schizodus, King, 1844, Ann. Mag. Nat. Hist., vol. 14, p. 313. [Ety. *schizo*, I split; *odus*, a tooth.] Shell oval or subtriangular; anterior side rounded, shorter than the other; posterior side tapering, truncate at the extremity, umbonal ridge extending to the postero-basal region; beaks prominent; surface smooth or with concentric striæ; hinge with two smooth cardinal teeth in the right valve and three in the left; middle tooth of the left valve bifid, and fitting between two of the right valve; free margins smooth. Type *S. truncatus*.
æqualis, Hall, 1885, Pal. N. Y., vol. 5, p. 459, Waverly Gr.
amplus, Meek & Worthen, 1870, Proc. Acad. Nat. Sci. Phil., p. 41, and Geo. Sur. Ill., vol. 5, p. 579, Coal Meas.
cayuga, Hall, 1870, Prelim. Notice Lam. Shells, p. 95, syn. for *Cytherodon appressus*.
chesterensis, Meek & Worthen, 1865, Proc. Acad. Nat. Sci. Phil., p. 457, and Geo. Sur. Ill., vol. 2, p. 301, Kaskaskia Gr.
circulus, Worthen, 1884, Bull. No. 2, Ill. St. Mus. Nat. Hist., p. 11, and Geo. Sur. Ill., vol. 8, p. 109, St. Louis Gr.
contractus, Hall, 1885, Pal. N. Y., vol. 5, p. 451, Ham. Gr.
cuneatus, Meek, 1875, Ohio Pal., vol. 2, p. 336, Coal Meas.
curtiformis, Walcott, 1885, Monogr. U. S. Geo. Sur., vol. 8, p. 253, Subcarboniferous.
curtus, Meek & Worthen, 1866, Proc. Chi. Acad. Sci., p. 18, Coal Meas.
degener, Hall, 1885, Pal. N. Y., vol. 5, p. 456, Chemung Gr.
deparcus, Walcott, 1885, Monogr. U. S. Geo. Sur., vol. 8, p. 252, Subcarboniferous.
depressus, Worthen, 1884, Bull. No. 2, Ill. St. Mus. Nat. Hist., p. 11, and Geo. Sur. Ill., vol. 8, p. 109, St. Louis Gr.
ellipticus, see *Cytherodon ellipticus*.
eminens, Hall, 1885, Pal. N. Y., vol. 5, p. 457, Chemung Gr.
gregarius, see *Cytherodon gregarius*.
magnus, Worthen, 1884, Bull. No. 2, Ill. St. Mus. Nat. Hist., p. 9, and Geo. Sur. Ill., vol. 8, p. 107, Kaskaskia Gr.
medinensis, Meek, 1871, Proc. Acad. Nat. Sci. Phil., vol. 23, p. 165, and Ohio Pal., vol. 2, p. 299, Waverly Gr.



FIG. 916.—*Schizodus medinensis*.



FIG. 917.—Hinge of *Schizodus truncatus*.

mooresi, n. sp. Shell very large, sub-rhomboidal, height and length sub-equal; anterior side straight from the beaks and at right angles to the posterior side, and then rounded into the basal line; basal margin regularly rounded; posterior side sloping at right angles to the anterior side from the beaks and abruptly rounding into the basal margin; beaks prominent, rising above the cardinal line, obtuse, and situate a little anterior to the middle of the shell; umbonal slope broadly rounded and undefined; pallial line strongly marked, pitted, and placed near the margin from one muscular scar to the other; anterior and posterior muscular scars subtrigonal and moderately impressed; a wide vascular impression, somewhat cordate, occupies the central area of the shell, extending from the anterior to the posterior muscular scars; one strong tooth in the right valve directed a little forward, with a socket on each side, the other tooth undefined; surface nearly smooth, showing fine concentric lines of growth. Found by Henry Moores, of Columbus, Ohio, at Carbon Hill, Hocking Valley, in the Coal Measures, and now in the collection of Charles Faber.



FIG. 918.—*Schizodus mooresi*. Right valve, posterior part broken off.

nauvoensis, Worthen, 1884, Bull. No. 2, Ill. St. Mus. Nat. Hist., p. 10, and Geo. Sur. Ill., vol. 8, p. 108, Keokuk Gr. orbicularis, Walcott, 1885, Monogr. U. S. Geo. Sur., vol. 8, p. 181, Devonian. ovatus, Meek & Hayden, 1858, (*Axinus ovatus*,) Proc. Acad. Nat. Sci. Phil., p. 262, and Pal. Up. Mo., p. 59, Permian Gr. patulus, Hall, 1885, Pal. N. Y., vol. 5, p. 457, Chemung Gr.

perelegans, Meek & Worthen, 1870, Proc. Acad. Nat. Sci. Phil., p. 42, and Geo. Sur. Ill., vol. 5, p. 581, Coal Meas.

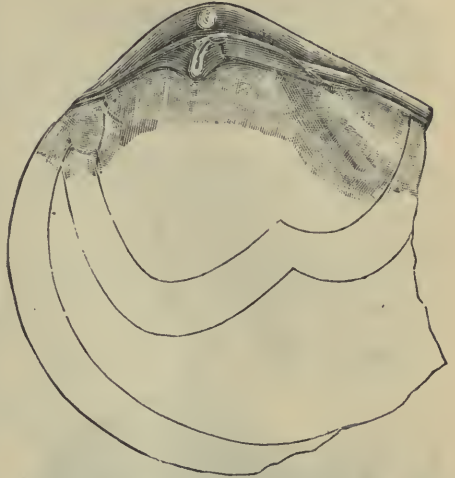


FIG. 919.—*Schizodus mooresi*. Interior of right valve, showing pallial line and place of subcordate muscular impression and hinge-teeth.

pintoensis, Walcott, 1885, Monogr. U. S. Geo. Sur., vol. 8, p. 253, Subcarboniferous. quadrangularis, see *Cytherodon quadrangularis*. randolphensis, Worthen, (in press,) Geo. Sur. Ill., vol. 8, p. 110, Kaskaskia Gr. rossicus, Verneuil, 1845, Geo. Russ., vol. 2, p. 309, Permian Gr. subtrigonalis, Meek, 1871, Proc. Acad. Nat. Sci., p. 166, Waverly Gr. triangularis, Swallow, 1858, Trans. St. Louis Acad. Sci., p. 193, Permian Gr. tumidus, see *Cytherodon tumidus*. ulrichi, Worthen, (in press,) Geo. Sur. Ill., vol. 8, p. 110, Up. Coal Meas. varsoviensis, Worthen, 1884, Bull. No. 2, Ill. St. Mus. Nat. Hist., p. 10, and Geo. Sur. Ill., vol. 8, p. 107, Keokuk Gr. wheeleri, Swallow, 1862, (*Littorina wheeleri*,) Trans. St. Louis Acad. Sci., vol. 1, p. 658, and Pal. E. Neb., p. 209, Coal Meas.

SEDGWICKIA, McCoy, 1844, Snyop. Carb. Foss. Ireland, p. 61. [Ety. proper name.] Nearly equivalve, inequilateral, depressed, oblong, or suboval, very thin; anterior side not quite closed, often gibbous; posterior side longer, more compressed, and gaping; beaks prominent, tumid, incurved; posterior umbonal slopes rounded, or forming an oblique ridge, separated from the postero-dorsal region by a shallow sulcus; lunule distinct; hinge edentulous; cardinal margin inflected so as to form a narrow false area behind the beaks; surface concentrically marked. Type *S. attenuata*.

- altirostrata, Meek & Hayden, 1858, (Altorisma (?) altirostratum,) Proc. Acad. Nat. Sci. Phil., p. 263, and Pal. Up. Mo., p. 41, Coal Meas.
- (?) compressa, Meek, 1872, Proc. Acad. Nat. Sci. Phil., p. 324, and Ohio Pal., vol. 1, p. 144, Hud. Riv. Gr.
- concava, Meek & Hayden, 1858, (Lyonsia concava,) Trans. Alb. Inst., vol. 4, p. 82, and Pal. Up. Mo., p. 41, Coal Meas.
- (?) divaricata, Hall & Whitfield, 1875, Ohio Pal., vol. 2, p. 89, Hud. Riv. Gr.
- (?) fragilis, Meek, 1872, Proc. Acad. Nat. Sci. Phil., p. 323, and Ohio Pal., vol. 1, p. 143, Hud. Riv. Gr.
- (?) lunulata, Whitfield, 1878, Jour. Cin. Soc. Nat. Hist., vol. 1, p. 140, Hud. Riv. Gr.
- neglecta, see Cuneameya neglecta.
- subarcuata, Meek & Worthen, 1865, Proc. Acad. Nat. Sci. Phil., p. 251, and Geo. Sur. Ill., vol. 3, p. 537, Keokuk Gr.

FIG. 920.—*Sedgwickia topekensis*.

- topekensis, Shumard, 1858, (Leptodomus topekaensis,) Trans. St. Louis Acad. Sci., vol. 1, p. 208, and Pal. Up. Mo., p. 40, Coal Meas.
- Solemya*, Lamarck, 1818, Hist. Nat. An. sans Vert., vol. 5. See *Solenomya*—the correct orthography, first used by Menke, 1823, Syn. Meth. Edit.
- SOLEN, Linnæus, 1758, Syst. Nat., 10th ed. [Ety. *Solen*, a tube or pipe.] Shell very long; subcylindrical; ends gaping; hinge teeth two in each valve; ligament external; anterior scar elongated; posterior oblong; pallial line extending beyond the adductors. Type *S. siliqua*. Not a Palæozoic genus.

FIG. 921.—*Solen siliqua*. One-third diam.

- missouriensis*, see *Sanguinolites missouriensis*.
- permianus*, see *Solenopsis permianus*.
- priscus*, Winchell, 1862, Proc. Acad. Nat. Sci., p. 423, Portage Gr.
- quadrangularis*, Winchell, 1862, Proc. Acad. Nat. Sci., p. 422, Marshall Gr.
- scalpriformis*, see *Solenopsis scalpriformis*.
- SOLENOMYA, Lamarck, 1818, (*Solemya*.) Hist. Nat. Anim. sans Vert., vol. 5, p. 488. [Ety. from the resemblance to the two genera *Solen* and *Mya*.] Elongate, ob-

long, equivalve, very inequilateral, posterior end the shorter; dorsal and ventral margins subparallel; ends rounded and gaping; surface covered with a thick, horny periostraca, extending in jagged portions beyond the ventral margin; beaks minute; cartilage forming a thick, triangular mass behind the beaks, supported internally by an oblique ensiform plate; long anterior margin simple, erect, without teeth; posterior adductor small, ovate, within the cartilage pit, anterior impression large, comma-shaped. Type *S. australis*.

- anodontoides, Meek, 1875, Ohio Pal., vol. 2, p. 339, Coal Meas.
- biarmica*, Verneuil, 1845, Geo. Russ. and Ural Mountains, Permian Gr. This species does not occur in this country.
- curta, Walcott, 1885, Monogr. U. S. Geo. Sur., vol. 8, p. 242, Subcarboniferous.
- iowensis, Worthen, 1884, Bull. No. 2, Ill. St. Mus. Nat. Hist., p. 13, and Geo. Sur. Ill., vol. 8, p. 132, St. Louis Gr.
- monroensis, Worthen, 1884, Bull. No. 2, Ill. St. Mus. Nat. Hist., p. 13, and Geo. Sur. Ill., vol. 8, p. 131, St. Louis Gr.
- radiata, Meek & Worthen, 1860, (*Solemya radiata*.) Proc. Acad. Nat. Sci. Phil., p. 457, and Geo. Sur. Ill., vol. 2, p. 349, Coal Meas.
- recurvata, Swallow, 1858, Trans. St. Louis Acad. Sci., vol. 1, p. 208, Up. Coal Meas.
- soleniformis, Cox, 1857, Geo. Sur. Ky., vol. 3, p. 573, Coal Meas.
- varsoviensis, Worthen, 1884, Bull. No. 2, Ill. St. Mus. Nat. Hist., p. 12, and Geo. Sur. Ill., vol. 8, p. 131, Keokuk Gr.
- vetusta, Meek, 1871, Proc. Acad. Nat. Sci. Phil., p. 66, and Ohio Pal., vol. 1, d. 206, Up. Held. Gr.

FIG. 922.—*Solenomya vetusta*.

- SOLENOPSIS, McCoy, 1844, Carb. Foss. Ireland, p. 47. [Ety. *Solenopsis*, resembling a shell of the genus *Solen*.] Elongated; beaks compressed, anterior; depression in front of beaks; surface concentrically marked. Type *S. minor*.
- permianus, Swallow, 1858, (*Solen permianus*.) Trans. St. Louis Acad. Sci., vol. 1, p. 190, Permian Gr.
- scalpriformis, Winchell, 1862, (*Solen scalpriformis*.) Proc. Acad. Nat. Sci., p. 422, Marshall Gr.
- solenoides, Geinitz, 1866, (*Clidophorus solenoides*.) Carb. und Dyas in Neb., p. 25, and Pal. E. Neb., p. 223, Coal Meas.

FIG. 923.—*Solenopsis solenoides*.

SPATHELLA, Hall, 1885, Pal. N. Y., vol. 5, p. 33. [Ety. *spathe*, a spathe; *ellus*, diminutive.] Equivalve, very inequilateral, wider behind, transversely sub-cylindrical; anterior end short, narrowly rounded; beaks subanterior, small; umbonal slope rounded or sub-angular; surface concentrically lined. Type *S. typica*.

typica, Hall, 1885, Pal. N. Y., vol. 5, p. 407, Chemung Gr.

vertrivosa, White & Whitfield, 1862, (*Orthonota ventricosa*.) Proc. Bost. Soc. Nat. Hist., vol. 8, p. 297, and Pal. N. Y., vol. 5, p. 408, Waverly Gr.

SPHENOLIUM, n. gen. [Ety. *sphen*, wedge; *leion*, smooth.] Shell large, equivalve, inequilateral, elongate, cuneiform, ventricose; umbones prominent; beaks incurved at the anterior end; cardinal line at an angle of fifty or sixty degrees from the basal line, and appearing wing-like toward the posterior end; lunule present; no escutcheon; ligament external; muscular scars and hinge-line unknown. Type *S. cuneiforme*.

cuneiforme, S. A. Miller, 1881, (*Orthodesma cuneiforme*.) Jour. Cin. Soc. Nat. Hist., vol. 3, p. 314, Hud. Riv. Gr.

faberi, n. sp. Shell below the medium size for species in this genus; beaks unite over the hinge-line near the anterior end; anterior end, pointed, rounded; hinge-line rising posteriorly into a wing-like expansion; posterior end prolonged at the postero-basal margin; basal margin subelliptical; umbones high and gradually tapering to the postero-basal margin; surface concentrically lined. Collected by Charles Faber in the Hud. Riv. Gr., at Cincinnati, Ohio.

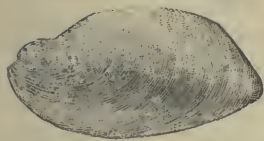


FIG. 924.—*Sphenollum faberi*.
Left valve.

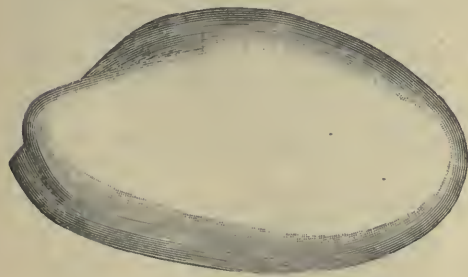


FIG. 925.—*Sphenollum richmondense*.

richmondense, n. sp. Shell large, cuneiform, ventricose, beaks incurved at the anterior end, pointed; umbones high, defined; cardinal line at a high angle,

having a wing-like posterior end; anterior end rounded below the lunule. Distinguished from *S. cuneiforme*, which it much resembles, by its shorter form and more angular umbones. Possibly more specimens may show a gradation

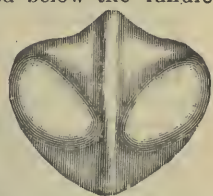


FIG. 926.—*Sphenollum* from one form richmondense. Anterior view.

to the other, and if so, this specific name will fall into synonymy. Collected by Charles Faber in the upper part of the Hud. Riv. Gr., at Richmond, Indiana.

SPHENOTUS, Hall, 1885, Pal. N. Y., vol. 5, p. 33. [Ety. *sphen*, wedge; *ous*, ear.]



FIG. 927.—*Sphenotus æolus*.

Equivalve, very inequilateral, elongate; anterior end short; posterior end obliquely

truncate; cardinal line, long, straight; umbonal ridge extending to the post-inferior extremity; surface concentrically lined; two short teeth beneath the beak of the right valve, and one or two slender lateral teeth; ligament external, contained in a groove; anterior muscular scar strongly marked; posterior scar shallow; pallial line simple. Type *S. arciformis*.

æolus, Hall, 1870, (*Sanguinolites æolus*.) Prelim. Not. Lam. Shells, p. 46, and Pal. N. Y., vol. 5, p. 404, Waverly Gr.

arciformis, Hall, 1870, (*Sanguinolites arceiformis*.) Prelim. Not. Lam. Shells, p. 40, and Pal. N. Y., vol. 5, p. 395, Ham. Gr.

arcuatus, Hall, 1885, Pal. N. Y., vol. 5, p. 400, Chemung Gr.

clavulus, Hall, 1870, (*Sanguinolites clavulus*.) Prelim. Not. Lam. Shells, and Pal. N. Y., vol. 5, p. 401, Chemung Gr.

contractus, Hall, 1843, (*Cypricardia contracta*.) Geo. Sur. 4th Dist. N. Y., p. 292, and Pal. N. Y., vol. 5, p. 399, Chemung Gr.

cuneatus, Conrad, 1838, (*Pterinea cuneata*.) Ann. Rep. Geo. N. Y., p. 116, and Pal. N. Y., vol. 5, p. 396, Ham. Gr.

flavius, Hall, 1870, (*Sanguinolites flavius*.) Prelim. Not. Lam. Shells, p. 47, and Pal. N. Y., vol. 5, p. 403, Waverly Gr.

rigidus, White & Whitfield, 1862, (*Cypricardia rigida*.) Proc. Bost. Soc. Nat. Hist., vol. 8, p. 300, and Pal. N. Y., vol. 5, p. 402, Waverly Gr.

signatus, Hall, 1885, Pal. N. Y., vol. 5, p. 405, Waverly Gr.

solenoides, Hall, 1870, (*Sanguinolites solenoides*.) Prelim. Not. Lam. Shells, p. 38, and Pal. N. Y., vol. 5, p. 398, Ham. Gr.

subtortuosus, Hall, 1870, (*Sanguinolites subtortuosus*), Prelim. Not. Lam. Shells, p. 41, and Pal. N. Y., vol. 5, p. 397, Ham. Gr.
 telamon, Hall, 1885, Pal. N. Y., vol. 5, p. 406, Waverly Gr.
 truncatus, Conrad, 1842, (*Cypricardites truncatus*), Jour. Acad. Nat. Sci., vol. 8, p. 244, Ham. Gr.
 undatus, Hall, 1885, Pal. N. Y., vol. 5, p. 506, Chemung Gr.
 valvulus, Hall, 1870, (*Sanguinolites valvulus*), Prelim. Not. Lam. Shells, p. 46, and Pal. N. Y., vol. 5, p. 403, Waverly Gr.



FIG. 928.—*Spiridomus insignis*.

SPIRIDOMUS, Beecher, 1886, 39th Rep. N. Y. Mus. Nat. Hist. [Ety. *spira*, spire; *demos*, house.] Equivalve, elongate-spiral; beaks terminal; muscular impressions at the two extremities; no hinge-line. Type *S. insignis*.
insignis, Beecher, 1886, 39th Rep. N. Y. Mus. Nat. Hist., Waverly Gr.
STREBLOPTERIA, McCoy, 1851, Ann. Mag. Nat. Hist., 2d series, vol. 7, p. 170, and Brit. Pal. Rocks, p. 482. [Ety. *streblos*, turned the wrong way; *pteron*, a wing.] Pectinoid, ovate, or rounded, obliquely extended toward the anterior side; posterior wing rectangular, anterior ear small, deeply defined; surface smooth or radiately ridged; large, faintly marked muscular impression behind the middle; short, narrow tooth posterior to the beaks; ligament confined to a narrow, simple facet on the hinge margin. Type *S. lævigata*.

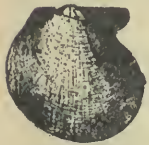


FIG. 929.—*Streblopteria similis*. Right valve.

similis, Walcott, 1885, Monogr. U. S. Geo. Sur., vol. 8, p. 230, Carboniferous.
tenuilineata, Meek & Worthen, 1860, (*Pecten tenuilineatus*), Proc. Acad. Nat. Sci., Phil., p. 452, and Geo. Sur. Ill., vol. 2, p. 334, Coal Meas.

TECHNOPHORUS, n. gen. [Ety. *techné*, art; *phoros*, bearing.] Shell small, equivalent, inequilateral; anterior end short, broadly rounded; two or more furrows arising near the beak extend to the postero-basal margin; beak small, upright; surface concentrically lined; umbonal rib in front of the beak represented in the cast by a transverse sulcus; no external ligament, escutcheon, or lunule. Type *T. faberi*.

faberi, n. sp. Shell small, equivalent, inequilateral, a little longer than high; anterior end short, broadly rounded; base more narrowly rounded in the anterior and central part; the postero-basal part slightly produced; cardinal line straight or nearly so; beak extremely small and standing upright, like a little point projecting beyond the cardinal line; valves convex in the umbonal region; two furrows or cinctures arising near the beak in the umbonal region, which gradually widen, are directed to the postero-basal margin, and above these the postero-dorsal part of the shell is somewhat wing-like; surface marked by very fine concentric lines; the casts show a deep sulcus directly in front of the beak for the reception of an umbonal rib, or support on the interior of the shell. Hud. Riv. Gr., near

Sharonville, Hamilton County, Ohio. Collected by Mr. Charles Faber.



FIG. 930.—*Technophorus faberi*. The right hand figure shows the left valve with a small piece broken from the posterior end; the left hand figure represents a well-preserved cast; the central figure presents a cardinal view.

Tellina, Linnæus, 1758, Syst. Nat., 10th ed. [Ety. *telline*, a sort of mussel.] This genus unknown in the Palæozoic rocks. (?) *ovata*, Hall, 1843, Geo. Rep. 4th Dist. N. Y., Syn. for *Palæoneilo maxima*.
TELLINOMYA, Hall, 1847, Pal. N. Y., vol. 1, p. 151. [Ety. from the resemblance to the genera *Tellina* and *Mya*.] Nearly equilateral, generally transverse, anterior side largest; beaks approximate, not prominent; hinge-line with a double series of bent teeth connected by smaller ones beneath the beak; ligament posterior, external, on a fulcrum; no striated area or cartilage pit; muscular impressions strong not bounded by elevated lines; pallial line simple. Type *T. nasuta*.
abrupta, Billings, 1862, (*Ctenodonta abrupta*), Pal. Foss., vol. 1, p. 46, Black Riv. Gr.
æquilatera, Hall, 1852, Pal. N. Y., vol. 2, p. 330, Coralline limestone.
alta, Hall, 1861, Geo. Rep. Wis., p. 27, and Geo. Sur. Ill., vol. 3, p. 309, Trenton Gr.
anatiniformis, see *Pterotheca anatiniformis*.
angela, Billings, 1865, (*Ctenodonta angela*), Pal. Foss., vol. 1, p. 221, Quebec Gr.

angustata, Hall, 1860, Can. Nat. and Geo., vol. 5, p. 152, Up. Sil.
 astartiformis, Salter, 1859, (Ctenodonta astarteformis,) Can. Org. Rem., Decade 1, p. 39, Black Riv. Gr.
 attenuata, Hall, 1860, Can. Nat. and Geo., vol. 5, p. 151, Up. Silurian.
 cingulata, Ulrich, 1879, Jour. Cin. Soc. Nat. Hist., vol. 2, p. 23, Hud. Riv. Gr.
 contracta, Salter, 1859, (Ctenodonta contracta,) Can. Org. Rem. Decade 1, p. 37, Black Riv. and Trenton Gr.
 curta, Hall, 1852, Pal. N. Y., vol. 2, p. 86, Clinton Gr.
 donaciformis, Hall, 1847, (Nucula ? donaciformis,) Pal. N. Y., vol. 1, p. 316, Trenton Gr.
 dubia, Hall, 1847, Pal. N. Y., vol. 1, p. 153, Black Riv. and Trenton Grs.
 elliptica, Hall, 1852, Pal. N. Y., vol. 2, p. 102, Clinton Gr.
 gibberula, Salter, 1859, (Ctenodonta gibberula,) Can. Org. Rem. Decade 1, p. 38, Black Riv. and Trenton Grs.
 gibbosa, Hall, 1847, Pal. N. Y., vol. 1, p. 153, Black Riv. and Trenton Grs.
 hamburgensis, Walcott, 1885, Monogr. U. S. Geo. Sur., vol. 8, p. 76, Trenton Gr.
 hartsvillensis, Safford, 1859, (Ctenodonta hartsvillensis,) Geo. of Tenn., p. 287, Nashville Gr.
 hilli, S. A. Miller, 1874, Cin. Quar. Jour. Sci., p. 230, Hud. Riv. Gr.
 houghtoni, Stevens, 1858, (Nucula houghtoni,) Am. Jour. Sci. and Arts, 2d ser., vol. 25, p. 262, Marshall or Waverly Gr.
 inflata, Hall, 1861, Geo. Rep. Wis., p. 26, Trenton Gr.
 iphigenia, Billings, 1862, (Ctenodonta iphigenia,) Pal. Foss., vol. 1, p. 152, Hud. Riv. Gr.
 lata, Hall, 1852, Pal. N. Y., vol. 2, p. 85, Clinton Gr.
 levata, Hall, 1847, (Nucula levata,) Pal. N. Y., vol. 1, p. 150, Black Riv., Trenton, and Hud. Riv. Grs.
 logani, Salter, 1851, (Ctenodonta logani,) Rep. Brit. Assoc., p. 36, Hud. Riv. Gr.
 machæriiformis, Hall, 1843, (Nucula machæriiformis,) Geo. Rep. 4th Dist. N. Y., p. 76, and Pal. N. Y., vol. 2, p. 85, Clinton Gr.
 mactriiformis, Hall, 1843, (Nucula mactriiformis,) Geo. Rep. 4th Dist., N. Y., p. 76, Clinton Gr.
 nasuta, Hall, 1847, Pal. N. Y., vol. 1, p. 152, Black Riv. and Trenton Grs.
 nucleiformis, Hall, 1859, Pal. N. Y., vol. 3, p. 263, Low. Held. Gr.
 nuculiformis, Hall, 1847, (Modiolopsis

nuculiformis,) Pal. N. Y., vol. 1, p. 298, Hud. Riv. Gr.
 ovata, Hall, 1861, Geo. Rep. Wis., p. 28, Trenton Gr.
 pectunculoides, Hall, 1871, 24th Rep. N. Y. Mus. Nat. Hist., p. 228, Hud. Riv. Gr.
 protensa, Hall, 1852, Stans. Ex. to Gt. Salt Lake, p. 412, Coal Meas.
 sanguinolarioidea, Hall, 1847, Pal. N. Y., vol. 1, p. 152, Trenton Gr.
 stella, Winchell, 1862, (Nucula stella,) Proc. Acad. Nat. Sci., p. 417, Marshall Gr.
 subnasuta, see Clinopistha subnasuta.
 ventricosa, Hall, 1861, Geo. Rep. Wis., p. 27, and Geo. Sur. Ill., vol. 3, p. 307, Trenton Gr.
 TELLINOPSIS, Hall, 1870, Prelim. Notice Lam. Shells, p. 80. [Ety. resembling a shell of the genus *Tellina*.] General form like *Tellina*; beaks small, subcentral, directed backward; ligament external; surface smooth or obscurely marked; ligament external; muscular impression shallow. Type *T. subemarginata*.
 subemarginata, Conrad, 1842, (Nuculites subemarginatus,) Jour. Acad. Nat. Sci., vol. 8, p. 249, and Pal. N. Y., vol. 5, p. 464, Ham. Gr.

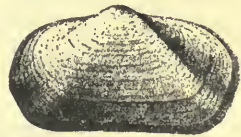


FIG. 933.—*Tellinopsis subemarginata*.

Ungulina, Daudin, 1802, Bosc. Hist. Nat. Coq. 3. [Ety. *ungulina*, like a hoof.]
 suborbicularis, see *Cardiomorpha suborbicularis*.
Unio orthonotus, see *Modiolopsis orthonota*.
primigenius, see *Modiolopsis primigenia*.
 VANUXEMIA, Billings, 1858, Rep. of Progr. Geo. Sur. Can., p. 186. [Ety. proper name.] Ovate; beaks terminal or subterminal; posterior extremity rounded, anterior more or less acuminated; two muscular impressions; anterior teeth variable in number sometimes curved and striated; posterior lateral teeth from two to four. Type *V. inconstans*.

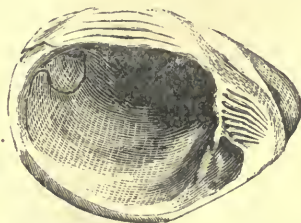


FIG. 934.—*Vanuxemia bayfieldi*. Interior of left valve, showing the striated teeth.

bayfieldi, Billings, 1858, Rep. of Progr. Geo. Sur. Can., p. 187, Hud. Riv. Gr.
dixonensis, Meek & Worthen, 1866, Proc. Chi. Acad. Sci., p. 16, Trenton Gr.



FIG. 932.—*Tellinomyra nasuta*.

- inconstans*, Billings, 1858, Rep. of Progr. Geo. Sur. Can., p. 186, Black Riv. and Trenton Grs.
- montrealensis*, Billings, 1859. Can. Nat. and Geol., vol. 4, p. 444, Chazy Gr.
- tomkinsi*, Billings, 1860, Can. Jour., vol. 6, p. 357, Up. Held. Gr.
- Venus mohegan*, Castelnau, 1843, Syst. Sil., p. 44. Not recognized.
- VERTUMNIA, Hall, 1884, Pal. N. Y., vol. 5, pt. 1, p. xii. Proposed as a subgenus of *Pterinea*, distinguished by having the right valve convex, and the left flat or concave; hinge area narrow. The species referred to it are *Pterinea avis*, *P. reproba*, and *P. reversa*.
- YOLIDA, Muller, 1842. Kroyer's Nat. Tid., vol. 4, p. 91. [Ety. proper name.] Shell ovate or subelliptical, subequilateral, compressed; posterior side narrower than the other; surface smooth, striate, or obliquely sculptured, and covered with a polished epidermis; margins smooth within; inner laminae pearly; hinge plates small, numerous on each side of the beaks; cartilage pit under the beaks; pallial line sinuous. Type *Y. myalis*.
- carbonaria*, Meek, 1871, Rep. Reg. University W. Va., p. 6, and Ohio Pal., vol. 2, p. 336, Coal Meas.
- gibbosa*, McChesney, 1859. The name was preoccupied. See *T. rusbensis*.
- knoxensis*, McChesney, 1865, (*Leda knoxensis*), Expl. Pal. Foss., pl. 2, Coal Meas.
- levistriata*, Meek & Worthen, 1860, (*Leda levistriata*), Proc. Acad. Nat. Sci. Phil., p. 457, and Geo. Sur. Ill., vol. 2, p. 282, St. Louis Gr.
- oweni*, McChesney, 1860, (*Leda oweni*), Desc. New. Pal. Foss., p. 52, Coal Meas.
- polita*, McChesney, 1859. The name was preoccupied, see *Y. knoxensis*.
- rusbensis*, McChesney, 1865, (*Leda rusbensis*), Expl. Pal. Foss., pl. 2, Coal Meas.
- stevensoni*, Meek, 1871, Rep. Reg. University W. Va., p. 6, and Ohio Pal., vol. 2, p. 335, Coal Meas.
- subscitula*, Meek & Hayden, 1858, (*Leda subscitula*), Trans. Alb. Inst., vol. 4, p. 79, and Pal. E. Neb., p. 205, Permian Gr.
- valvulus*, Hall & Whitfield, 1872, 24th Rep. N. Y. Mus. Nat. Hist., p. 190, Up. Held. Gr.

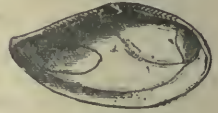


FIG. 935.—*Yoldia myalis*.

SUBKINGDOM ARTICULATA.

THE Articulata are the most numerous of all living animals, and abound alike on land and sea. They are divided into Classes, Subclasses, Orders, and Suborders. Many of them possess intelligence, arising from ganglionic centers, and in the summer season provide their food for winter. Several living orders are unknown in Palæozoic rocks; this may have resulted, however, from want of preservation. The fossils belong to the Classes Annelida, Crustacea, Arachnida, Myriapoda, Insecta.

CLASS ANNELIDA.

The Annelida have the bodies divided into segments, which are generally furnished with jointed appendages. The living forms are distributed in four Orders, but no such division is practicable with the Palæozoic fossils, where generally only the internal jaws, called Conodonts or worm-burrows, are found preserved. The Conodonts may be the internal jaws of Crustacea, as seems to the author most probable; but there is no ground for referring them to fish, as has been done by some authors. The class may be divided as follows:

CONODONTS.—Arabellites, Distacodus, Drepanodus, Eunicites, Glycerites, Lumbriconereites, Nereidavus, Oeonites, Polygnathus, Prioniodus, Staurocephalites.

WORM-BURROWS.—Arenicolites, Gyrichnites, Myrianites, Monocraterion, Nemapodia, Nereites, Palæochorda, Scolithus, Walcottia.

ORDER TUBICOLA.—Conchicolites, Cornulites, Salterella, Serpula, Serpulites, Spirorbis.

ORDER UNCERTAIN.—Protoscolex.

- ARABELLITES, Hinde, 1879, Quar. Jour. Geo. Soc. Lond., vol. 35, p. 377. [Ety. *Arabella*, an existing genus; *lithos*, stone.] Jaws with an extremely prominent anterior hook, and a row of smaller teeth on a wide base, sickle-shaped jaws, and also subquadrate forms, with a straight upper edge of small teeth. Type *A. hamatus*.
- ascialis*, Hinde, 1879, Quar. Jour. Geo. Soc. Lond., vol. 35, p. 378, Hud. Riv. Gr.
- cervicornis*, Hinde, 1879, Quar. Jour. Geo. Soc. Lond., vol. 35, p. 379, Hud. Riv. Gr.
- cornutus*, Hinde, 1879, Quar. Jour. Geo. Soc. Lond., vol. 35, p. 377, Hud. Riv. Gr.
- crenulatus*, Hinde, 1879, Quar. Jour. Geo. Soc. Lond., vol. 35, p. 379, Hud. Riv. Gr.
- cristatus*, see *Eunicites cristatus*.
- cuspidatus*, Hinde, 1879, Quar. Jour. Geo. Soc. Lond., vol. 35, p. 378, Hud. Riv. Gr.
- elegans*, Hinde, 1879, Quar. Jour. Geo. Soc. Lond., vol. 35, p. 382, Clinton Gr.
- gibbosus*, Hinde, 1879, Quar. Jour. Geo. Soc. Lond., vol. 35, p. 378, Hud. Riv. Gr.
- hamatus*, Hinde, 1879, Quar. Jour. Geo. Soc. Lond., vol. 35, p. 377, Hud. Riv. Gr.
- lunatus*, Hinde, 1879, Quar. Jour. Geo. Soc. Lond., vol. 35, p. 378, Hud. Riv. Gr.
- obliquus*, Hinde, 1879, Quar. Jour. Geo. Soc. Lond., vol. 35, p. 379, Hud. Riv. Gr.
- ovalis*, Hinde, 1879, Quar. Jour. Geo. Soc. Lond., vol. 35, p. 378, Hud. Riv. Gr.
- pectinatus*, Hinde, 1879, Quar. Jour. Geo. Soc. Lond., vol. 35, p. 379, Hud. Riv. Gr.
- politus*, Hinde, 1879, Quar. Jour. Geo. Soc. Lond., vol. 35, p. 385, Ham. Gr.
- quadratus*, Hinde, 1879, Quar. Jour. Geo. Soc. Lond., vol. 35, p. 379, Hud. Riv. Gr.
- rectus*, Hinde, 1879, Quar. Jour. Geo. Soc. Lond., vol. 35, p. 378, Hud. Riv. Gr.
- scutellatus*, Hinde, 1879, Quar. Jour. Geo. Soc. Lond., vol. 35, p. 379, Hud. Riv. Gr.
- similis*, Hinde, 1879, Quar. Jour. Geo. Soc. Lond., vol. 35, p. 382, Niagara Gr.
- similis* var. *arcuatus*, Hinde, 1879, Quar. Jour. Geo. Soc. Lond., vol. 35, p. 385, Ham. Gr.
- ARENICOLITES, Salter, 1856, Quar. Jour. Geo. Soc., vol. 13, p. 199. [Ety. *arena*, sand; *colo*, I inhabit; *lithos*, stone.] Circular holes which appear in twos on the surface of sandstones, and have the ap-

- pearance of worm-burrows, like those of the *Arenicola*. Type *A. sparsus* or *A. didyma*.
- sparsus*, Salter, 1856, Quar. Jour. Geo. Soc., vol. 13, p. 203, Clinton Gr.
- spiralis*, Torell, 1868, as identified by Billings, Pal. Foss., vol. 2, p. 77, Up. Taconic. woodi, Whitfield, 1882, Geo. Wis., vol. 4, p. 177, Potsdam Gr.
- Aulacodus obliquus*, see *Lumbriconereites obliquus*.
- CONCHICOLITES, Nicholson, 1872, Am. Jour. Sci. and Arts, 3d ser., vol. 3, p. 202. [Ety. *concha*, shell; *colo*, I dwell; *lithos*, a stone.] Tubes conical, slightly curved, walls thin, composed of imbricating rings. Type *C. gregarius*. Prof. Hall and others regard this genus as a synonym for *Cornulites*.
- corrugatus*, Nicholson, 1873, Lond. Geo. Mag., vol. 10, p. 55, Hud. Riv. Gr.
- flexuosus*, Hall, 1847, (Tentaculites flexuosus,) Pal. N. Y., vol. 1, p. 92, Trenton and Hud. Riv. Grs.



FIG. 936.—*Conchicolites flexuosus*, on *Strophomena alternata*.

- intermedius*, Nicholson, 1874, (*Ortonia intermedia*.) Geo. Mag., n. s., vol. 1, p. 199, Ham. Gr.
- minor*, Nicholson, 1873, (*Ortonia minor*.) Lond. Geo. Mag., vol. 10, p. 56, Hud. Riv. Gr.
- CORNULITES, Schlothheim, 1820, Petrefaktenkunde, p. 378. [Ety. *cornu*, horn; *lithos*, stone.] Tube gradually tapering, conical, slightly flexuous, small end usually curved, and attached to some foreign body; walls thick, cellular, composed of numerous imbricating rings, their widest edge next the slender base; external surface annulated, finely striated longitudinally; inner surface and casts scalariform, with two or three longitudinally impressed furrows. Type *C. serpularius*.

arcuatus, Conrad, 1842, Jour. Acad. Nat. Sci., vol. 8, p. 276, Niagara Gr.



FIG. 937.—Cornulites arcuatus.

bellistriatus, Hall, 1888, Pal. N. Y., vol. 7, p. 20, Low. Held. Gr.

carbonarius, Gurley, 1883, New. Carb. Foss., p. 8, Kinderhook Gr. The publication is not such as required by the rules of nomenclature.

chrysalis, Hall, 1888, Pal. N. Y., vol. 7, p. 20, Low. Held. Gr.

cingulatus, Hall, 1888, Pal. N. Y., vol. 7, p. 20, Low. Held. Gr.

clintoni, Hall, 1879, 28th Rep. N. Y. St. Mus. Nat. Hist., p. 184, Clinton Gr. This name was proposed instead of *C. flexuosus*, which is preoccupied, when *Conchicolites* is regarded as synonymous with *Cornulites*.

contractus, Ringueberg, 1884, Proc. Acad. Nat. Sci., p. 148, Niagara Gr. Syn. for *C. proprius*.

distans, Hall, 1852, (Tentaculites distans,) Pal. N. Y., vol. 2, p. 184, Clinton Gr.

flexuosus, Hall, 1852, Pal. N. Y., vol. 2, p. 98, Clinton Gr.

flexuosus var. gracilis, Hall, 1860, Can. Nat. and Geo., vol. 5, p. 155, Niagara Gr.

nodosus Ringueberg, 1884,

Proc. Acad. Nat. Sci., p. 149, Niagara Gr. proprius, Hall, 1876, 28th Rep. N. Y. St. Mus. Nat. Hist., p. 182, Niagara Gr.

tribulis, Hall, 1888, Pal. N. Y., vol. 7, p. 20, Ham. Gr.

DISTACODUS, Hinde, 1879, Quar. Jour. Geo. Soc. Lond., vol. 35, p. 357. [Ety. *distazo*, to doubt; *odus* tooth.] Small, curved tooth, with a sharp edge on both the outer and inner curve; base expanded. Type *D. incurvus*.

incurvus, Pander, 1856, (Machairodus incurvus,) Monogr. d. foss. Fische. d. Silur. syst., p. 23, Hud. Riv. Gr.

DREPANODUS, Pander, 1856, Monogr. d. foss. Fische. d. Silur. Syst., p. 20. [Ety. *drepans*, sickle; *odus* tooth.] Small, curved, spine-like tooth, nearly circular in section; base expanded. Type *D. arcuatus*.

arcuatus, Pander, 1856, Monogr. d. Foss. Fische. d. Silur. Syst., p. 20, Hud. Riv. Gr.

EOTROPHONIA, Ulrich, 1878, Jour. Cin. Soc. Nat. Hist., vol. 1, p. 91. Not satisfactorily defined.

setigera, Ulrich, 1878, Jour. Cin. Soc. Nat. Hist., vol. 1, p. 91. Not satisfactorily defined, and specimen too poor for definition.

EUNICITES, Ehlers, 1868, Palæontographica, vol. 17, p. 145. [Ety. *Eunice*, a Nereid; *lithos*, stone.] Minute, variously formed, denticulated jaws of annelids or crustaceans. Type *E. avitus*.

alveolatus, Hinde, 1879, Quar. Jour. Geo. Soc. Lond., vol. 35, p. 384, Ham. Gr.

chriomorphus, Hinde, 1879, Quar. Jour. Geo. Soc. Lond., vol. 35, p. 381, Clinton Gr.

clintonensis, Hinde, 1879, Quar. Jour. Geo. Soc. Lond., vol. 35, p. 381, Clinton Gr.

compactus, Hinde, 1879, Quar. Jour. Geo. Soc. Lond., vol. 35, p. 384, Ham. Gr.

contortus, Hinde, 1879, Quar. Jour. Geo. Soc. Lond., vol. 35, p. 375, Hud. Riv. Gr.

coronatus, Hinde, 1879, Quar. Jour. Geo. Soc. Lond., vol. 35, p. 381, Clinton Gr.

cristatus, Hinde, 1879, (Arabellites cristatus), Quar. Jour. Geo. Soc., vol. 35, p. 378, Hud. Riv. Gr.

digitatus, Hinde, 1879, Quar. Jour. Geo. Soc. Lond., vol. 35, p. 376, Hud. Riv. Gr.

gracilis, Hinde, 1879, Quar. Jour. Geo. Soc. Lond., vol. 35, p. 376, Hud. Riv. Gr.

major, see *Oeononites major*.

nannus, Hinde, 1879, Quar. Jour. Geo. Soc. Lond., vol. 35, p. 384, Ham. Gr.

palmatus, Hinde, 1879, Quar. Jour. Geo. Soc. Lond., vol. 35, p. 384, Ham. Gr.

perdentatus, see *Lumbriconereites perdentatus*.

simplex, Hinde, 1879, Quar. Jour. Geo. Soc. Lond., vol. 35, p. 376, Hud. Riv. Gr.

tumidus, Hinde, 1879, Quar. Jour. Geo. Soc. Lond., vol. 35, p. 384, Ham. Gr.

GLYCERITES, Hinde, 1879, Quar. Jour. Geo. Soc. Lond., vol. 35, p. 380. [Ety. genus *Glycera*; *lithos*, stone.] Jaws consisting of a simple curved hook with a wide base, without smaller teeth. Type *G. sulcatus*.

calceolus, Hinde, 1879, Quar. Jour. Geo. Soc. Lond., vol. 35, p. 384, Clinton Gr.

sulcatus, Hinde, 1879, Quar. Jour. Geo. Soc. Lond., vol. 35, p. 380, Hud. Riv. Gr.

sulcatus, var. *excavatus*, Hinde, 1879, Quar. Jour. Geo. Soc. Lond., vol. 35, p. 380, Hud. Riv. Gr.

Gordia marina, see *Palæochorda marina*.

GYRICHNITES, Whiteaves, 1883, Trans. Roy. Soc. Can., p. 109. [Ety. *gyros*, a circle; *ichnos* a track.] Trails supposed to have been made by an annelid. Type *G. gaspensis*.

gaspensis, Whiteaves, 1883, Trans. Roy. Soc. Can., p. 109, Mid. Devonian.

Helminthoidichnites, Fitch, see *Palæochorda marina*, see *Palæochorda marina*.

tenuis, see *Palæochorda tenuis*.

LUMBRICONEREITES, Ehlers, 1868, Palæontographica, vol. 17, p. 159. [Ety. *Lumbriconereis*, a genus; *lithos*, stone.] Distinguished from *Eunicites* by having a well defined basal extension. Type *L. deperditus*.



FIG. 938.—Cornulites distans.

armatus, Hinde, 1879, Quar. Jour. Geo. Soc. Lond., vol. 35, p. 383, Clinton Gr.

basalis, Hinde, 1879, Quar. Jour. Geo. Soc. Lond., vol. 35, p. 383, Clinton Gr.

dactylodus, Hinde, 1879, Quar. Jour. Geo. Soc. Lond., vol. 35, p. 380, Hud. Riv. Gr.

obliquus, Eichwald, 1854, (Sphagodus obliquus), Bull. d. l. Soc. Imp. d. Nat. d. Moscou, p. 110, Hud. Riv. and Clinton Gr.

perdentatus, Hinde, 1879, (Eunicites perdentatus), Quar. Jour. Geo. Soc., vol. 35, p. 375, Clinton Gr.

triangularis, Hinde, 1879, Quar. Jour. Geo. Soc. Lond., vol. 35, p. 383, Clinton Gr.

Machairodus, Pander, 1856. This name was preoccupied. See *Distacodus*.

incurvus, see *Distacodus incurvus*.

MONOCRATERION, Torell, 1860, Acta universitatis lundensis, p. 13. [Ety. *monos*, one; *kraterion*, small basin.] Borings in the rock resembling *Scolithus*, except in having a funnel-shaped enlargement at the upper end.

lesleyi, Prime, 1878, Geo. Sur. Pa. DD. p. 79, Calciferous (?) Gr.

MYRIANITES, Murchison, 1839, Sil. Syst., p. 700. [Ety. *Myrias*, a myriad; *lithos*, stone.] Trails lying together in great numbers, more or less corrugated upon the edges, and resembling delicate wave lines upon the surface of the rock. Type *M. macleaii*.

murchisoni, Emmons, 1844, Taconic syst., p. 44, Up. Taconic.

sillimani, Emmons, 1844, Taconic Syst., p. 44, Up. Taconic.

NEMAPODIA, Emmons, 1844, Taconic Syst., p. 68. [Ety. *nema*, a thread; *pous*, a foot.] Trail consisting of a series of depressions marked by numerous short parallel fine lines; the trail is flexuous, and the short, fine lines have the direction of the trail. Type *N. tenuissima*.

tenuissima, Emmons, 1844, Taconic syst., p. 68, Up. Taconic.

NEREIDAVUS, Grinnell, 1877, Am. Jour. Sci. and Arts, 3d ser., vol. 14, p. 229. [Ety. *Nereis*, genus; *avus*, grandfather.] Minute denticulated teeth or jaws. Type *N. varians*.

solitarius, Hinde, 1879, Quar. Jour. Geo. Soc. Lond., vol. 35, p. 385, Ham. Gr.

varians, Grinnell, 1877, Am. Jour.

Sci. and Arts, 3d ser., vol. 14, p. 229, Hud. Riv. Gr.

NEREITES, Murchison, 1839, Sil. Syst., p. 700. [Ety. from a resemblance to the track of the *Nereis*.] Long, convoluted trails; each side equally crenulated; crenulations oval or pointed on the margin,

and often traceable to the center of the trail. Type *N. cambrensis*.

deweyi, Emmons, 1844, Taconic Syst., p. 69, Up. Taconic.

gracilis, Emmons, 1844, Taconic Syst., p. 69, Up. Taconic.

jacksoni, Emmons, 1844, Taconic Syst., p. 69, Up. Taconic.

lancaelatus, Emmons, 1844, Taconic Syst., p. 69, Up. Taconic. This may belong to *Nereograpsus*, as suggested by Emmons.

loomisi, Emmons, 1844, Taconic Syst., p. 69, Up. Taconic.

pugnus, Emmons, 1844, Taconic Syst., p. 69, Up. Taconic.

robustus, Emmons, 1856, (*Nereograpsus robustus*), Am. Geol., p. 111, Up. Taconic.

OENONITES, Hinde, 1879, Quar. Jour. Geo. Soc. Lond., vol. 35, p. 376. [Ety. *Oenone*, a genus; *lithos*, stone.] Jaws with a more or less curved anterior hook; followed by a series of smaller teeth, similar in character to those of the existing genus *Oenone*. Type *O. curvidens*.

amplus, Hinde, 1879, Quar. Jour. Geo. Soc. Lond., vol. 35, p. 382, Clinton Gr.

carinatus, Hinde, 1879, Quar. Jour. Geo. Soc. Lond., vol. 35, p. 377, Hud. Riv. Gr.

cuneatus, Hinde, 1879, Quar. Jour. Geo. Soc. Lond., vol. 35, p. 377, Hud. Riv. Gr.

curvidens, Hinde, 1879, Quar. Jour. Geo. Soc. Lond., vol. 35, p. 376, Hud. Riv. Gr.

fragilis, Hinde, 1879, Quar. Jour. Geo. Soc. Lond., vol. 35, p. 382, Clinton Gr.

inæqualis, Hinde, 1879, Quar. Jour. Geo. Soc. Lond., vol. 35, p. 376, Hud. Riv. Gr.

infrequens, Hinde, 1879, Quar. Jour. Geo. Soc. Lond., vol. 35, p. 382, Niagara Gr.

major, Hinde, 1879, (*Eunicites major*), Quar. Jour. Geo. Soc., vol. 35, p. 374, Hud. Riv. and Clinton Gr.

rostratus, Hinde, 1879, Quar. Jour. Geo. Soc. Lond., vol. 35, p. 376, Hud. Riv. Gr.

serratus, Hinde, 1879, Quar. Jour. Geo. Soc. Lond., vol. 35, p. 376, Hud. Riv. Gr.

Ortonia, Nicholson, 1872, Lond. Geol. Mag., vol. 9. Synonym for *Conchicolites*, if indeed both are not synonyms for *Cornulites*.

conica, syn. for *Conchicolites flexuosus*.

intermedia, see *Conchicolites intermedius minor*, see *Conchicolites minor*.

PALÆOCHORDA, McCoy, 1848, Quar. Jour. Geol. Soc., vol. 4, p. 224. [Ety. *palaios*, ancient; *chorde*, intestine.] Trail very long, cylindrical, chord-like, frequently

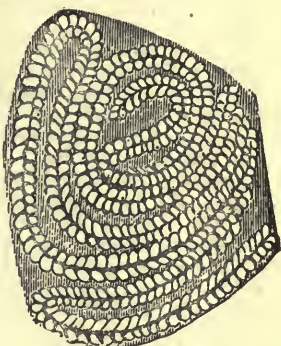


FIG. 940.—*Nereites deweyi*.



FIG. 939 — *Nereidavus varians*. Magnified 8 diam.

- crossing itself, without order, surface smooth. Type *P. minor*.
marina, Emmons, 1844, (*Gordia marina*), p. 68, and *Am. Geol.*, p. 103, *Up. Taconic*.
prima, Whitfield, 1877, *Prelim. Rept. Pal. Black Hills*, p. 7, and *Geol. Black Hills of Dakota*, p. 331, *Potsdam Gr.*
tenuis, Fitch, 1849, (*Helminthoidichnites tenuis*), *Trans. Agr. Soc.*, and *Am. Geol.*, p. 103, *Up. Taconic*.
PLANOLITES, Nicholson, 1873, *Proc. Roy. Soc.*, No. 144. [Ety. *planos*, wanderer; *lithos*, stone.] Irregularly cylindrical, tortuous casts of supposed worm-tubes. Type *P. vulgaris*.
vulgaris, Nicholson, 1873, *Proc. Roy. Soc.*, No. 144, and *Pal. Prov. of Ontario*, p. 42, *Clinton Gr.*
POLYGNATHUS, Hinde, 1879, *Quar. Jour. Geo. Soc. Lond.*, vol. 35, p. 361. [Ety. *polys*, many; *gnathos*, jaw.] Minute variously formed teeth and minute tuberculated plates. Type *P. dubius*.
coronatus, Hinde, 1879, *Quar. Jour. Geo. Soc. Lond.*, vol. 35, p. 365, *Ham. Gr.*
crassus, Hinde, 1879, *Quar. Jour. Geo. Soc. Lond.*, vol. 35, p. 365, *Ham. Gr.*
cristatus, Hinde, 1879, *Quar. Jour. Geo. Soc. Lond.*, vol. 35, p. 366, *Ham. Gr.*
curvatus, Hinde, 1879, *Quar. Jour. Geo. Soc. Lond.*, vol. 35, p. 366, *Ham. Gr.*
dubius, Hinde, 1879, *Quar. Jour. Geo. Soc. Lond.*, vol. 35, p. 362, *Ham. Gr.*
duplicatus, Hinde, 1879, *Quar. Jour. Geo. Soc. Lond.*, vol. 35, p. 364, *Ham. Gr.*
eriensis, Hinde, 1879, *Quar. Jour. Geo. Soc. Lond.*, vol. 35, p. 366, *Ham. Gr.*
immersus, Hinde, 1879, *Quar. Jour. Geo. Soc. Lond.*, vol. 35, p. 364, *Ham. Gr.*
linguiformis, Hinde, 1879, *Quar. Jour. Geo. Soc. Lond.*, vol. 35, p. 367, *Ham. Gr.*
nasutus, Hinde, 1879, *Quar. Jour. Geo. Soc. Lond.*, vol. 35, p. 364, *Ham. Gr.*
palmatus, Hinde, 1879, *Quar. Jour. Geo. Soc. Lond.*, vol. 35, p. 367, *Ham. Gr.*
pennatus, Hinde, 1879, *Quar. Jour. Geo. Soc. Lond.*, vol. 35, p. 366, *Ham. Gr.*
princeps, Hinde, 1879, *Quar. Jour. Geo. Soc. Lond.*, vol. 35, p. 365, *Ham. Gr.*
punctatus, Hinde, 1879, *Quar. Jour. Geo. Soc. Lond.*, vol. 35, p. 367, *Ham. Gr.*
radiatus, Hinde, 1879, *Quar. Jour. Geo. Soc. Lond.*, vol. 35, p. 364, *Ham. Gr.*
serratus, Hinde, 1879, *Quar. Jour. Geo. Soc. Lond.*, vol. 35, p. 365, *Ham. Gr.*
simplex, Hinde, 1879, *Quar. Jour. Geo. Soc. Lond.*, vol. 35, p. 367, *Ham. Gr.*
solidus, Hinde, 1879, *Quar. Jour. Geo. Soc. Lond.*, vol. 35, p. 365, *Ham. Gr.*
truncatus, Hinde, 1879, *Quar. Jour. Geo. Soc. Lond.*, vol. 35, p. 366, *Ham. Gr.*
tuberculatus, Hinde, 1879, *Quar. Jour. Geo. Soc. Lond.*, vol. 35, p. 366, *Ham. Gr.*
PRIONIODUS, Pander, 1856, *Monogr. d. Foss. Fische d. Silur. Syst.*, p. 28. [Ety. *pri-onion*, small saw; *odous*, tooth.] Basal portion narrow supporting numerous, delicate denticles and an elongated tapering tooth which extends below the basal portion. Type *P. elegans*.
abbreviatus, Hinde, 1879, *Quar. Jour. Geo. Soc. Lond.*, vol. 35, p. 359, *Ham. Gr.*
acicularis, Hinde, 1879, *Quar. Jour. Geo. Soc., Lond.*, vol. 35, p. 360, *Ham. Gr.*
alatus, Hinde, 1879, *Quar. Jour. Geo. Soc. Lond.*, vol. 35, p. 361, *Ham. Gr.*
angulatus, Hinde, 1879, *Quar. Jour. Geo. Soc. Lond.*, vol. 35, p. 360, *Waverly Gr.*
armatus, Hinde, 1879, *Quar. Jour. Geo. Soc. Lond.*, vol. 35, p. 360, *Ham. Gr.*
clavatus, Hinde, 1879, *Quar. Jour. Geo. Soc.*, vol. 35, p. 360, *Ham. Gr.*
elegans, Pander, 1856, *Monogr. d. Foss. Fische d. Silur. Syst.*, p. 29, *Hud. Riv. Gr.*
erraticus, Hinde, 1879, *Quar. Jour. Geo. Soc. Lond.*, vol. 35, p. 359, *Ham. Gr.*
furcatus, Hinde, 1879, *Quar. Jour. Geo. Soc. Lond.*, vol. 35, p. 358, *Hud. Riv. Gr.*
panderi, Hinde, 1879, *Quar. Jour. Geo. Soc. Lond.*, vol. 35, p. 361, *Ham. Gr.*
politus, Hinde, 1879, *Quar. Jour. Geo. Soc. Lond.*, vol. 35, p. 358, *Hud. Riv. Gr.*
radicans, Hinde, 1879, *Quar. Jour. Geo. Soc. Lond.*, vol. 35, p. 356, *Hud. Riv. Gr.*
spicatus, Hinde, 1879, *Quar. Jour. Geo. Soc. Lond.*, vol. 35, p. 361, *Ham. Gr.*
PROTOSCOLEX, Ulrich, 1878, *Jour. Cin. Soc. Nat. Hist.*, vol. 1, p. 89. [Ety. *protos*, first; *skolex*, worm.] Long, slender, numerous segments, both ends obtusely pointed. Type *P. covingtonensis*.
covingtonensis, Ulrich, 1878, *Jour. Cin. Soc. Nat. Hist.*, vol. 1, p. 89, *Utica Slate Gr.*
ornatus, Ulrich, 1878, *Jour. Cin. Soc. Nat. Hist.*, vol. 1, p. 90, *Utica Slate Gr.*
simplex, Ulrich, 1878, *Jour. Cin. Soc. Nat. Hist.*, vol. 1, p. 91, *Utica Slate Gr.*
tenuis, Ulrich, 1878, *Jour. Cin. Soc. Nat. Hist.*, vol. 1, p. 90, *Utica Slate Gr.*
SALTERELLA, Billings, 1861, *Pal. Foss.*, vol. 1, p. 17. [Ety. proper name.] Small, slender, elongate, placed one within another, the last one forming the chamber of habitation; surface concentrically or longitudinally striated. Type *S. rugosa*.
billingsi, Safford, 1869, *Geo. of Tenn.*, p. 289, *Trenton Gr.*
obtusata, Billings, 1861, *Pal. Foss.*, vol. 1, p. 18, *Up. Taconic*.
pulchella, Billings, 1861, *Pal. Foss.*, vol. 1, p. 18, *Up. Taconic*.
rugosa, Billings, 1861, *Pal. Foss.*, vol. 1, p. 17, *Up. Taconic*.
SCOLITHUS, Haldeman, 1840, *Supp. to. Monograph of Limniades*. [Ety. *skolex*, worm;



FIG. 941.—Protoscolex ornatus.



FIG. 942.—Salterella rugosa.

lithos, stone.] Merely worm furrows, without organic characters.
canadensis, Billings, 1862, Pal. Foss. vol. 1, p. 96, Potsdam Gr.

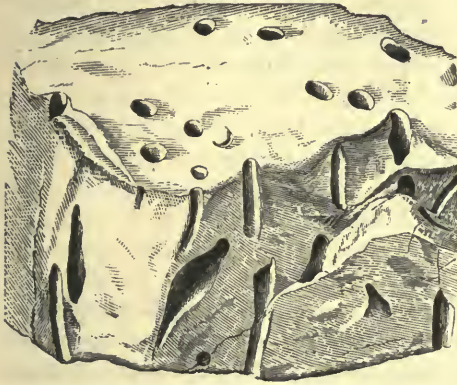


FIG. 943.—*Scolithus canadensis*.

linearis, Hall, 1847, Pal. N. Y., vol. 1, p. 2, Potsdam Gr.
verticalis, Hall, 1852, Pal. N. Y., vol. 2, p. 6, Medina sandstone.
tuberosus, Miller & Dyer, 1878, Cont. to Pal. No. 2, p. 5, Hud. Riv. Gr.
woodi, Whitfield, 1880, Ann. Rep. Geo. Sur. Wis., p. 45, Potsdam Gr.
Serpula, Linnæus, 1758, Syst. Nat., 10th ed. p. 786. [Ety. *serpo*, to creep.] Tube calcareous, procumbent, variously curved or spirally coiled, growing singly or in groups, attached to marine bodies, capable of receiving the entire animal; aperture at the larger extremity simple and rounded. Type *S. vermicularis*.
insita, White, 1878, Proc. Acad. Nat. Sci., p. 37, and Cont. to Pal., No. 8, p. 171, Coal Meas.

omphalodes, see *Spirorbis omphalodes*.

valvata, see *Spirorbis valvata*.

SERPULITES, Murchison, 1839, Murch. Sil. Syst., p. 608. [Ety. *Serpula*, a genus of annelids.] Tube smooth, arched, slightly calcareous, glossy; having two small longitudinal tubes at opposite points of the circumference, stronger than the rest of the shell, and prolonged at the posterior end. Type *S. longissimus*.



FIG. 944.—*Serpulites annulatus*.

annulatus, Dawson, 1868, Acad. Geol., p. 312, Carboniferous.
dissolutus, Billings, 1862, Pal. Foss., vol. 1, p. 56, Trenton Gr.
hortonensis, Dawson, 1868, Acad. Geol., p. 312, Carboniferous.
inelegans, Dawson, 1868, Acad. Geol., p. 312, Carboniferous.
murchisoni, Hall, 1861, Geo. Rep. Wis., p. 43, Potsdam Gr.
murrayi, Dawson, 1883, Rep. on Redpath Mus., No. 2, p. 13, Carboniferous.

splendens, Billings, 1859, Can. Nat. and Geo., vol. 4, p. 470, Chazy Gr.
Sphagodus obliquus, see *Lumbriconereites obliquus*.

SPIRORBIS, Lamarek, 1801, Syst. An. sans Vert., p. 326. [Sig. spiral-whorl.] Tube calcareous, solitary, coiled; flat, dextral (or sinistral, attached by one side to some foreign object. Type *Serpula spirorbis* of Linnaeus.

ammon, Winchell, 1866, Rep. Low. Peninsula Mich., p. 97, Ham. Gr.

angulatus, Hall, 1862, 15th Rep. N. Y. St. Mus. Nat. Hist., p. 84, Ham. Gr.

angulatus, Dawson, 1868. The name was preoccupied.

annulatus, Hall, 1858, Trans. Alb. Inst., vol. 4, p. 34, and Bull. Am. Mus. Nat. Hist., p. 92, Warsaw Gr.

annulatus var. *nodulosus*, see *S. nodulosus*.

anthracosia, Whitfield, 1881, Am. Jour. Sci. and Arts, 3d ser. vol. 21, p. 128, Coal Meas.

arietinus, Dawson, 1869, Rep. of Progr. Geo. Sur. Can., p. 14, Coal Meas.

arkonensis, Nicholson, 1874, Geo. Mag., vol. 1, p. 199, Ham. Gr.

carbonarius, Dawson, 1845, Quar. Jour. Geo. Soc., vol. 1, p. 326, Coal Meas.

cincinnatiensis, Miller & Dyer, 1878, Jour. Cin. Soc. Nat. Hist., vol. 1,

p. 38, Hud. Riv. Gr.

flexuosus, Hall, 1863, Trans. Alb. Inst., vol. 4,

p. 224, Niagara Gr.

inornatus, Hall, 1863, Trans. Alb. Inst., vol. 4,

p. 224, Niagara Gr.

kinderhookensis, Gurley, 1883, New Carb. Foss., p. 9. Publication not sufficient.

laxus, Hall, 1859, Pal. N. Y., vol. 3, p. 349, Low. Held. Gr.

nodulosus, Hall, 1858, Trans. Alb. Inst., vol. 4,

p. 34, and Bull. Am. Mus. Nat. Hist., p. 93, Warsaw Gr.

obesus, Winchell, 1866, Rep. Low. Peninsula Mich., p. 97, Ham. Gr.

omphalodes, Goldfuss, 1826, Germ. Petref., Up. Held. and Ham. Grs.

orbiculostoma, Swallow, 1858, Trans. St. Louis Acad. Sci., p. 181, Permian Gr.

spinuliferus, Nicholson, 1875, Pal. Proy. Ont., p. 83, Ham. Gr.

valvatus, Goldfuss, 1826, (*Serpula valvata*). Not American.



FIG. 945.—*Spirorbis carbonarius*.

STAUROCEPHALITES, Hinde, 1879, Quar. Jour. Geo. Soc. Lond., vol. 35, p. 383. [Ety. *Staurocephalus*, an existing genus; *lithos*, stone.] Jaws of more or less elongated compressed denticulate plates resembling those of the genus *Staurocephalus*. Type *S. niagarensis*.

niagarensis, Hinde, 1879, Quar. Jour. Geo. Soc. Lond., vol. 35, p. 383, Niagara Gr.

FIG. 946.—*Walcottia rugosa*.

WALCOTTIA, Miller & Dyer, 1878, Jour. Cin. Soc. Nat. Hist., vol. 1, p. 39. [Ety. proper name.] A rugose, flexuous, worm-like furrow. Type *W. rugosa*.
 cookana, Miller & Dyer, 1878, Cont. to Pal., No. 2, p. 11, Hud. Riv. Gr.
rugosa, Miller & Dyer, 1878, Jour. Cin. Soc. Nat. Hist., vol. 1, p. 39, Hud. Riv. Gr.

CLASS CRUSTACEA.

THERE is such an immense diversity among Crustaceous animals, it has been found necessary to make subclasses, orders, and suborders, to give intelligible definitions to the classification. They are generally covered with a peculiar calcareous secretion or integument, constituting a cutaneous skeleton, inclosing the soft parts of the body. Segments are united by a membrane, giving flexibility to the armor. There being no way to increase the integument by growth, it is cast off at stated periods, and a new one is secreted to cover the enlarged body. The subclasses are Cirripedia, Entomostraca, Xyphosura, Edriophthalmata, and Podophthalmata.

The Subclass Cirripedia includes only a single order which bears the same name. The animals, when mature, are attached to submarine objects, and are inclosed in a shell composed of several calcareous plates, from an opening in which articulated cirri are exerted and retracted when the animal is alive in search of prey. The common barnacle, which frequently covers the bottoms of ships so as to impede their progress across the ocean, is a representative of this order.

The Subclass Entomostraca is divided into several orders, only three of which are Palæozoic, viz.: Ostracoda, Phyllopoda, and Trilobita. The Ostracoda are minute animals inclosed in a little bivalve shell; the feet and antennæ are protruded between the lower edges of the valves. The Cypris, Daphnia, and Polyphemus are living examples of this order. The Phyllopoda are so named on account of the broad and leaf-like feet. Some of them are covered with a bivalve shell, and others are without such protection. The Palæozoic are bivalve shells. The Estheria, which abound in pools and springs, belong to this order. The Trilobita possessed a cephalic shield, a trilobed thorax composed of segments, which were flexible and allowed the animal to double itself up, and a tail-piece called the pygidium. The order became extinct in the Palæozoic era.

The Subclass Xyphosura has an anterior subrescentiform carapace, inclosing the cephalothoracic organs, and a posterior abdominal piece, from which a tail spine projects. The upper surface is convex, and the lower concave. There are three orders—Amphipeltida, Euripterida, and Xyphosura. Only a fragment of the shell of the Amphipeltida is known. The Euripterida is also an extinct order. A common form of the Xyphosura is the *Limulus*, or Horseshoe Crab, which is common on the shores of the tropical seas.

The Subclass Edriophthalmata has the head distinct from the thoracic segments, and therefore has no cephalothorax. The head has a pair of simple compound eyes, not pedunculated. The Palæozoic orders are Amphipoda and Anisopoda.

The Order Amphipoda consists of animals that live in water, burrow in sand, or become parasitic on fishes. The abdomen is well developed, and bears limbs for leaping or swimming. They always swim on their sides. The common sand-hopper on the shore of the sea belongs to this order. The Order Anisopoda has a long body, convex above and flattened below, and has affinities with the Isopoda, of which the common wood-louse is an example.

The Subclass Podopthalmata has compound eyes at the extremity of a pair of movable stalks; the head and thorax are generally united, covered by a single piece of shell, and called the cephalothorax; this includes the antennæ, eyes, mouth, jaws, feet, etc. The remaining segments form an abdomen, which frequently terminates in a caudal fin. Common examples are the squill and the small edible crab. There are several orders in this subclass, only three of which are Palæozoic, viz.: Phyllocarida, Decapoda, Tetradeapoda.

The Phyllocarida has cephalic, thoracic, and abdominal segments. The carapace has no regular hinge. The living representative is *Nebalia*, which inhabits the sea at moderate depths. The Decapoda are stalk-eyed, and the head and thoracic segments are united in a cephalothorax, incased in a common shell, and have the branchial organs inclosed on the sides of the cephalothorax. The true thoracic legs are almost always ten, whence the name of the order. The Tetradeapoda have their relations with the Decapoda.

SUBCLASS AND ORDER CIRRIPIEDIA.

FAMILY BALANIDÆ.—Palæocrusia, Protobalanus.

FAMILY LEPADIDÆ.—Lepidocoleus, Strobilepis, Turrilepas.

SUBCLASS ENTOMOSTRACA.

ORDER OSTRACODA.

FAMILY BEYRICHIDÆ.—Beyrichia, Beyrichona, Hipponicharion, Primitia.

FAMILY CYPRIDÆ.—Candona.

FAMILY CYTHERIDÆ.—Cytherella, Cytheropsis.

FAMILY FABERIDÆ.—Faberia.

FAMILY LEPERDITIDÆ.—Aparchites, Isochilina, Leperditia.

ORDER PHYLLOPODA.

FAMILY ESTHERIDÆ.—Estheria, Leaia, Schizodiscus.

FAMILY UNCERTAIN.—Lepidilla, Lepiditta.

ORDER TRILOBITA.

FAMILY ACIDASPIDÆ.—Acidaspis.

FAMILY AGLASPIDÆ.—Aglaspis.

FAMILY AGNOSTIDÆ.—Agnostus, Microdiscus, Shumardia.

FAMILY ASAPHIDÆ.—Asaphus, Barrandia, Megalaspis, Nileus, Ogygia, Symphysurus.

FAMILY BATHYURIDÆ.—Asaphiscus, Bathyurellus, Bathyuriscus, Bathyurus.

FAMILY BRONTEIDÆ.—Bronteus.

FAMILY CALYMENIDÆ.—Calymene, Homalonotus.

- FAMILY CERAURIDÆ.—Ceraurus, Sphærocoryphe, Sphærexochus.
 FAMILY CONOCORYPHIDÆ.—Bailiella, Chariocephalus, Conocoryphe, Harttia, Menocephalus, Prototypus.
 FAMILY CYPHASPIDÆ.—Cyphaspis.
 FAMILY DICELLOCEPHALIDÆ.—Dicellocephalus, Pterocephalia, Ptychaspis.
 FAMILY ENCRINURIDÆ.—Amphion, Encrinurus.
 FAMILY ELLIPSOCEPHALIDÆ.—Ellipsocephalus.
 FAMILY HARPIDÆ.—Harpes.
 FAMILY ILLÆNIDÆ.—Illænurus, Illænus.
 FAMILY LICHIDÆ.—Lichas, Terataspis.
 FAMILY OLENIDÆ.—Dolichometopus, Oryctocephalus, Telephus, Triarthrella, Triarthrus.
 FAMILY PARADOXIDÆ.—Anoplenus, Atops, Bathynotus, Elliptocephala, Mesonacis, Olenoides, Paradoxides.
 FAMILY PHACOPIDÆ.—Dalmanites, Phacops.
 FAMILY PROETIDÆ.—Harpides, Phæthonides, Phillipsia, Proetus.
 FAMILY PTYCHOPARIDÆ.—Agraulus, Crepicephalus, Liostracus, Longocephalus, Loganellus, Ptychoparia, Solenopleura.
 FAMILY REMOPLEURIDÆ.—Remopleurides.
 FAMILY TRINUCLEIDÆ.—Ampyx, Dionide, Endymionia, Trinucleus.
 FAMILY AFFINITY UNCERTAIN.—Pemphigaspis.
 TRACKS SUPPOSED TO BE CRUSTACEAN.—Asaphoidichnus, Climachtichnites, Diplichnites, Protichnites, Rusichnites.

SUBCLASS XIPHOSURA.

ORDER AMPHIPELTIDA.

- FAMILY AMPHIPELTIDÆ.—Amphipeltis.

ORDER EURYPTERIDA.

- FAMILY ECHINOGNATHIDÆ.—Echinognathus.
 FAMILY EURYPTERIDÆ.—Anthraconectes, Dolichopterus, Eurypterella, Eurypterus, Pterygotus, Stylonurus.
 FAMILY HEMIASPIDÆ.—Bunodella.

ORDER XIPHOSURA

- FAMILY BELINURIDÆ.—Belinurus, Euproops, Protolimulus.
 FAMILY CYCLIDÆ.—Cyclus, Dipeltis.

SUBCLASS EDRIOPTHALMATA.

ORDER AMPHIPODA.

- FAMILY DIPLOSTYLIDÆ.—Diplostylus.

ORDER ANISOPODA.

- FAMILY ACANTHOTELSONIDÆ.—Acanthotelson.

SUBCLASS PODOPTHALMATA.

ORDER PHYLLOCARIDA.

FAMILY CERATIOCARIDÆ.—Ceratiocaris, Colpocaris, Echinocaris, Elymocariss, Ribeiria (?), Solenocaris, Tropicocaris.

FAMILY DISCINOCARIDÆ.—Dipterocaris, Spathiocaris.

FAMILY PINACARIDÆ.—Dithyrocaris, Mesothyra.

FAMILY PROTOCARIDÆ.—Protocaris.

FAMILY RACHURIDÆ.—Rachura.

FAMILY RHINOCARIDÆ.—Rhinocaris.

ORDER DECAPODA.

FAMILY ANTHRACARIDÆ.—Anthrapalæmon.

FAMILY CARIDIDÆ.—Palæopalæmon.

FAMILY PALÆOCARIDÆ.—Gampsonyx, Palæocaris.

ORDER TETRADECAPODA.

FAMILY ARCHÆOCARIDÆ.—Archæocaris.

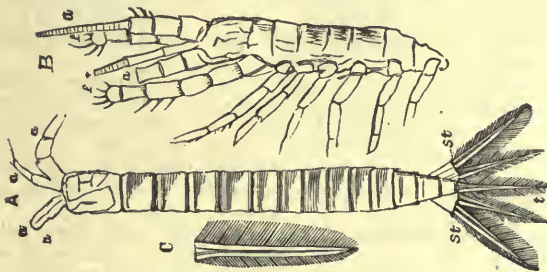


FIG. 947.—*Acanthotelson eveni*. A, dorsal view; *st*, stylet; *t*, telson; B, side view; α and z , antennæ; *f*, anterior leg; C, enlarged stylet.

A CANTHOTELSON, Meek & Worthen, 1860, Proc. Acad. Nat. Sci., p. 47. [Ety. *akantha*, spine; *telson*, end.] Superior antennæ as long as the inferior, flagella longer than the peduncles; head about the length of the two anterior



thoracic segments; thoracic and abdominal segments about the same length; anterior thoracic legs longer than the others; telson simple, long, spine-like, laterally compressed; stylets with second segments longer than first, and similar to the telson. Type A. *stimpsoni*. eveni, Meek & Worthen, 1868, Am. Jour. Sci., vol.

FIG. 949.—*Acanthotelson stimpsoni*. Dorsal view.

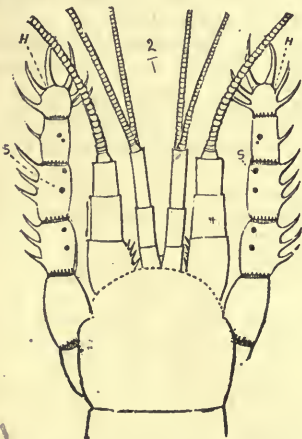


FIG. 948.—*Acanthotelson eveni*. Enlarged; H, anterior legs and antennæ; S, punctures left by spines on the lower side.

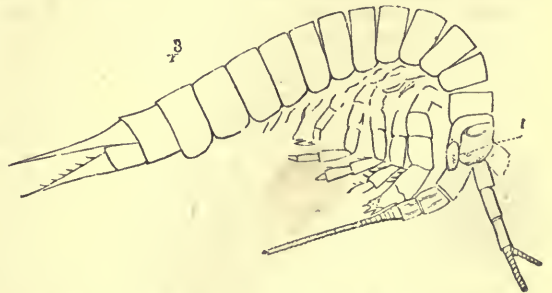


FIG. 950.—*Acanthotelson stimpsoni*. Enlarged 3 diam.; *t*, a protuberance that may be an eye.

Acantholoma, syn. for *Acidaspis*.
spinosa, syn. for *Acidaspis tuberculata*.

46, p. 28, and Geo. Sur. Ill., vol. 3, p. 551, Coal Meas.

inæqualis, Meek & Worthen, syn. for *Palæocaris typus*.

stimpsoni, Meek & Worthen, 1865, Proc. Acad. Nat. Sci., p. 47, and Geo. Sur. Ill., vol. 2, p. 401, Low. Coal Meas.

ACIDASPIS, Murchison, 1839, Sil. Syst., p. 658. [Ety. *akis*, a point; *aspis*, shield.] Cephalic shield, semicircular, margin thickened and spinous, lateral angles produced in spines; glabella convex, narrow in front, not reaching the margin, two lobes on each side, and having a large spine projecting backward, eyes prominent; thorax with eight segments; pleuræ wide, and terminating in spines; pygidium small, axis short, of two joints, sides depressed, one segmental furrow, long spine extending backward from the margin at each side, and smaller spines from the other parts of the margin. Type *A. brightii*.



FIG. 951.—*Acidaspis anchoralis*. Cephalic shield.

Jour. Sci., vol. 34, p. 379. Not defined so as to be recognized.

cincinnatiensis, Meek, 1873, Ohio Pal., vol. 1, p. 167, Hud. Riv. Gr.

crostotus, Locke, 1843, Am. Jour. Sci., vol. 44, p. 347, and Ohio Pal., vol. 1, p. 165, Hud. Riv. Gr. The word is misspelled; it should be



FIG. 952.—*Acidaspis anchoralis*. Pygidium.

crossota.

danai, Hall, 1862, Geo. Sur. Wis., p. 423, Niagara Gr.

eripis, see *Terataspis eripis*.

fimbriata, Hall, 1879, Desc. New Spec. Foss., p. 20, and 11th Rep. Geo. and Nat. Hist. Ind., p. 334, Niagara Gr.

grandis, see *Terataspis grandis*.

halli, Shumard, 1855, Geo. Sur. Mo., p. 200, Trenton Gr.

hamata, Conrad, 1841, (Diceranurus hamatus.) Ann. Rep. N. Y., p. 48, and Pal. N. Y., vol. 3, p. 371, Low. Held. Gr.

horani, Billings, 1859, Rep. of Progr. Geo. Sur. Can., p. 341, Trenton Gr.

ida, syn. for *Acidaspis danai*.

onealli, S. A. Miller, 1875, Cin. Quar. Jour. Sci., vol. 2, p. 86, Hud. Riv. Gr.

parvula, Walcott, 1877, 31st Rep. N. Y. St. Mus. Nat. Hist., p. 69, Trenton Gr.

romingeri, Hall, 1888, Pal. N. Y., vol. 7, p. 71, Ham. Gr.

spiniger, see *Bathyurus spiniger*.

trentonensis, Hall, 1847, Pal. N. Y., vol. 1, p. 240, Trenton Gr.



FIG. 953.—*Acidaspis onealli*.

tuberculata, Conrad, 1840, Ann. Rep. N. Y., p. 205, and Pal. N. Y., vol. 3, p. 368, Low. Held. Gr.

AGLASPIS, Hall, 1862, Can. Nat. and Geo., vol. 7, p. 443, and 16th Rep. N. Y. St. Mus. Nat. Hist., p. 181. [Ety. *aglaos*, bright; *aspis*, shield.] Cephalic shield somewhat semielliptical, wider than long, sinus in front; glabella narrow, conical; eyes prominent, and situate anterior to the middle; thorax having eight segments; pygidium small, and terminating in a single spine. Type *A. barrandii*.

barrandii, Hall, 1862, Can. Nat. and Geo., vol. 7, p. 443, and 16th Rep. N. Y. St. Mus. Nat. Hist., p. 181, Potsdam Gr.

eatoni, Whitfield, 1880, Ann. Rep. Geo. Sur. Wis., p. 52, and Geo. of Wis., vol. 4, p. 192, Potsdam Gr.

AGNOSTUS, Brongniart, 1822, Hist. Nat. Crust. Foss., p. 38. [Ety. *agnostos*, obscure.] Body elongate, elliptical; cephalic shield and pygidium subequal, subrotund, or longer than wide, convex rim on the border; glabella convex; no eyes; no facial sutures; two thoracic segments. Type *A. pisiformis*.

acidicus, Hartt, 1868, Acad. Geol., p. 655, St. John Gr.

acidicus var. *declivis*, Matthew, 1885, Trans. Roy. Soc. Can., p. 70, St. John Gr.

acutilobus, Matthew, 1885, Trans. Roy. Soc. Can., p. 73, St. John Gr.

americanus, Billings, 1860, Can. Nat. and Geol., vol. 5, p. 301, and Pal. Foss., p. 395, Up. Taconic.

bidenis, Meek, 1873, 6th Rep. Hayden's Geo. Sur. Terr., p. 463, and Monog. U. S. Geo. Sur., vol. 8, p. 26, Prospect Mountain Gr., Up. Taconic.

canadensis, Billings, 1860, Can. Nat. and Geol., vol. 5, p. 301, and Pal. Foss., vol. 1, p. 397, Up. Taconic.

coloradoensis, Shumard, 1861, Am. Jour. Sci. and Arts, 2d ser., vol. 32, p. 218, Up. Taconic.

communis, Hall & Whitfield, 1877, U. S. Geo. Expl. 40th parallel, vol. 4, p. 288, Prospect Mountain Gr., Up. Taconic.

? *disparilis*, Hall, 1863, 16th Rep. N. Y. St. Mus. Nat. Hist., p. 179, Potsdam Gr.

fabius, Billings, 1865, Pal. Foss., vol. 1, p. 298, Up. Taconic.

galba, Billings, 1865, Pal. Foss., vol. 1, p. 297, Up. Taconic.

interstrictus, White, 1874, Rep. Invert. Foss., p. 7, and Geo. Sur. W. 100th Mer., vol. 4, p. 38, Up. Taconic.

? *josepha*, Hall, 1863, 16th Rep. N. Y. St. Mus. Nat. Hist., p. 178, Potsdam Gr.

latus, see *Beyrichia lata*.

lobatus, see *Microdiscus lobatus*.

maladensis, Meek, 1873, Hayden's Sur. Terr., p. 464. Not properly defined.

neon, Hall & Whitfield, 1877, U. S. Geo. Expl., 4th parallel, vol. 4, p. 229, Prospect Mountain Gr., Up. Taconic.

nobilis, Ford, 1872, Am. Jour. Sci., 3d ser., vol. 3, p. 421, Up. Taconic.
 obtusilobus, Matthew, 1885, Trans. Roy. Soc. Can., p. 72, St. John Gr.
 orion, Billings, 1860, Can. Nat. and Geo., vol. 5, p. 301, and Pal. Foss., vol. 1, p. 397, Up. Taconic.
 ? parilis, Hall, 1863, 16th Rep. N. Y. St. Mus. Nat. Hist., p. 179, Potsdam Gr.
 partitus, Matthew, 1885, Trans. Roy. Soc. Can., p. 68, St. John Gr.
 prolongus, Hall & Whitfield, 1877, U. S. Geo. Expl. 40th parallel, p. 230, Prospect Mountain Gr., Up. Taconic.
 regulus, Matthew, 1885, Trans. Roy. Soc. Can., p. 67, St. John Gr.



FIG. 954.
 Agnostus rex.

rex, Barrande. Probably not an American species, but illustrative of the genus.
 richmondensis, Walcott, 1884, Monogr. U. S. Geo. Sur., vol. 8, p. 24, Prospect Mountain Gr., Up. Taconic.
 seclusus, Walcott, 1884, Monogr. U. S. Geo. Sur., vol. 8, p. 25, Prospect Mountain Gr., Up. Taconic.
 similis, Hartt, 1868, Acad. Geol., p. 656, St. John Gr.
 tessella, Matthew, 1885, Trans. Roy. Soc. Can., p. 71, St. John Gr.
 tumidosus, Hall & Whitfield, 1877, U. S. Geo. Expl. 40th parallel, vol. 4, p. 231, Up. Taconic.
 umbo, Matthew, 1885, Trans. Roy. Soc. Can., p. 71, St. John Gr.
 vir, Matthew, 1885, Trans. Roy. Soc. Can., p. 69, St. John Gr.
 vir var. concinnus, Matthew, 1885, Trans. Roy. Soc. Can., p. 70, St. John Gr.

AGRAULUS, Hawle & Corda, 1847, Prodr. einer Monographie der bomischen Trilobiten, p. 142. [Ety. *agraulos*, dwelling in the fields.] Body elongate-ovate; cephalic shield large, semicircular to lunate, with a wide margin, that merges in the cheeks; glabella convex, narrowed and rounded in front, conoidal, three or four lateral furrows on each side, margined in front, neck furrow distinct; eyes small, distant from glabella or submarginal; facial sutures, beginning near the lateral posterior angles, are directed forward, curving over the eyes to the anterior margin, nearly in parallel lines; cheeks small, narrow; sixteen thoracic segments, axial lobe convex; pygidium small, rounded, three segments; hypostoma oval, truncated anteriorly. Type *A. ceticcephalus*.
 affinis, Billings, 1874, Pal. Foss., vol. 2, p. 72, Up. Taconic.
 articephalus, Matthew, 1885, Trans. Roy. Soc. Can., p. 75, St. John Gr.
 bipunctatus, Shumard, 1863, (Arionellus bipunctatus,) Trans. St. Louis Acad. Sci., vol. 2, p. 101, Potsdam Gr. Poorly defined; probably belongs to another genus.

convexus, Whitfield, 1877, (Arionellus convexus,) Geo. Sur. Wis., vol. 4, p. 190, Potsdam Gr. Founded upon a fragment, and may belong to another genus.
 cylindricus, Billings, 1860, (Arionellus cylindricus, Can. Nat. and Geo., vol. 5, p. 301, and Pal. Foss., vol. 1, p. 406, Up. Taconic or St. John Gr.
 globosus, Walcott, 1885, Monogr. U. S. Geo. Sur., vol. 8, p. 61, Up. Taconic.



FIG. 955.
 Agraulus cylindricus.

hallanus, Matthew, 1887, Trans. Roy. Soc. Can., p. 132, St. John Gr.
 planus, Shumard, 1861, (Arionellus planus,) Am. Jour. Sci. and Arts, 2d series, vol. 32, p. 219, Potsdam Gr.
 pustulatus, Walcott, 1879, (Arionellus pustulatus,) 31st Rep. N. Y. St. Mus. Nat. Hist., p. 68, Chazy Gr.
 quadrangularis, Whitfield, 1884, (Arionellus quadrangularis,) Bull. Am. Mus. Nat. Hist., vol. 1, p. 139, Up. Taconic.
 socialis, Billings, 1874, Pal. Foss., vol. 2, p. 71, Up. Taconic or St. John Gr.
 strenuus, Billings, 1874, Pal. Foss., vol. 2, p. 71, Up. Taconic or St. John Gr.
 subclavatus, Billings, 1860, (Arionellus subclavatus,) Can. Nat. and Geo., vol. 5, p. 301, and Pal. Foss., vol. 1, p. 406, Up. Taconic or Quebec Gr.
 texanus, Shumard, 1861, (Arionellus texanus,) Am. Jour. Sci. and Arts, 2d ser., vol. 32, p. 218, Potsdam Gr. or Up. Taconic.
 tripunctatus, Whitfield, 1876, Rep. Recon. Up. Mo. to Yel. Nat. Park, p. 141, Potsdam Gr. or Up. Taconic.
 whitfieldaus, Matthew, 1887, Trans. Roy. Soc. Can., p. 130, St. John Gr.
 whitfieldanus var. compressus, Matthew 1887, Trans. Roy. Soc. Can., p. 130, St. John Gr.
 woosteri, Whitfield, 1878, Geo. Sur. Wis., vol. 4, p. 189, Potsdam Gr.

AMPHION, Pander, 1830, Beitrage zur Geognosie des Russischen Reiches, p. 139. [Ety. mythological name.] Cephalic shield short, transverse; glabella convex or subrectangular, three pairs of furrows, front inclosing a small forehead lobe; eyes small; facial suture, behind the eyes, ending on the exterior margin in advance of the rounded angles; thorax 15 to 18 articulations; pleuræ with out grooves; pygidium with short axis and pleuræ with free terminations; labrum pointed, convex, margined. Type *A. frontiloba*.
 barrandii, Billings, 1865, Pal. Foss., vol. 1, p. 288, Quebec Gr.



FIG. 956—Amphion canadensis. Pygidium.

canadensis, Billings, 1859, Can. Nat. and Geo., vol. 4, p. 381, Chazy Gr.

convexus, Billings, 1865, Pal. Foss., vol. 1, p. 322, Quebec Gr.

insularis, Billings, 1865, Pal. Foss., vol. 1, p. 290, Quebec Gr.

julius, Billings, 1865, Pal. Foss., vol. 1, p. 290, Quebec Gr.

matutinus, Hall, 1863, 16th Rep. N. Y. St. Mus. Nat. Hist., p. 222, Potsdam Gr.

multisegmentatus, see Encrinurus multisegmentatus.

nevadensis, Walcott, 1885, Monogr. U. S. Geo. Sur., vol. 8, p. 94, Chazy Gr.

salteri, Billings, 1861, Can. Nat. and Geo., vol. 6, Calciferous Gr.

westoni, Billings, 1865, Pal. Foss., vol. 1, p. 321, Quebec Gr.

AMPHIPELTIS, Salter, 1863, Quar. Jour. Geo. Soc., vol. 19, p. 75.

[Ety. *amphi*, on both sides; *peltis*, provided with a shield or buckler.] Carapace oblong, oval, rounded in front, more truncate behind; thorax with 9 segments, 5 project beyond the carapace and 4 concealed beneath it; tail-piece semicircular, as wide as the abdomen, and as long as the last three segments taken together. Type A. paradoxus.



FIG. 957.—*Amphipeltis paradoxus*.

paradoxus, Salter, 1863, Quar. Jour. Geo. Soc., vol. 19, p. 76, and Acad. Geo., p. 523, Up. Devonian.

AMPYX, Dalman, 1827, Ueber die palæozoen oder die sogenannten Trilobiten, p. 53.

[Ety. *ampyx*, head-band.] Cephalic shield somewhat trigonal; glabella large, prominent, narrow behind, and projecting upward and forward anteriorly; cheeks flattened, posterior angles produced; no eyes or facial sutures; thoracic segments 5 or 6, flattened, sides straight, divided by a diagonal pleural groove; pygidium subtrigonal, nearly as large as the cephalic shield; one anterior segmental furrow; axis faintly marked with transverse furrows. Type A. nasutus.

halli, Billings, 1861, Pal. Foss., vol. 1, p. 24, Chazy Gr.

læviusculus, Billings, 1865, Pal. Foss., vol. 1, p. 295, Quebec Gr.

normalis, Billings, 1865, Pal. Foss., vol. 1, p. 295, Quebec Gr.

rutilius, Billings, 1865, Pal. Foss., vol. 1, p. 296, Quebec Gr.

semicostatus, Billings, 1865, Pal. Foss., vol. 1, p. 297, Quebec Gr.



FIG. 958.—*Ampyx normalis*. Head without movable cheeks and the pygidium.

Angelina hitchcocki, see *Prototypus hitchcocki*.

Anomocare, Angelin, 1852, Pal. Scand., p. 24. This genus is not yet known in America.

(?) *parvum*, Walcott, 1885, Mon. U. S. Geo. Sur., vol. 8, p. 59, Up. Taconic. This species is founded on a fragment of the cephalic shield and the generic reference is only provisional.

ANOPOLENUS, Salter, 1864, Quar. Jour. Geo. Soc., vol. 20, p. 236, and vol. 21, p. 477.

[Ety. *a*, without; *ops*, an eye; *olenus*, a genus.] Elongated, depressed; cephalic shield semicircular with prolonged spines, and clavate glabella having 4 pairs of furrows; fixed cheeks, large, punctate, strongly margined, each a quarter of a circle in shape, and reaching nearly to the front of the glabella, against which the long eyes abut; thence the facial suture curves out-



FIG. 959.—*Anopolenus venustus*.

ward, and is marginal in front; the long eye-lobe, which forms the margin of the fixed cheeks, reaches quite to the glabella in front, and nearly to the posterior angle below; free cheeks are a narrow band

margined and reaching only three-fourths down the fixed cheek; pygidium wide, expanded, but narrower than the thorax, widely marginate, and serrated by 6 or 8 marginal spines. Type A. henrici.

venustus, Billings, 1874, Pal. Foss., vol. 2, p. 73, Up. Taconic.

ANTHRACONECTES,

Meek & Worthen, 1868, Am. Jour. Sci., vol. 46, p. 21, and Geo. Sur. Ill., vol. 3, p. 544.

[Ety. *anthrax*, coal; *nectos*, swimming.] Distinguished from *Eurypterus* by the absence of lateral spines at the articulations of the legs, which terminate in single

points, and in the great length and simple extremity of the mesial appendage of its operculum, as well as in the possession of two little spatulate supplementary pieces. Type A. mazonensis.

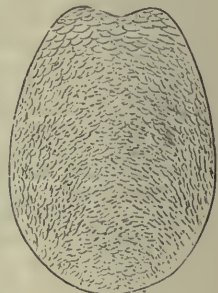


FIG. 960.—*Anthraconectes mazonensis*. Hypostoma enlarged to show the scale-like sculpturing.

mazonensis, Meek & Worthen, 1868, Am. Jour. Sci. and Arts, vol. 46, p. 21, and Geo. Sur. Ill., vol. 3, p. 544, Coal Meas.

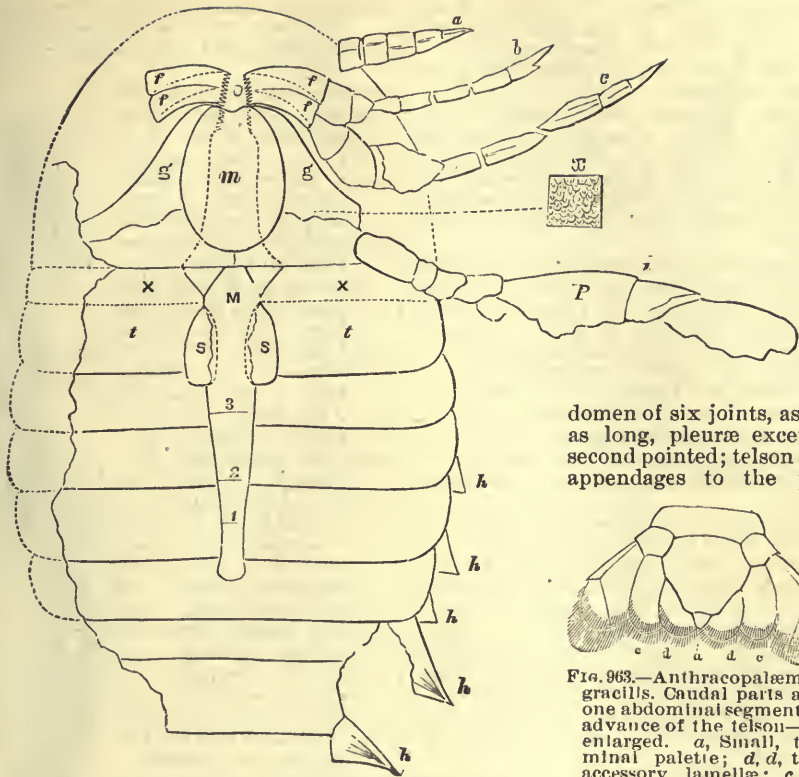


FIG. 961.—*Anthraconectes mazonensis*. *a, b, c*, Legs, crushed and broken; *h*, ends of dorsal half of body segments; *m*, hypostoma; *P*, swimming paddle broken; *t*, natural articulation; *g*, basal joints of same; *x*, enlarged surface markings; *M*, mesial appendage of operculum; 1, 2, 3, articulations; *z, 4*, lateral alae of operculum; *s, 5*, accessory pieces; *o*, position of mouth.

domen of six joints, as broad as long, pleuræ except the second pointed; telson broad, appendages to the penul-

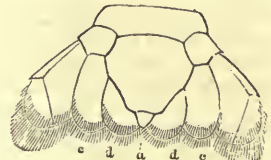


FIG. 963.—*Anthracopalaemon gracilis*. Caudal parts and one abdominal segment in advance of the telson—all enlarged. *a*, Small, terminal palette; *d, a*, two accessory lamellæ; *c, c*, lateral lamellæ or fins.

timate joint double on each side, subtrigonal, broad, lateral fins divided. Type *A. grossarti*.

gracilis, Meek & Worthen, 1865, Proc. Acad. Nat. Sci. Phil., p. 50, and Geo. Sur. Ill., vol. 2, p. 407, Coal Meas. hillanus, Dawson, 1877, Geo. Mag., vol. 4, p. 56, Coal Meas.

APARCHITES, Jones, 1889, Ann. and Mag. Nat. Hist., 6th ser., vol. 3, p. 384. [Ety. *aparche*, first.] In form like *Leperditia*, but smaller and without ocular or muscular spot, and having no overlap on the ventral margin. Type *A. whiteavesi*. *whiteavesi*, Jones, 1889, Ann. and Mag. Nat. Hist., 6th ser., vol. 3, p. 384, Trenton Gr.

ARCHÆOCARIS, Meek, 1872, Proc. Acad. Nat. Sci. Phil., p. 335. [Ety. *archaios*, ancient; *karis*, shrimp.] Cephalothorax about equaling in length 3½ segments, subtrigonal, pointed in front, truncated and sinuous posteriorly; abdomen with six imbricating segments; telson as long as 3½ abdominal segments with a stylet on each side. Type *A. vermiformis*.



FIG. 964.—*Archæocaris vermiformis*.

ANTHRACOPALÆMON, Salter, 1861, Quar. Jour.

Geo. Soc. Lond., vol. 17, p. 529. [Ety. *anthrac*, coal; *palaemon*, prawn.] Carapace scarcely as broad as long, simple, convex, sides arched outward; central ridge in front separated by a furrow from a central ridge; front margin serrate; outer antennæ have wide, square basal joints; second and third joints not much oblique; the rest about as broad as long; ab-

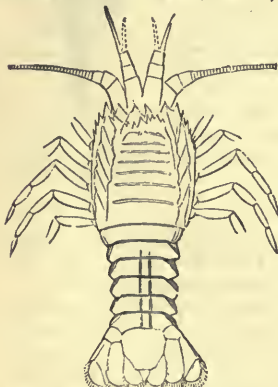


FIG. 962.—*Anthracopalaemon gracilis*. Dorsal view somewhat enlarged.

domen of six joints, as broad as long, pleuræ except the second pointed; telson broad, appendages to the penul-

- vermiformis, Meek, 1872, Proc. Acad. Nat. Sci. Phil., p. 335, and Ohio Pal., vol. 2, p. 321, Subcarboniferous.
- Arctinurus*, Castelnau, 1843, Syst. Syl., p. 21, syn. for *Lichas*.
- Arctusinus*, Barrande, 1852, Syst. Sil. Boh. Not yet known as an American genus.
- (?) *americana*, Walcott, 1885, Monogr. U. S. Geo. Sur., vol. 8, p. 62, Potsdam Gr. Founded upon a fragment of a cephalic shield which does not belong to this genus.
- Arges*, Goldfuss, 1839, Nova Acta Phys. Acad. Caes. Leop. Nat. Cur. Not American.
- Arionellus*, Barrande, 1852, Syst. Sil. Boh., syn. for *Agraulus*.
- bipunctatus*, see *Agraulus bipunctatus*.
- convexus*, see *Agraulus convexus*.
- cylindricus*, see *Agraulus cylindricus*.
- oweni*, see *Crevicephalus oweni*.
- planus*, see *Agraulus planus*.
- pustulatus*, see *Agraulus pustulatus*.
- quadrangularis*, see *Agraulus quadrangularis*.
- subclavatus*, see *Agraulus subclavatus*.
- texanus*, see *Agraulus texanus*.
- tripunctatus*, see *Agraulus tripunctatus*.
- ARISTOZOE, Barrande, 1872, Syst. Sil. Boh., vol. 1, p. 477. [Ety. *aristos*, best; *zoon*, animal.] Carapace bivalve; test thin; hinge-line straight; ventral margin grooved and reflected; tubercle near anterior margin. Type A. *bisulcata*.
- rotundata*, Walcott, 1887, Am. Jour. Sci. and Arts, 3d ser., vol. 4, p. 193, Up. Taconic.
- troyensis*, Ford, 1873, (Leperditia troyensis.) Am. Jour. Sci. and Arts, 3d ser., vol. 6, p. 138, Up. Taconic.
- ASAPHISCUS, Meek, 1873, 6th Rep. Hayden's Geo. Sur. Terr., p. 485. [Ety. from the genus *Asaphus*.] Distinguished from *Asaphus* by having nine thoracic segments, a conical and well-defined glabella, without lateral lobes, the furrow at the anterior margin of the head, and less arcuate eyes more remote from the glabella; distinguished from *Bathurellus* by having its conical glabella depressed, and the margin of the head, in front, first convex, and sloping forward into a transverse mesial furrow, and then rising in a convex margin; the mesial lobe of the pygidium is longer, and the free margins narrower, less flattened and alate. Type A. *wheeleri*.
- bradleyi*, Meek, 1873, 6th Rep. Hayden's Geo. Sur. Terr., p. 484, Up. Taconic.



FIG. 965.—*Asaphiscus wheeleri*.

wheeleri, Meek, 1873, 6th Rep. Hayden's Geo. Sur. Terr., p. 485, and Geo. Sur. W. 100th Mer., vol. 4, p. 43, Up. Taconic.

- ASAPHOIDICHNUS, S. A. Miller, 1880, Jour. Cin. Soc. Nat. Hist., vol. 2, p. 217. [Ety. *Asaphus*, a genus; *eidos*, form; *ichnos*, track.] A track supposed to have been made by a crustacean. Type A. *trifidus*.
- dyeri*, S. A. Miller, 1880, Jour. Cin. Soc. Nat. Hist., vol. 2, p. 219, Utica Slate Gr.
- trifidus*, S. A. Miller, 1880, Jour. Cin. Soc. Nat. Hist., vol. 2, p. 218, Utica Slate Gr.

ASAPHUS, Brongniart, 1822, Hist., Nat. Crust. Foss., p. 17. [Ety. *asaphus*, uncertain, obscure.] Body somewhat elliptical, sides straightened; cephalic shield and pygidium nearly equal and somewhat semi-elliptical; glabella contracted between the eyes; eyes large, smooth; facial sutures extending forward and outward in advance of the eyes, and then curving to the middle of the front margin, posteriorly extending obliquely outward, and cutting the posterior margin of the cephalic shield within the lateral angles; thoracic segments 8, with wide, nearly straight pleural grooves; axis of pygidium, when traceable, elongate conic, segments usually indistinct. Type A. *cornigerus*.



FIG. 966.—*Asaphoidichnus trifidus*.

- acantholeurus*, see *Dalmanites acantholeurus*.
- alacer*, Billings, 1866, Catal. Sil. Foss. Antic., p. 26, Hud. Riv. Gr.
- aspectans*, see *Dalmanites aspectans*.
- astragalotes*, Green, 1834, Am. Jour. Sci., vol. 25, p. 325. Probably founded upon the pygidium of a Phacops.
- barrandi*, Hall, 1851, Lake Sup. Land Dist., p. 210, Birdseye Gr.
- canadensis*, Chapman, 1856, Can. Jour. vol. 2, p. 47, Trenton Gr.
- canalis*, Conrad, 1847, Pal. N. Y., vol. 1, p. 25, Chazy Gr.
- caribouensis*, Walcott, 1885, Monogr. U. S. Geo. Sur., vol. 8, p. 98, Quebec Gr.

caudatus, Green, syn. for *Dalmanites limulurus*. (?)
cordieri, Castelnau, syn. for *Dalmanites limulurus*.
corycæus, see *Proetus corycæus*.
crypturus, Green, 1834, *Trans. Geo. Soc. Pa.*, vol. 1, p. 37. Not an *Asaphus*; form not determined.
 (?) *curiosus*, Billings, 1865, *Pal. Foss.*, vol. 1, p. 318, Quebec Gr.
denticulatus, see *Dalmanites denticulatus*.
ditmarsie, Honeyman, 1879, *Proc. Nova Scotia Inst.*, vol. 5, p. 18, Low. Sil.
diurus, Green, 1839, *Am. Jour. Sci.*, vol. 39, p. 40, Niagara Gr. Probably the fragment of a *Dalmanites*.
edwardsi, Castelnau, syn. for *Dalmanites limulurus*.
extans, see *Bathyrurus extans*.



FIG. 967.—*Asaphus gigas*.

gigas, Dekay, 1825, (*Isotelus gigas*.) *Ann. Lyc. Nat. Hist. N. Y.*, vol. 1, p. 174, and *Pal. N. Y.*, vol. 1, p. 231, Trenton and Hud. Riv. Grs.
 (?) *goniocercus*, MEEK, 1873, *Hayden's Geo. Sur. Terr.*, p. 480, Quebec Gr. or Up. Taconic. Probably a *Megalaspis*.
 (?) *goniurus*, Billings, 1860, *Can. Nat.*, vol. 5, p. 301, Up. Taconic. Not defined so as to be recognized.
grattonensis, Meek & Worthen, 1870, *Proc. Acad. Nat. Sci.*, p. 54, Hud. Riv. Gr.
halli, Conrad, syn. for *Dalmanites boothi*.
halli, Chapman, 1858, *Ann. and Mag. Nat. Hist.*, 3d ser., vol. 2, p. 14, Trenton Gr.
hausmani, Brongniart, as identified by D'Archiac and Verneuil. Not American.
hincksi, Salter, 1859, *Ann. and Mag. Nat. Hist.*, 3d ser., vol. 4, p. 2, Trenton Gr.
homalonotoides, Walcott, 1877, 31st Rep. N. Y. St. Mus. Nat. Hist., p. 71, Trenton Gr.
 (?) *huttoni*, Billings, 1865, *Pal. Foss.*, vol. 1, p. 271, Quebec Gr. or Up. Taconic.
 (?) *illænoides*, Billings, 1860, *Can. Nat.*, vol. 5, p. 301, Up. Taconic.
iowensis, Owen, 1852, *Geo. Wis., Iowa, and Minn.*, p. 577, Trenton Gr.
laticostatus, syn. for *Dalmanites anchiops*.
 (?) *latimarginatus*, Hall, 1847, *Pal. N. Y.*, vol. 1, p. 253, Utica Slate Gr.
limulurus, see *Dalmanites limulurus*.
marginalis, Hall, 1847, *Pal. N. Y.*, vol. 1, p. 24, Chazy Gr.
megalophthalmus, Troost, 1840, 5th, *Geo. Tenn. Niagara Gr.* Not clearly defined, but probably a *Dalmanites*.

megistus, Locke, 1841, (*Isotelus megistos*.) *Trans. Am. Geo. and Nat.*, p. 221, Trenton and Hud. Riv. Grs.

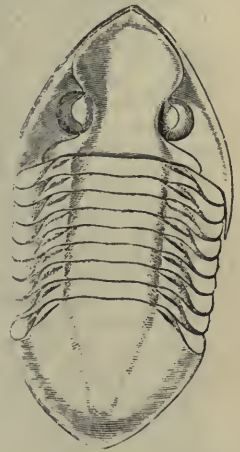


FIG. 968.—*Asaphus megistus*.

micrurus, see *Dalmanites micrurus*.
 (?) *morrisi*, Billings, 1865, *Pal. Foss.*, vol. 1, p. 272, Quebec Gr. or Up. Taconic.
murchisoni, Castelnau, syn. for *A. gigas*.
myrmecophorus, see *Dalmanites myrmecophorus*.
nasutus, see *Dalmanites nasutus*.
nodostriatus, Hall, 1847, *Pal. N. Y.*, vol. 1, p. 248.
 Not defined so as to establish a species.
notans, Billings, 1866, *Catal. Sil. Foss. Antic.*, p. 24, Hud. Riv. Gr.
obtusus, Hall, 1847, *Pal. N. Y.*, vol. 1, p. 24, Chazy Gr.
pelops, Billings, 1865, *Pal. Foss.*, vol. 1, p. 317, Quebec Gr. or Up. Taconic. Not an *Asaphus*.
platycephalus, Stokes, 1822, *Trans. Geo. Soc. Lond.*, 2d ser., vol 1, p. 258, Trenton Gr.
platypleurus, Green, 1837, *Am. Jour. Sci.*, vol. 32, p. 169, Low. Sil. Not very clearly defined.
pleuropteryx, see *Dalmanites pleuropteryx*.
polypleurus, Green, 1838, *Am. Jour. Sci.*, vol. 34, Keokuk Gr. Probably a *Phillipsia*.
quadraticaudatus, Billings, 1865, *Pal. Foss.*, vol. 1, p. 272, Quebec Gr. or Up. Taconic. Not an *Asaphus*.
romingeri, Walcott, 1876, 28th Rep. N. Y. Mus. Nat. Hist., p. 96, Black Riv. and Trenton Gr.
selenurus, see *Dalmanites selenurus*.
stokesi, see *Proetus stokesi*.
suse, Calvin, 1882, *Geo. Wis.*, vol. 4, p. 236, Trenton Gr.
tetragonocephalus, Green, 1834, *Am. Jour. Sci.*, vol. 25, p. 336. Not an *Asaphus*, and the relations not clear.
trentonensis, see *Lichas trentonensis*.
triangularatus, Whitfield, syn. for *A. homalonotoides*.
trimblii, Green, 1837, *Jour. Acad. Nat. Sci. Phil.*, vol. 7, Niagara Gr.
vetustus, Hall, 1847, (*Ogygia vetustus*.) *Pal. N. Y.*, vol. 1, p. 227, Birdseye Gr.
vigilans, Meek & Worthen, 1870, (*Isotelus vigilans*.) *Proc. Acad. Nat. Sci. Phil.*, p. 53, and *Geo. Sur. Ill.*, vol. 6, p. 497, Hud. Riv. Gr.

wetherilli, Green, syn. for *Dalmanites limulurus*.

wisconsinensis, Walcott, 1876, 28th Rep. N. Y. Mus. Nat. Hist., p. 97, Trenton Gr.

ATOPS, Emmons, 1844, Taconic System, p. 64, and Am. Geol. p. 115. [Ety. *a*, absence of; *ops*, an eye.] Cephalic shield semicircular, anterior and lateral edges turned upward, posterior angles rounded, convex; glabella subquadrate, convex, appearing as a continuation of the central lobe, two lateral furrows on each side, neck segment well defined; facial suture beginning at the antero-lateral part of the cephalic shield, runs nearly parallel with the anterior margin to the front of the glabella, when it turns at right angles and runs parallel with the glabella to the posterior margin; no eyes; thoracic segments 17, axial nearly as wide as the lateral lobes, narrowing gradually to the pygidium, armed with a row of short spines, lateral lobes with a row of tubercles on the median line; pygidium small, somewhat semielliptical, flat, axial lobe with a single ring. Type A. *trilineatus*.

fischeri, Billings, 1865, (*Triarthrus fischeri*), Pal. Foss., vol. 1, p. 291, Quebec Gr. or Up. Taconic.

miser, Billings, 1861, (*Conocephalites miser*), Pal. Foss., vol. 1, p. 12, Up. Taconic.

trilineatus, Emmons, 1844, Taconic System, p. 64, and Am. Geol., p. 115, Up. Taconic.

BAILIELLA, Matthew, 1884, Trans. Roy. Soc.

Can., vol. 2, pl. 1. [Ety. proper name.] Proposed as a subgenus and founded on *Conocoryphe baileyi*.

BARRANDIA, McCoy, 1849, Ann. Nat. Hist. 2d ser. vol. 4, p. 409. [Ety. proper name.] Ovale, depressed; glabella with incomplete axial furrows and no distinct lobes; eyes large, subcentral; facial

suture cutting the posterior margin about the middle, and in front of the eyes arching forward, first outward and then inward; pleuræ falcate, with a fulcrum close to the axis, grooved, not faceted; pygidium with short axis and smooth sides. Type B. *cordai*.

(?) *maccoyi*, Walcott, 1885, Monogr. U. S. Geo. Sur., vol. 8, p. 96, Trenton Gr.

Barrandia, Hall, 1860. The name was preoccupied by McCoy in 1849; beside, it is a syn. for *Elliptocephala*.

thompsoni, see *Elliptocephala thompsoni*. *vermontana*, see *Elliptocephala vermontana*.

BATHYNOTUS, Hall, 1860, 3d Rep. N. Y. St. Mus. Nat. Hist., p. 117. [Ety. *bathys*, ample; *notos*, back.] Cephalic shield somewhat semielliptical, with posterior



FIG. 970—*Bathynotus holopyga*. Long eye-lobes crushed down.

angles produced in very long spines; glabella transversely lobed; eye-lobe narrow, elongate, extending from opposite the antero-lateral angle of the glabella obliquely backward nearly to the posterior margin; facial suture passes nearly around the extended eye-lobe, and cuts the margin before reaching the posterior extension of the eye-lobe; anteriorly it passes in front of the glabella without, as it appears, cutting, the front margin; free cheeks united in front; thirteen thoracic segments; middle lobe prominent, twice as wide as the lateral lobes; articulations strong, each bearing a central node; pleuræ short, each terminating in a spine, the last pair being prolonged far beyond the pygidium; pygidium short, middle lobe with three annulations, lateral lobes flat and plain; hypostoma having an obtuse angle; at the front margin of the doublure, the latter being cut away to permit the extension to cross it, behind the doublure it is transversely quadrangular. Type B. *holopyga*.

holopyga, Hall, 1859, (*Peltura holopyga*), 12th Rep. N. Y. St. Mus. Nat. Hist., p. 61 and Pal. N. Y., vol. 3, p. 528, Up. Taconic.

BATHYURELLUS, Billings, 1865, Pal. Foss., vol. 1, p. 262. [Ety. diminutive of *Bathyrurus*.] Form oblong, ovate; cephalic shield convex, lunate; glabella conical or pointed, without furrows; eyes lunate; facial suture in front of the eye, curving outward, then straight forward or inward on approaching the margin behind the eye, running outward subparallel to the neck furrow, and cutting the margin before reaching the outer angle; thorax, nine segments; axis of pygidium short, not strongly grooved, side lobes with short ribs, and a broad, smooth border all around, sometimes concave. Type *B. abruptus* and *B. nitidus*. *abruptus*, Billings, 1865, Pal. Foss., vol. 1, p. 263, Quebec Gr. or Up. Taconic. *bradleyi*, Meek, see *Asaphiscus bradleyi*. *expansus*, Billings, 1865, Pal. Foss., vol. 1, p. 318, Quebec Gr. or Up. Taconic. *formosus*, Billings, 1865, Pal. Foss., vol. 1, p. 266, Quebec Gr. or Up. Taconic. *fraternus*, Billings, 1865, Pal. Foss., vol. 1, p. 267, Quebec Gr. or Up. Taconic. *litoreus*, Billings, 1865, Pal. Foss., vol. 1, p. 320, Quebec Gr. or Up. Taconic. *marginatus*, Billings, 1865, Pal. Foss., vol. 1, p. 264, Quebec Gr. or Up. Taconic. *nitidus*, Billings, 1865, Pal. Foss., vol. 1, p. 265, Quebec Gr. or Up. Taconic. *rarus*, Billings, 1865, Pal. Foss., vol. 1, p. 320, Quebec Gr. or Up. Taconic. *truncatus*, Meek, 1873, Hayden's Geo. Sur. Terr., p. 465. Not satisfactorily defined. *validus*, Billings, 1865, Pal. Foss., vol. 1, p. 268, Quebec Gr. or Up. Taconic. *wheeleri*, Meek, see *Asaphiscus wheeleri*.



FIG. 971.—*Bathyurellus nitidus*.



FIG. 972.—*Bathyuriscus productus*.

BATHYURISCUS, Meek, 1873, 6th Rep. Hayden's U. S. Geo. Sur. Terr., p. 484. [Ety. from *Bathyrurus*.] Ovate; head semicircular; glabella straight or slightly expanded in front, three or four pairs of furrows; eyes elongate; facial sutures cut the anterior margin of the head each side of the greatest expansion of the glabella, and extend obliquely inward to the anterior bases of the eyes; encircling the latter, they extend obliquely outward, cutting the posterior margin so as to leave a narrow, elongate lateral limb; thorax from 7 to 9 segments; axis strong; pleural groove broad; pygidium semicircular, axis strong, and crossed by several furrows which cross the lateral lobes. Type *B. haydeni*.

haydeni, Meek, 1873, (Bathyrurus haydeni,) 6th Rep. Hayden's U. S. Geo. Sur. Terr., p. 482, Up. Taconic. *howelli*, Walcott, 1886, Bull. U. S. Geo. Sur. No. 30, p. 216, Up. Taconic. *productus*, Hall & Whitfield, 1877, (Ogygia producta,) Geol. Expl. 40th Par., vol. 4, p. 244, Up. Taconic. **BATHYURUS**, Billings, 1859, Can. Nat. and Geo., vol. 4, p. 365. [Ety. *bathys*, deep; *oura*, tail.] Elliptical, sides straight; cephalic shield lunate, posterior angles produced in spines; glabella subquadrate, rounded anteriorly, convex, furrows obscure, neck segment distinct; eyes large, smooth, semilunar; facial sutures curving forward anteriorly, and posteriorly directed straight backward from the eye, and then, abruptly curving outward, cut the cephalic shield half-way to the genal angle; nine thoracic segments, axial lobe narrower than lateral lobes, and gradually tapering; pleurae furrowed; pygidium smaller than the head, segments closely united, border flattened and smooth; hypostoma not forked. Type *B. extans*. *amplimarginatus*, Billings, 1859, Can. Nat. and Geo., vol. 4, p. 365, Calciferous Gr. *angelini*, Billings, 1859, Can. Nat. and Geol., vol. 4, p. 468, Chazy Gr. *arcuatus*, Billings, 1865, Pal. Foss., vol. 1, p. 205, Quebec Gr. or Up. Taconic. *armatus*, Billings, 1860, Can. Nat. and Geo., vol. 5, p. 321, Quebec Gr. or Up. Taconic. *bituberculatus*, Billings, 1860, Can. Nat. and Geo., vol. 5, p. 321, Quebec Gr. or Up. Taconic. *breviceps*, Billings, 1865, Pal. Foss., vol. 1, p. 262, Quebec Gr. or Up. Taconic. *capax*, Billings, 1860, Can. Nat. and Geol., vol. 5, p. 321, Quebec Gr. or Up. Taconic. *caudatus*, Billings, 1865, Pal. Foss., vol. 1, p. 261, Quebec Gr. or Up. Taconic. *conicus*, Billings, 1859, Can. Nat. and Geol., vol. 4, p. 366, Calciferous Gr. (?) *congeneris*, Walcott, 1885, Monogr. U. S. Geo. Sur., vol. 8, p. 92, Quebec Gr. or Up. Taconic. *cordai*, Billings, 1860, Can. Nat. and Geol., vol. 5, p. 321, Calciferous Gr. *crotaliformis*, Dwight, 1884, Am. Jour. Sci. and Arts, 3d ser., vol. 27, p. 253, Calciferous Gr. *cybele*, Billings, 1859, Can. Nat. and Geol., vol. 4, p. 366, Calciferous Gr. *dubius*, Billings, 1860, Can. Nat. and Geo., vol. 5, p. 321, Quebec Gr. or Up. Taconic. *extans*, Hall, 1847, (Asaphus (?) *extans*,) Pal. N. Y., vol. 1, p. 228, Lower Trenton Gr. *gregarius*, Billings, 1865, Pal. Foss., vol. 1, p. 363, Up. Taconic. *haydeni*, see *Bathyuriscus haydeni*. *longispinus*, Walcott, 1876, 28th Rep. N. Y. St. Mus. Nat. Hist., p. 94, Black River and Trenton Grs.

minganensis, Billings, 1865, Pal. Foss., vol. 1, p. 353, Calciferous Gr.
 nero, Billings, 1865, Pal. Foss., vol. 1, p. 260, Quebec Gr. or Up. Taconic.
 oblongus, Billings, 1860, Can. Nat. and Geo., vol. 5, p. 321, Quebec Gr. or Up. Taconic.
 parvulus, Billings, 1861, Pal. Foss., vol. 1, p. 16, Up. Taconic.
 perplexus, Billings, 1865, Pal. Foss., vol. 1, p. 364, Potsdam Gr. or Up. Taconic.
 perspicator, Billings, 1865, Pal. Foss., vol. 1, p. 205, Quebec Gr. or Up. Taconic.
 pogonipensis, Hall & Whitfield, 1877, U. S. Geo. Expl. 40th Parallel, vol. 4, p. 243, Quebec Gr. or Up. Taconic.
 quadratus, Billings, 1860, Can. Nat. and Geo., vol. 5, p. 320, Quebec Gr. or Up. Taconic.
 saffordi, Billings, 1860, Can. Nat. and Geol., vol. 5, p. 321, Quebec Gr. or Up. Taconic.
 seelyi, Whitfield, 1886, Bull. Am. Mus. Nat. Hist., vol. 1, p. 339, Birdseye Gr.
 senectus, Billings, 1861, Pal. Foss., vol. 1, p. 15, Up. Taconic.
 serratus, Meek, 1873, 6th Rep. Hayden's Geo. Sur. Terr., p. 480, Potsdam Gr. or Up. Taconic.
 ? simillimus, Walcott, 1885, Monogr. U. S. Geo. Sur., vol. 8, p. 93, Quebec Gr. or Up. Taconic.



FIG. 973.—*Bathyrus smithi*.

smithi, Billings, 1862, Pal. Foss., vol. 1, p. 56, Black Riv. Gr.
 solitarius, Billings, 1865, Pal. Foss., vol. 1, p. 362, Up. Taconic.

spiniger, Hall, 1847, (Acidaspis spiniger,) Pal. N. Y., vol. 1, p. 241, Black River and Trenton Gr.
 stonemani, Vogdes, 1884, 12th Rep. Geo. and Nat. Hist. Minn., p. 8, Trenton Gr.
 strenuus, Billings, 1865, Pal. Foss., vol. 1, p. 204, Quebec Gr. or Up. Taconic.
 taurifrons, Dwight, 1884, Am. Jour. Sci. and Arts, 3d ser., vol. 27, p. 252, Calciferous Gr.
 timon, Billings, 1865, Pal. Foss., vol. 1, p. 261, Quebec Gr. or Up. Taconic.
 ? tuberculatus, Walcott, 1885, Monogr. U. S. Geo. Sur., vol. 8, p. 91, Quebec Gr. or Up. Taconic.

vetulus, Billings, 1865, Pal. Foss., vol. 1, p. 365, Potsdam Gr. or Up. Taconic.
BELINURUS, Konig, 1825, Icones Fossilium Sectiles, p. 230. [Ety. *belos*, dart; *oura*, tail.] Cephalo-thoracic shield sub-crescentiform, more than twice as wide as long, lateral angles pointed; ocular ridge surrounds a transversely subelliptical area, within which there is a crown-shaped area, surrounded by a ridge; eyes small, and at the lateral extremities of the subelliptical area; mesial lobe narrow, and contracted toward each end; lateral lobes wide, flattened on the margin and serrate on the edge; telson tapering to a point. Type *B. bellulus*.

danae, see *Euproops danae*.
laccii, Packard, 1885, Am. Naturalist, vol. 19, p. 291, Coal Meas.

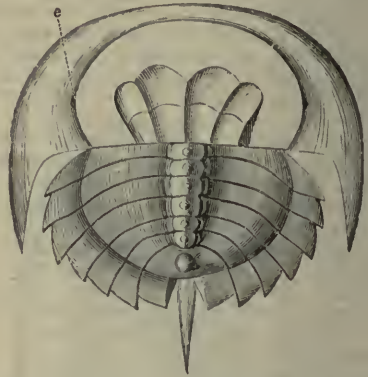


FIG. 974.—*Bellinurus bellulus*. *e*, Position of eye, at the lateral extremity of a transversely elliptical area.

BEYRICHTIA, McCoy, 1844, Syn. Sil. Foss. Ireland, p. 57. [Ety. proper name.] Carapace equivalve, oblong, extremities rounded, ventral border semicircular, dorsal straight; valves wider at the caudal than the cephalic extremity, more or less convex, impressed with transverse furrows. Type *B. klødeni*.
aequilatera, Hall, 1860, Can. Nat. and Geo., vol. 5, p. 158, and Acad. Geol., p. 609, Up. Silurian.
americana, Shumard, 1858, (*Cythere americana*), Trans. St. Louis Acad. Sci., vol. 1, p. 227, Up. Coal Meas.
arcuata, Bean, 1836, Lond. Geo. Mag., p. 438, Low. Held. Gr.
atlantica, Billings, 1865, Pal. Foss., vol. 1, p. 300, Quebec Gr. or Up. Taconic.
bella, Walcott, 1883, 35th Rep. N. Y. St. Mus. Nat. Hist., p. 213, Trenton Gr.



FIG. 975.—*Beyrichia chambersi*.
 Mag. 12 diam.

chambersi, S. A. Miller, 1874, Cin. Quar. Jour. Sci., vol. 1, p. 234, Hud. River Gr.
ciliata, Emmons, 1855, American Geo., p. 219, Hud. Riv. Gr.
cincinnatiensis, see *Primitia cincinnatiensis*.
clathrata, Jones, 1858, Ann. and Mag. Nat. Hist., 3d series, vol. 1, p. 242, Niagara Gr.
decora, Billings, 1866, Catal. Sil. Foss. Antic., p. 67, Anticosti Gr.
dacon, Clarke, 1855, Bull. U. S. Geo. Sur., No. 16, p. 29, Genesee Shale.
duryi, S. A. Miller, 1874, Cin. Quar. Jour. Sci., vol. 1, p. 232, Hud. Riv. Gr.

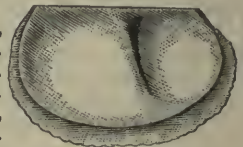


FIG. 976.—*Beyrichia duryi*. Magnified 25 diam.

foctoidea, White & St. John, 1868, Trans. Chi. Acad. Sci., p. 126, Up. Coal Meas. granulosa, Hall, 28th Rep. N. Y. St. Mus. Nat. Hist., p. 186, Niagara Gr.



FIG. 977.—*Beyrichia duryi*. Interior of left valve, magnified 25 diam.

granulata, Hall, 1859, Pal. N. Y., vol. 3, p. 377, Low. Held. Gr.

jonesi, Dawson, 1868, Acad. Geol., p. 312, Carboniferous.

klædeni var. acadica, 1889, Ann. and Mag. Nat. Hist., 6th ser., vol. 3, p. 379, Low. Held. Gr.

lata, Vanuxem, 1842, (Agnostus latus), Geo. Rep. N. Y., p. 80, and Pal. N. Y., vol. 2, p. 301, Clinton Gr.

lithofactor, White & St. John, 1868, Prelim. Notice of New Foss., Coal Meas.

logani, see *Primitia logani*.

logani var. leperditoides, see *Primitia leperditoides*.

logani var. reniformis, see *Primitia reniformis*.

maccoyana, Jones, 1855, Ann. and Mag. Nat. Hist., 2d ser., vol. 16, p. 88, Onondaga Gr.

notata, Hall, 1859, Pal. N. Y., vol. 3, p. 379, Low. Held. Gr.

notata var. ventricosa, Hall, 1859, Pal. N. Y., vol. 3, p. 380, Low. Held. Gr.

novascotia, Jones & Kirby, 1884, Lond. Geo. Mag., 3d ser., vol. 1, p. 356, Carboniferous.

occidentalis, Walcott, 1885, Monogr. U. S. Sur., vol. 8, p. 204, Devonian.

oculifera, Hall, 1871, 24th Rep. N. Y. St. Mus. Nat. Hist., p. 232, Hud. Riv. Gr.

oculina, Hall, 1859, Pal. N. Y., vol. 3, p. 378, Low. Held. Gr.

pennsylvanica, Jones, 1858, Ann. and Mag. Nat. Hist., 3d ser., vol. 1, p. 253, Onondaga Gr.

persulcata, Ulrich, 1879, Jour. Cin. Soc. Nat. Hist., vol. 2, p. 12, Hud. Riv. Gr.

petrifactor, White & St. John, 1868, Trans. Chi. Acad. Sci., p. 125, St. Louis Gr.

petrifactor var. velata, White & St. John, 1868, Trans. Chi. Acad. Sci., p. 126, St. Louis Gr.

plagosa, Jones, 1858, Ann. and Mag. Nat. Hist., 3d ser., vol. 1, p. 243, Niagara Gr.

punctulifera, Hall, 1862, 15th Rep. N. Y. St. Mus. Nat. Hist., p. 83, Ham. Gr.

pustulosa, Hall, 1860, Can. Nat. and Geo., vol. 5, p. 157, and Acad. Geol., p. 609, Up. Silurian.

quadrilirata, Hall & Whitfield, syn. for *Beyrichia regularis*.

regularis, Emmons, 1855, Am. Geo., p. 219, Hud. Riv. Gr.

richardsoni, S. A. Miller, 1874, Cin. Quar. Jour. Sci., vol. 1, p. 347, Hud. Riv. Gr.

striato-marginata, S. A. Miller, 1874, Cin. Quar. Jour. Sci., vol. 1, p. 233, Hud. Riv. Gr. This species probably belongs to an undefined genus.

symmetrica, Hall, 1852, Pal. N. Y., vol. 2, p. 317, Niagara Gr.

trisulcata, Hall, 1859, Pal. N. Y., vol. 3, p. 381, Low. Held. Gr.

tumifrons, Hall, syn. for *Beyrichia ciliata*.

venusta, Billings, 1868, Catal. Sil. Foss. Antic., p. 68, Anticosti Gr.

rugulifera, see *Primitia rugulifera*.
sigillata, see *Primitia sigillata*.
spinosa, Hall, 1852, (*Cytherina spinosa*), Pal. N. Y., vol. 2, p. 317, Niagara Gr.

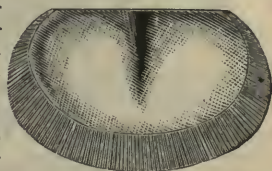


FIG. 979.—*Beyrichia striato-marginata*. Mag. 20 diam.

symmetrica, Hall, 1852, Pal. N. Y., vol. 2, p. 317, Niagara Gr.

trisulcata, Hall, 1859, Pal. N. Y., vol. 3, p. 381, Low. Held. Gr.

tumifrons, Hall, syn. for *Beyrichia ciliata*.

venusta, Billings, 1868, Catal. Sil. Foss. Antic., p. 68, Anticosti Gr.

BEYRICHONA, Matthew, 1885, Trans. Roy. Soc. Can., p. 65. [Ety. from the genus *Beyrichia*.] Breadth and length nearly equal, broad end anterior, subtrigonal toward the base, rounded on the surface and having two furrows, short and faintly impressed. Type *B. papilio*.

papilio, Matthew, 1885, Trans. Roy. Soc. Can., p. 65, St. John Gr.

tinea, Matthew, 1885, Trans. Roy. Soc. Can., p. 66, St. John Gr.

Brongniartia, Eaton, 1832, Geo. Text Book, syn. for *Asaphus*.

BRONTEUS, Goldfuss, 1839, Nova. Act. Phys. Med. Cæsareæ Leop. Carol. Nat. Curios, xix, p. 360. [Ety. mythological name.] Glabella depressed, ovate, widest in front, three pair of segmental furrows, anterior ones farthest apart; eye-line proceeding upward from the middle of each side of the posterior margin, with a short, sigmoidal curve to the eye-lobe, and thence curving inward and forward to the front; thorax of ten segments, axial lobe equaling the lateral lobes in width, lateral lobes flat, without facets, bent backward at the tip, no pleural groove; pygidium semi-orbicular with a flattened entire margin, axial lobe short, sulci prolonged toward the margin, lateral folds broad, not reaching the margin. Type *B. altaceus*.

acamas, Hall, syn. for *B. occasus*.

barrandi, Hall, 1859, Pal. N. Y., vol. 3, p. 350, Low. Held. Gr.

canadensis, Logan, 1846, Rep. Geo. Sur. Canada, App. G. G. G. of Legislative Documents, Low. Held. Gr.

altaceus, Hall, syn. for *B. occasus*.

barrandi, Hall, 1859, Pal. N. Y., vol. 3, p. 350, Low. Held. Gr.

canadensis, Logan, 1846, Rep. Geo. Sur. Canada, App. G. G. G. of Legislative Documents, Low. Held. Gr.

altaceus, Hall, syn. for *B. occasus*.

barrandi, Hall, 1859, Pal. N. Y., vol. 3, p. 350, Low. Held. Gr.

canadensis, Logan, 1846, Rep. Geo. Sur. Canada, App. G. G. G. of Legislative Documents, Low. Held. Gr.

altaceus, Hall, syn. for *B. occasus*.

barrandi, Hall, 1859, Pal. N. Y., vol. 3, p. 350, Low. Held. Gr.

canadensis, Logan, 1846, Rep. Geo. Sur. Canada, App. G. G. G. of Legislative Documents, Low. Held. Gr.

altaceus, Hall, syn. for *B. occasus*.

barrandi, Hall, 1859, Pal. N. Y., vol. 3, p. 350, Low. Held. Gr.

canadensis, Logan, 1846, Rep. Geo. Sur. Canada, App. G. G. G. of Legislative Documents, Low. Held. Gr.

altaceus, Hall, syn. for *B. occasus*.

barrandi, Hall, 1859, Pal. N. Y., vol. 3, p. 350, Low. Held. Gr.

canadensis, Logan, 1846, Rep. Geo. Sur. Canada, App. G. G. G. of Legislative Documents, Low. Held. Gr.



FIG. 978.—*Beyrichia richardsoni*. Mag. 6½ diam.



FIG. 980.—*Bronteus iunatus*.

flabellifer, Goldfuss, Nova. Acta. Acad. Caes. Leop. Nat. Cur., vol. 16, p. 360, Up. Silurian.

insularis, Billings, 1866, Catal. Sil. Foss. Antic., p. 66, Anticosti Gr.

laphami, Whitfield, 1878, Ann. Rep. Geo. Sur. Wis., p. 88, and Geo. Wis., vol. 4, p. 310, Niagara Gr.

lunatus, Billings, 1857, Rep. of Progr. Geo. Sur. Can., p. 338, Trenton Gr.

niagarensis, Hall, 1852, Pal. N. Y., vol. 2, p. 314, Niagara Gr.

occasus, Winchell & Marcy, 1865, Mem. Bost. Soc. Nat. Hist., vol. 1, p. 104, Niagara Gr.

pompilius, Billings, 1863, Proc. Port. Soc. Nat. Hist., vol. 1, p. 123, Low. Held. Gr.

tullius, Hall, 1888, Pal. N. Y., vol. 7, p. 12, Ham. Gr.

Bumastus, Murchison, 1839, Sil. Syst. Not American, though I have illustrated the genus because so many have referred *Illænus* to it.

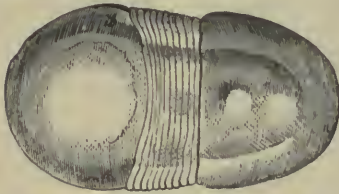


FIG. 981.—*Bumastus barriensis*.

barriensis, see *Illænus ioxus*.

trentonensis, see *Illænus trentonensis*.

BUNODELLA, Matthew, 1888, Trans. Roy. Soc. Can., p. 56. Body ovate-elongate, trilobed longitudinally; cephalic shield subtriangular, with rounded angles; composed of a glabella, fixed cheeks and movable (?) cheeks; glabella broadly cylindrical and rounded in front; fixed cheeks expanded in front, and having ear-shaped lateral lobes defined by an impressed line which may have been movable; thorax, so far as known, had seven segments, and consisted of an elongate cylindro-conical body, having triangular lappets or pleuræ attached at the sides. Type *B. horrida*.

horrida, Matthew, 1888, Trans. Roy. Soc. Can., p. 56, Up. Silurian or Low. Devonian.

CALYMENE, Brongniart, 1822, Hist. Nat. Crust. Foss., p. 7. [Ety. *kekalymenos*, concealed.] Cephalic shield sublunate, margin thickened, distinctly defined; glabella convex, narrower in front than behind, three lateral furrows on each side, the posterior one deep, neck segment well defined, eyes, small, prominent, hiant, near the glabella furrows, and slightly anterior to the middle; facial sutures cut the margin, in front of the eyes and curving slightly over each eye, defining a semicircular

eye-lobe, they extend to the lateral angles, each of which is exactly bisected; anteriorly they are connected by a rostral suture, thorax of thirteen segments, axis most convex, lateral lobes wider than axis, bent down with large facets; pygidium semi-oval, axis prominent, seven to eleven segments, margin entire. Type *C. blumenbachi*.

anchiops, see *Dalmanites anchiops*.

becki, see *Triarthrus becki*.

blumenbachi, Brongniart, 1822, Hist. Nat. Crust. Foss., p. 11. American form called *C. niagarensis*.

bucklandi, syn. for *Ceraurus pleurexanthemus*.

bufo, see *Phacops bufo*.

callicephala, Green, 1832, Monograph Trilobites, p. 30, and Pal. N. Y., vol. 1, p. 238, Trenton and Hud. Riv. Grs.

camerata, Conrad, 1842, Jour. Acad. Nat. Sci., vol. 8, p. 278, and Pal. N. Y., vol. 2, p. 337, Coralline limestone.

christyi, Hall, 1860, 13th Rep. N. Y. St. Mus. Nat. Hist., p. 119, Hud. Riv. Gr.

clintoni, Vanuxem, (*Hemicrypturus clintoni*), Geo. Rep. 3d Dist. N. Y., p. 79, Clinton Gr.

conradi, Emmons, 1856, Am. Geol., p. 236, Hud. Riv. Gr.

crassimarginata, see *Proetus crassimarginatus*.

mammillata, Hall, 1861, Geo. Rep. Wis., p. 50, Trenton Gr.

marginalis, see *Proetus marginalis*.

multicostata, Hall, 1847, Pal. N. Y., vol. 1, p. 228, Birdseye and Trenton Gr.

nasuta, Ulrich, 1879, Jour. Cin. Soc. Nat. Hist., vol. 2, p. 131, Niagara Gr.



FIG. 982.—*Calymene callicephala*. Rolled specimen and the under side of cephalic shield with hypostoma in place.

niagarensis, Hall, 1843, Geo. Rep. 4th Dist. N. Y., p. 102, and Pal. N. Y., vol. 2, p. 307, Niagara Gr. This is the American variety of *C. blumenbachi*.

nupera, see *Phacops nupera*.

odontocephala, syn. for *Dalmanites selenurus*.

phlyctainodes, see *Encrinurus phlyctainodes*.

platys, Green, 1832, Monograph of Trilobites, p. 32, and Illust. Devon. Foss., pl. 1, Schoharie grit.

rostrata, Vogdes, 1880, Proc. Acad. Nat. Sci., p. 176, Clinton Gr.

rowii, see *Proetus rowii*.

rugosa, Shumard, 1855, Geo. Rep. Mo., p. 200, Low. Held. Gr.

- senaria*, Conrad, 1841, syn. for *C. calli-cephala*.
spinifera, not defined.
trisulcata, Hall, 1843, *Gep. Rep.* 4th Dist. N. Y., p. 74, Clinton Gr.
 CANDONA, Baird, 1845, *Trans. Berw. Nat. Club*, vol. 2, p. 152. A living genus, and probably not Palæozoic. Like *Cypris*, except the lower antennæ possess no tuft of setæ, and the second pair of jaws are destitute of a branchial appendage. The shell is also usually longer and narrower. Type *C. lucens*.
 (?) *elongata*, Jones & Kirby, 1884, *London Geo. Mag.*, 3d ser., vol. 1, p. 356, Carboniferous.
 CERATIOCARIS, McCoy, 1849, *Ann. and Mag. Nat. Hist.*, 2d ser., vol. 4, p. 412. [Ety. *keration*, pod; *karis*, shrimp,] Carapace bivalve, dorsal line angulated

- simplex*, Clarke, 1885, *Bull. U. S. Geo. Sur.*, No. 16, p. 43, Ham. Gr.
sinuata, Meek & Worthen, 1868, *Am. Jour. Sci.*, vol. 46, p. 22, and *Geo. Sur. Ill.*, vol. 3, p. 540, Coal Meas.
strigata, see *Solenocaris strigata*.
Ceratocephala, Warder, not defined so as to be recognized.
ceralepta, Anthony, a fragment of the tail of a *Ceraurus pleurexanthemus*, or of an *Acidaspis*.
goniata, Warder, a fragment of a *Dalmanites*, or an *Acidaspis*.
 CERAURUS, Green, 1832, *Monograph Trilobites*, p. 84. [Ety. *keras*, horn; *oura*, tail.] Cephalic shield crescentiform, trilobed, posterior angles extended into spines; glabella subquadrate, rounded and prominent in front, three lateral furrows on each side; eyes faceted minutely; facial sutures, commencing at the anterior margin, passing close to the anterior corners of the glabella curve around the eyes, from which points they extend outward, and then deflect a little backward, and cut the lateral margins forward of the neck furrow, if it were extended; cheeks generally scrobiculate; thorax of ten or twelve segments, axial lobe narrower than the



FIG. 983.—*Ceratiocaris sinuata*. Outline.

- with a slight furrow beneath it on each side; sides semielliptical, much elongated from before backward, evenly convex, ventral margin gently convex, posterior end truncated obliquely; on each side near the anterior end, low down, is an ocular spot; surface marked with fine, imbricating striæ. Type *C. solenoides*.
aculeata, Hall, 1859, *Pal. N. Y.*, vol. 3, p. 422, Waterlime Gr.
acuminata, Hall, 1859, *Pal. N. Y.*, vol. 3, p. 422, Waterlime Gr.
armata, syn. for *Echinocaris punctata*.
bradleyi, see *Colpocaris bradleyi*.
beecheri, Clarke, 1885, *Bull. U. S. Geo. Sur.*, No. 16, p. 44, Ham. Gr.
deweyi, Hall, 1859, (*Onchus deweyi*) *Pal. N. Y.*, vol. 2, p. 320, Niagara Gr.
elytroides, see *Colpocaris elytroides*.
grandis, Pohlman, 1881, *Bull. Buf. Soc. Nat. Hist.*, vol. 4, p. 19, Waterlime Gr.
longicauda, see *Echinocaris longicauda*.
maccoyana, Hall, 1859, *Pal. N. Y.*, vol. 3, p. 421, Waterlime Gr.
punctata, see *Echinocaris punctata*.
pusillus, Matthew, 1889, *Trans. Roy. Soc. Can.*, vol. 6, p. 49, Low. Held. Gr.

- lateral lobes; pleuræ flattened for a distance, and then curve downward and backward; pygidium small, segments terminating in digitations or spines; labrum oblong truncate, with a pair of furrows and small lateral auricles. Type *C. pleurexanthemus*.
 (?) *apollo*, Billings, 1860, (*Cheirurus apollo*) *Can. Nat. and Geol.*, vol. 5, p. 67, Quebec Gr. or Up. Taconic.
bimucronatus, see *Ceraurus niagarensis*.
crocotus, see *Acidaspis crocotus*.
 (?) *eryx*, Billings, 1860, (*Cheirurus eryx*) *Can. Nat. and Geol.*, vol. 5, p. 67, Quebec Gr. or Up. Taconic.
 (?) *glancus*, Billings, 1865, (*Cheirurus glaucus*) *Pal. Foss.*, vol. 1, p. 323, Quebec Gr. or Up. Taconic.
icarus, Billings, 1860, (*Cheirurus icarus*) *Can. Nat. and Geol.*, vol. 5, p. 67, Hud. Riv. Gr.
insignis, see *Ceraurus niagarensis*.
meekanus, n. sp., Hud. Riv. Gr. Proposed instead of *C. icarus*. Meek, in *Ohio Pal.*, vol. 1, p. 162, and plate 14, figs. a, b, and c. Meek referred this form to *C. icarus* of Billings, but it is distinguished by the form of the gla-

bella, by the furrows, structure of the thorax and form of central lobe, and by the pygidium, beside occurring in higher rocks and growing to a much larger size.

(?) *mercurius*, Billings, 1865, (*Cheirus mercurius*.) Pal. Foss., vol. 1, p. 285, Quebec Gr. or Up. Taconic.

niagarensis, Hall, 1867, 20th Rep. N. Y. St. Mus. Nat. Hist., p. 427, Niagara Gr. numitor, Billings, 1866, (*Cheirus numitor*.) Catal. Sil. Foss. Antic., p. 27, Hud. Riv. Gr.

nuperus, Billings, 1866, (*Cheirus nuperus*.) Catal. Sil. Foss. Antic., p. 60, Anticosti Gr.

(?) *perforator*, Billings, 1865, (*Cheirus perforator*.) Pal. Foss., vol. 1, p. 287, Quebec Gr. or Up. Taconic.



FIG. 984.—*Ceraurus pleurexanthemus*.

pompilius, Billings, 1865, (*Cheirus pompilius*.) Pal. Foss., vol. 1, p. 181, Chazy or Black Riv. Gr.

(?) *prolificus*, Billings, 1865, (*Cheirus prolificus*.) Pal. Foss., vol. 1, p. 285 and 325, Quebec Gr. or Up. Taconic.

pustulosus, syn. for *Ceraurus pleurexanthemus*.

rus, Walcott, 1877, 31st Rep. N. Y. St. Mus. Nat. Hist., p. 68, Trenton Gr.

satyrus, Billings, 1865, (*Cheirus satyrus*.) Pal. Foss., vol. 1, p. 324, Chazy Gr.

(?) *sol*, Billings, 1865, (*Cheirus sol*.) Pal. Foss., vol. 1, p. 288, Quebec Gr. or Up. Taconic.

(?) *solitarius*, Billings, 1865, (*Cheirus solitarius*.) Pal. Foss., vol. 1, p. 206, Quebec Gr. or Up. Taconic.

tarquinius, Billings, 1863, (*Cheirus tarquinius*.) Proc. Port. Soc. Nat. Hist., vol. 1, p. 121, Upper Silurian.

vigilans, see *Encrinurus vigilans*.

(?) *vulcanus*, Billings, 1865, (*Cheirus vulcanus*.) Pal. Foss., vol. 1, p. 284, and 324, Quebec Gr. or Up. Taconic.

CHARIOCEPHALUS, Hall, 1863, 16th Rep. N. Y. St. Mus. Nat. Hist., p. 175. [Ety. *charis*, charming or graceful; *kephale*, head.] Cephalic shield broad; cheeks moderately convex toward the eyes; glabella regularly convex and marked

by transverse furrows; eyes large, facial sutures cutting the contour of the front at or near the center as in *Agraulus*, but distinguished by the character of the palpebral lobe, large eye, and form of the cheek. Type *C. whitfieldi*.

tumifrons, Hall & Whitfield, 1877, U. S. Geo. Expl., 40th parallel, vol. 4, p. 224, Potsdam Gr.

whitfieldi, Hall, 1863, 16th Rep. N. Y. St. Mus. Nat. Hist., p. 175, Potsdam Gr.

Cheirus, Beyrich, 1845, syn. for *Ceraurus apollo*, see *Ceraurus apollo*.

eryx, see *Ceraurus eryx*.

glaucus, see *Ceraurus glaucus*.

icarus, see *Ceraurus icarus*.

mercurius, see *Ceraurus mercurius*.

numitor, see *Ceraurus numitor*.

nuperus, see *Ceraurus nuperus*.

perforator, see *Ceraurus perforator*.

polydorus, see *Ceraurus polydorus*.

pompilius, see *Ceraurus pompilius*.

prolificus, see *Ceraurus prolificus*.

satyrus, see *Ceraurus satyrus*.

sol, see *Ceraurus sol*.

solitarius, see *Ceraurus solitarius*.

tarquinius, see *Ceraurus tarquinius*.

vulcanus, see *Ceraurus vulcanus*.

pleurexanthemus, Green, 1832, Monog. Trilobites, p. 84, and Pal. N. Y., vol. 1, p. 242, Trenton and Hud. Riv. Gr.

(?) *polydorus*, Billings, 1865, (*Cheirus polydorus*.) Pal. Foss., vol. 1, p. 286, Quebec Gr. or Up. Taconic.

pompilius, Billings, 1865, (*Cheirus pompilius*.) Pal. Foss., vol. 1, p. 181, Chazy or Black Riv. Gr.

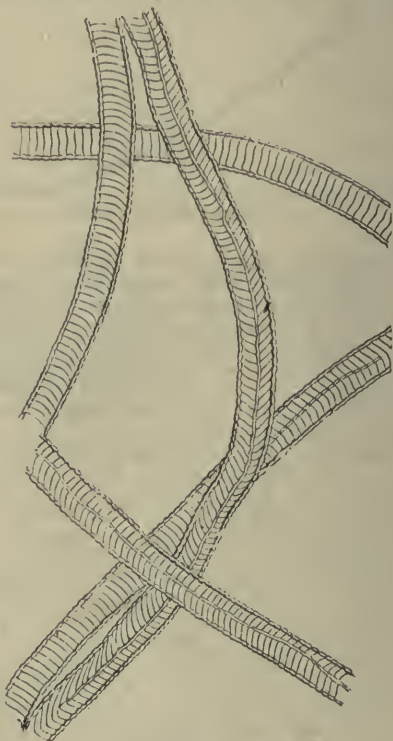


FIG. 985.—*Climactichnites wilsoni*.

CLIMACTICHNITES, Logan, 1860, Can. Nat. and Geol., vol. 5, p. 279. [Ety. *klimax*, ladder; *ichnos*, footstep.] A continuous

narrow trail, with cross furrows, making it ladder-like. It may not be the track of a Crustacean. Type *C. wilsoni*.

fosteri, Chamberlin, 1883, *Geo. of Wis.*, vol. 1, p. 132, Potsdam Gr.

wilsoni, Logan, 1860, *Can. Nat. and Geol.*, vol. 5, and *Geo. of Can.*, p. 107, Potsdam Gr.

youngi, Chamberlin, 1883, *Geo. of Wis.*, vol. 1, p. 132, Potsdam Gr.

COLPOCARIS, Meek, 1872, *Proc. Acad. Nat. Sci. Phil.*, p. 323. [Ety. *kolpos*, sinus; *karis*, shrimp.] Carapace valves are truncated backward and upward, with a profoundly sinuous outline; posterior extremity of the dorsal margin produced, pointed and curved downward; ventral margin inflected; attached on the dorsal margin by a flexible ligament; no eye tubercle or spot. Type *C. bradleyi*.

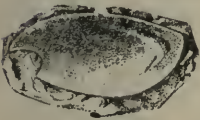


FIG. 986. — *Colpocaris bradleyi*.

bradleyi, Meek, 1872, *Proc. Acad. Nat. Sci. Phil.*, vol. 24, p. 322, and *Ohio Pal.*, vol. 2, p. 318, Waverly Gr.

chesterensis, Worthen, 1884, *Bull. No. 2*, Ill. St. Mus.

Nat. Hist., p. 3, and *Geo. Sur. Ill.*, vol. 8, p. 153, Kaskaskia Gr.

elytroides, Meek, 1872, *Proc. Acad. Nat. Sci. Phil.*, vol. 24, p. 334, and *Ohio Pal.*, vol. 2, p. 319, Waverly Gr.

Conocephalus, Zenker, 1833, *Beitr. z. Naturg. d. Urwelt*, p. 49. Preoccupied for a genus of Orthoptera.

Conocephalites, Barrande, 1852, *Syst. Sil. Boh.* This genus is regarded as a synonym for *Ptychoparia*, by Walcott, who also refers *Atops*, which has priority, to the same genus. After examining the original figure of *Ptychoparia*, I am not convinced that it is a synonym for *Atops*, hence I retain both names. There were but few genera better defined and established than *Atops*, when the name was put forth by Emmons; hence the rules of priority demand its retention.

adamsi, see *Conocoryphe adamsi*.

anatinus, see *Ptychoparia anatina*.

antiquatus, see *Ptychoparia antiquata*.

arenosus, see *Ptychoparia arenosa*.

aurora, see *Liostracrus aurora*.

baileyi, see *Conocoryphe baileyi*.

billingsi, see *Ptychoparia billingsi*.

binodosus, see *Ptychoparia binodosa*.

calceiferus, see *Ptychoparia calceifera*.

calymenoides, see *Ptychoparia calymenoides*.

cordilleræ, see *Ptychoparia cordilleræ*.

depressus, see *Ptychoparia depressa*.

diadematus, see *Ptychoparia diademata*.

elegans, see *Conocoryphe elegans*.

eos, see *Crepicephalus eos*.

eryon, see *Ptychoparia eryon*.

explanatus, see *Ptychoparia explanata*.

formosus, see *Solenopleura formosa*.

geminispinosus, see *Conocoryphe geminispinosa*.

halli, see *Solenopleura halli*.

hartii, see *Ptychoparia hartii*.

laticeps, see *Pterocephalia laticeps*.

matthewi, see *Harttia matthewi*.

minor, see *Ptychoparia minor*.

minutus, see *Ptychoparia minuta*.

miser, see *Atops miser*.

nactus, Hall. Not defined so as to be recognized.

nasutus, see *Ptychoparia nasuta*.

neglectus, see *Liostracrus neglectus*.

optatus, see *Ptychoparia optata*.

orestes, see *Solenopleura orestes*.

ouangondianus, see *Liostracrus ouangondianus*.

oweni, see *Ptychoparia oweni*.

pattersoni, see *Ptychoparia pattersoni*.

perseus, see *Ptychoparia perseus*.

quadratus, Hartt, see *Liostracrus quadratus*.

quadratus, Whitfield, see *Ptychoparia quadrata*.

robbei, see *Solenopleura robbei*.

shumardi, see *Ptychoparia shumardi*.

subcoronatus, see *Ptychoparia subcoronata*.

tener, see *Liostracrus tener*.

teucer, see *Ptychoparia teucer*.

thyrsites, see *Solenopleura thyrsites*.

verrucosus, see *Ptychoparia verrucosa*.

vulcanus, see *Crepicephalus vulcanus*.

winona, see *Ptychoparia winona*.

zenkeri, see *Ptychoparia zenkeri*.

CONOCORYPHE, Corda, 1847, *Prodrom einer Monographie der bohmischen Trilobiten*, p. 139. [Ety. *konos*, cone; *koryphe*, top of the head.] Cephalic shield somewhat semicircular, convex; glabella convex, somewhat cone-shaped, widest behind, rounded in front, from one-half to three-fourths the length of the head, lateral furrows from one to three on each side, more or less distinct; facial sutures cut obliquely across the margin from about the beginning of the lateral third, and curve around the eyes, and then curve outward toward the posterior angles; (in *C. sulzeri* and as described by Corda, the facial sutures begin near the apex directly in front of the eyes, and are directed in lines nearly parallel to the eye-lobes.) Thorax eight to sixteen segments, axial lobe narrower than lateral lobes, pleuræ faceted; pygidium small. Type *C. sulzeri*.

adamsi, Billings, 1861, (*Conocephalites adamsi*), *Geo. Vt.*, vol. 2, p. 950, Up. Taconic or Georgia Gr.

baileyi, Hartt, 1868, (*Conocephalites baileyi*), *Acad. Geol.*, p. 645, St. John Gr. *elegans*, Hartt, 1868, (*Conocephalites elegans*), *Acad. Geol.*, p. 650, St. John Gr. *gallatinensis*, Meek, 1873, 6th Rep. Hayden's U. S. Geo. Sur. Terr., p. 485, Up. Taconic.

geminispinosa, Hartt, 1868, (*Conocephalites geminispinosus*.) Acad. Geol., p. 653, St. John Gr.

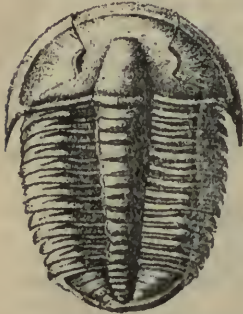


FIG. 987.—*Conocoryphe kingi*.

Can., p. 119, St. John Gr.

Coronura, Hall, 1888, Pal. N. Y., vol. 7, p. 32. Founded upon the variation in the spines of the pygidium of Dalmanites. *Corycephalus*, Hall, 1888, syn. for Dalmanites.

CREPICEPHALUS, Owen, 1852, Geo. Sur. Wis. Iowa, and Minn., p. 376. [Ety. *krepis*, horseshoe; *kephale*, head.] Glabella rather flat, slipper-shaped, tapering and slightly acuminate anteriorly, with a faint ridge in the median line; two small depressions, and a posterior furrow partially divide the glabella; facial sutures run nearly parallel to the margin of the glabella, and join a thickened, cord-like, anterior, narrow border, inclosing a convex area, narrower in front than at the sides; pygidium large; axial lobe has four segments, side-lobes bounded by a slightly concave border, which widens posteriorly, and terminates in long spines, and of which the confines are almost rectangular, with rounded corners. Type *C. iowensis*.

angulatus, Hall & Whitfield, 1877, U. S. Geo. Expl. 40th Parallel, vol. 4, p. 220, Potsdam Gr.

anytus, Hall & Whitfield, 1877, U. S. Geo. Expl. 40th parallel, vol. 4, p. 219, Potsdam Gr.

angusta, Walcott, 1886, Bull. U. S. Geo. Sur., No. 30, p. 208, Up. Taconic.

centralis, Whitfield, 1877, Rep. on the Pal. of Black Hills, p. 10, and Geo. Black Hills, p. 341, Potsdam Gr.

diadematus, Hall, 1863, (*Conocephalites diadematus*.) 16th Rep. N. Y. St. Mus. Nat. Hist., p. 167, Potsdam Gr.

eos, Hall, 1863, (*Conocephalites eos*.) 16th Rep. N. Y. St. Mus. Nat. Hist., p. 151, Potsdam Gr.

gibbesi, Whitfield, 1880, Ann. Rep. Geo. Sur. Wis., p. 50, Potsdam Gr.

granulosus, Hall & Whitfield, 1877, U. S. Geo. Expl. 40th Parallel, vol. 4, p. 214, Potsdam Gr.

kingi, Meek, 1870, Proc. Acad. Nat. Sci. Phil., vol. 22, p. 63, and Rep. on 40th Parallel, p. 20, Up. Taconic.

quadrans, Hall & Whitfield, 1877, (*Crepicephalus quadrans*.) Geo. 40th Parallel, vol. 4, p. 238, Up. Taconic.

walcotti, Matthew, 1884, Trans. Roy. Soc.

haguei, Hall & Whitfield, 1877, U. S. Geo. Expl. 40th Parallel, vol. 4, p. 210, Potsdam Gr.

iowensis, Owen, 1852, Geo. Sur. Wis., Iowa, and Minn., p. 576, Potsdam Gr.



FIG. 988.—*Crepicephalus liliannus*. Cephalic shield without the movable cheeks.



FIG. 989.—*Crepicephalus liliannus*. Pygidium.

liliannus, Walcott, 1886, Bull. U. S. Geo. Sur., vol. No. 30, p. 207, Up. Taconic.

maculosus, Hall & Whitfield, 1877, U. S. Geo. Expl. 40th Parallel, vol. 4, p. 215, Potsdam Gr.

miniscensis, Owen, 1852, Geo. Sur. Wis., Iowa, and Minn., pl. 1, fig. 14, Potsdam Gr.

montanensis, Whitfield, 1876, Rep. Recon. Up. Mo. to Yel. Nat. Park, p. 141, Potsdam Gr.

nitidus, Hall & Whitfield, 1877, U. S. Geo. Expl. 40th Parallel, vol. 4, p. 212, Potsdam Gr.

onustus, Whitfield, 1878, Ann. Rep. Geo. Sur. Wis., Potsdam Gr.

oweni, Meek & Hayden, 1861, (*Arionellus* (*Crepicephalus*) *oweni*.) Proc. Acad. Nat. Sci., vol. 13, p. 436, Potsdam Gr.

planus, Whitfield, 1877, Rep. on Pal. of Black Hills, p. 11, and Geol. Black Hills, p. 343, Potsdam Gr.

quadrans, see *Conocoryphe quadrans*.

simulator, Hall & Whitfield, 1877, U. S. Geo. Expl. 40th Parallel, vol. 4, p. 218, Potsdam Gr.

unisulcatus, Hall & Whitfield, 1877, U. S. Geo. Expl. 40th Parallel, vol. 4, p. 216, Potsdam Gr.

vulcanus, Billings, 1861, (*Conocephalites vulcanus*.) Pal. Foss., vol. 1, p. 14, Potsdam Gr.

wisconsinensis, see *Lonchocephalus wisconsinensis*.

Cryphaeus, Green, 1837, Jour. Acad. Nat. Sci., vol. 7, syn. for Dalmanites. Not well defined, and the name was preoccupied for a genus of Coleoptera in 1833.

boothii, see *Dalmanites boothii*.

calliteles, see *Dalmanites calliteles*.

greeni, syn. for *Dalmanites calliteles*.

Cryptolithus, syn. for *Trinucleus*.

tesselatus, see *Trinucleus concentricus*.

Cybele, Loven, 1845, p. 110, Oversigt Vetensk. Acad. Handl., p. 110.

punctata, Hall, 1852. This species belongs to the genus *Encriurus*, and the specific name being preoccupied, the name is changed to *E. ornatus*.

Cyclus americanus, Packard, 1885, Am. Nat., vol. 19, p. 293, Coal Meas. Not defined so as to be recognized.

CYPHASPIS, Burmeister, 1843, Die Organ der Trilobiten, p. 103. [Ety. *cyphos*, convex; *aspis*, shield.] Cephalic shield semicircular, posterior angles produced in spines, margin thickened; glabella very convex, ovoid, no furrows, but with two small pyriform basal lobes bounded by deep furrows; eyes small, semilunate; cheeks broad; facial sutures proceed in a nearly straight line, from the anterior margin to the eyes, and are then directed to the posterior angles; thorax 10 to 17 segments, rounded at their extremities; axis tapering; pygidium small, axis short, lateral lobes depressed. Type *C. ceratophthalmus*.

brevimarginatus, Walcott, 1885, Monogr. U. S. Geo. Sur., vol. 8, p. 93, Trenton Gr.

christyi, Hall, Trans. Alb. Inst., vol. 4, p. 188, Niagara Gr.

celebs, Hall, 1888, Pal. N. Y., vol. 7, p. 151, Low. Held. Gr.

craspedota, Hall, 1888, Pal. N. Y., vol. 7, p. 148, Ham. Gr.

diadema, Hall, 1888, Pal. N. Y., vol. 7, p. 144, Up. Held. Gr.

girardeauensis, Shumard, 1855, Geo. Rep. Mo., p. 197, Trenton Gr.

hybrida, Hall, 1888, Pal. N. Y., vol. 7, p. 144, Up. Held. Gr.

lævis, Hall, 1876, (Phillipsia *lævis*,) Illust. Devon. Foss., pl. 21, Chemung Gr.

minuscula, Hall, 1876, (Phillipsia *minuscula*,) Illust. Devon. Foss., pl. 20, Up. Held. Gr.

ornata, Hall, 1876, (Phillipsia *ornata*,) Illust. Devon. Foss., pl. 21, Ham. Gr.

ornata var. *baccata*, Hall, 1888, Pal. N. Y., vol. 7, p. 146, Ham. Gr.

stephanophora, Hall, 1888, Pal. N. Y., vol. 7, p. 142, Up. Held. Gr.

Cythere, Muller, 1785, Entomostraca sue Insecta, etc., p. 63. The type is *C. flavida* a living species. The genus is unknown in Palæozoic rocks.

americana, see Beyrichia *americana*.

carbonaria, see Leperditia *carbonaria*.

cincinnatiensis, see Cytheropsis *cincinnatiensis*.

crassimarginata, see Cytheropsis *crassimarginata*.

irregularis, see Cytheropsis *irregularis*.

nebraskensis, see Cytheropsis *nebraskensis*.

okeni, see Leperditia *okeni*.

simplex, see Cytheropsis *simplex*.

sublævis, see Leperditia *sublævis*.

subrecta, see Leperditia *subrecta*.

CYTHIERELLA, inflata.

I find in the Acadian Geology, p. 206, a small Entomostraca, from the Coal Meas. of Nova Scotia, figured under this name, but without any description or reference to any other author. The figures are reproduced.



FIG. 992.—Cytherella inflata.

Cytherella glandella, see Cytheropsis *glandella*.

Cytherina, Lamarck, 1818, Anim. sans Vert. t. v, p. 125. [Ety. diminutive of *Cythere*.] A synonym for *Cythere*, which is not a Palæozoic genus.

alta, see Leperditia *alta*.

crenulata, see Cytheropsis *crenulata*.

cylindrica, see Isochilina *cylindrica*.

fabulites; see Leperditia *fabulites*.

spinosa, see Beyrichia *spinosa*. Not Reuss in 1844.

subcylindrica, see Cytheropsis *subcylindrica*.

subelliptica, see Cytheropsis *subelliptica*.

CYTHIEROPSIS, McCoy, 1849, Ann. and Mag. Nat. Hist., 2d. ser., vol. 4, p. 249. [Ety. *Cytheropsis*, resembling *Cythere*.] Distinguished from *Cythere*, which now swarms in the sea, by the great thickness of the valves, and in having eye or muscle spots. Type *C. aldensis*.

cincinnatiensis, Meek, 1872, (Cythere *cincinnatiensis*,) Proc. Acad. Nat. Sci., p. 331, and Ohio Pal., vol. 1, p. 158, Hud. Riv. Gr.

concinna, see Primitia *concinna*.

crassimarginata, Winchell, 1862, (Cythereopsis *crassimarginata*,) Proc. Acad. Nat. Sci., p. 429, Marshall Gr.

crenulata, Emmons, 1856, (Cytherina *crenulata*,) Am. Geol., p. 220, Trenton Gr.



FIG. 993.—Cytheropsis concinna.



FIG. 991.—Cyphaspis girardeauensis.

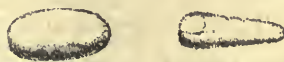


FIG. 994.—Cytheropsis glandella.

glandella, Whitfield, 1882, (Cytherellina *glandella*,) Bull. Am. Mus. Nat. Hist., vol. 1, p. 94, Warsaw Gr.

irregularis, S. A. Miller, 1878, (Cythere *irregularis*,) Jour. Cin. Soc. Nat. Hist., vol. 1, p. 106, Hud. Riv. Gr.

nebraskensis, Geinitz, 1866, (Cythere *nebraskensis*,) Carb. und Dyas in Neb., p. 2, Coal Meas.

rugosa, Jones, 1858, Ann. Nat. Hist., 3d ser., vol. 1, p. 249, Black Riv. Gr.

siliqua, Jones, 1858, Ann. Nat. Hist., 3d ser., vol. 1, p. 249, Black Riv. Gr.

simplex, White & St. John, 1868, (Cythere simplex,) Trans. Chi. Acad. Sci., p. 127, St. Louis Gr.

subcylindrica, Emmons, 1856, (Cytherina subcylindrica,) Am. Geo., p. 220, Trenton Gr.

subelliptica, Emmons, 1856, (Cytherina subelliptica,) Am. Geo., p. 220, Black Riv. Gr.

Dalmania, Emmrich, 1845. This name having been preoccupied for a genus of insects, Dalmanites has been substituted, though many authors prefer to use *Odontochile*, a name proposed by Corda.

DALMANITES, (Emmrich, 1845, *Dalmania*.) Barrande, 1852, Syst. Syl. Boh., vol. 1. [Ety. proper name.] Cephalic shield sublunate, with lateral angles produced into spines; glabella widest anteriorly, rounded in front, with a highly convex anterior subelliptical lobe, three lateral furrows on each side; eyes prominent, subreniform, lenses numerous, situated posteriorly; facial sutures, curving slightly from the anterior margin, and each, following the curvature of the eye to the posterior part by a sigmoidal flexure, reach the lateral margin very slightly posterior to the eye itself; thorax with eleven segments, axis most convex, lateral lobes wider and more or less flattened; pygidium subtriangular, usually extended posteriorly into a spine, segments numerous. Type *D. caudatus*.

acantholeurus, Conrad, 1841, (Asaphus *acantholeurus*.) Ann. Rep. N. Y., p. 48, and Illust. Devon. Foss., pl. 19, Onondaga limestone.

achates, Billings, 1860, Can. Nat. and Geo., vol. 5, p. 63, Trenton Gr.

ageria, Hall, 1862, 15th Rep. N. Y. St. Mus. Nat. Hist., p. 57, and Illust. Devon. Foss., pl. 12, Up. Held. Gr.

anchiops, Green, 1832, (Calymene *anchiops*.) Monograph of Trilobites, p. 35, and Illust.

Devon. Foss., pl. 9, Schoharie grit.
anchiops var. *armatus*, Hall, 1862, 15th Rep. N. Y. St. Mus. Nat. Hist., p. 56, Schoharie grit.

anchiops var. *sobrinus*, syn. for *D. anchiops*.
aspectans, Conrad, 1841, (Asaphus *aspectans*.) Ann. Rep. N. Y., p. 49, and Illust. Devon. Foss., pl. 13, Up. Held. Gr.

barrisi, Hall, 1888, Pal. N. Y., vol. 7, p. 48, Ham. Gr.

bebryx, Billings, 1860, Can. Nat. and Geo., vol. 5, p. 61, Trenton Gr.

bicornis, Hall, 1876, 28th Rep. N. Y. St. Mus. Nat. Hist., p. 196, Niagara Gr.

bifidus, Hall, 1862, 15th Rep. N. Y. St. Mus. Nat. Hist., p. 63, Up. Held. Gr.

boothi, Green, 1837, (Cryphaeus *boothi*.) Am. Jour. Sci., vol. 32, p. 343, and Pal. N. Y., vol. 7, p. 42, Ham. Gr.

breviceps, Hall, 1866, 24th Rep. N. Y. St. Mus. Nat. Hist., p. 223, Hud. Riv. Gr.

callicephalus, Hall, 1847, (Phacops *callicephalus*.) Pal. N. Y., vol. 1, p. 247, Trenton Gr.

calliteles, Green, 1837, (Cryphaeus *calliteles*.) Am. Jour. Sci. and Arts, vol. 32, p. 346, and Illust. Devon. Foss., pl. 16, Ham. Gr.

calypso, Hall, 1862, 15th Rep. N. Y. St. Mus. Nat. Hist., p. 61, and Illust. Devon. Foss., pl. 13, Up. Held. Gr.

carleyi, Meek, 1872, Am. Jour. Sci., 3d ser., vol. 3, p. 424, and Ohio Pal. vol. 1, p. 170, Hud. Riv. Gr.

comis, Hall, 1888, Pal. N. Y., vol. 7, p. 41, Up. Held. Gr.

concinus, Hall, 1876, Illust. Devon. Foss., pl. 10, Schoharie grit.

concinus var. *serrula*, Hall, 1888, Pal. N. Y., vol. 7, p. 30, Up. Held. Gr.

coronatus, Hall, 1862, 15th Rep. N. Y. St. Mus. Nat. Hist., p. 58, and Illust. Devon. Foss., pl. 12, Ham. Gr.

cuyahogæ, Claypole, 1884, Geol. Mag., 3d ser., vol. 1, p. 303, Waverly Gr.

danæ, Meek & Worthen, 1865, Proc. Acad. Nat. Sci. Phil., p. 264, and Geo. Sur. Ill., vol. 3, p. 363, Niagara Gr.

dentatus, Barrett, 1876, Am. Jour. Sci. and Arts, vol. 11, p. 200, Low. Held. Gr.
denticulatus, Conrad, 1841, (Asaphus *denticulatus*.) Ann. Rep. N. Y., p. 48, and Illust. Devon. Foss., pl. 10, Up. Held. Gr.

emarginatus, Hall, 1876, Illust. Devon. Foss., pl. 10, Up. Held. Gr.

epicrates, Billings, 1863, Proc. Port. Soc. Nat. Hist., vol. 1, p. 119, Low. Held. Gr.
erina, Hall, 1862, 15th Rep. N. Y. St. Mus. Nat. Hist., p. 62, Up. Held. Gr.

helena, Hall, 1862, 15th Rep. N. Y. St. Mus. Nat. Hist., p. 61, Up. Held. Gr.
intermedius, Walcott, 1877, 31st Rep. N. Y. St. Mus. Nat. Hist., p. 69, Trenton Gr.

laticaudatus, Hall, 1847. This name is erased from the list.

limulus, Green, 1832, (Asaphus *limulus*.) Monograph Trilobites, p. 48, and Pal. N. Y., vol. 2, p. 303, Niagara Gr.

logani, Hall, 1860, Can. Nat. and Geo., vol. 5, p. 156, and Acad. Geol., p. 608, Up. Silurian.



FIG. 996.—*Dalmanites callicephalus*.



FIG. 997.—*Dalmanites calliteles*.



FIG. 995.—*Dalmanites achates*.

macrops, Hall, 1862, 15th Rep. N. Y. St. Mus. Nat. Hist., p. 59, Up. Held. Gr.
meeki, Walcott, 1885, Monogr. U. S. Geo. Sur., vol. 8, p. 207, Lower Devonian.
micurus, Green, 1832, (Asaphus micurus,) Monograph Trilobites, p. 56, and Pal. N. Y., vol. 3, p. 359, Low. Held. Gr.

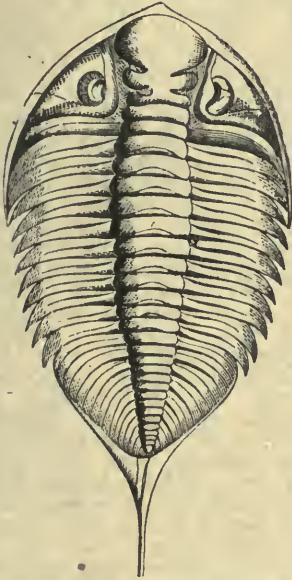


FIG. 998.—*Dalmanites limulurus*.

myrmecophorus, Green, 1835, (Asaphus myrmecophorus,) Supp. to Monograph of Trilobites, p. 16, and Illust. Devon. Foss., pl. 13, Up. Held. Gr.
nasutus, Conrad, 1841, (Asaphus nasutus,) Ann. Rep. N. Y., p. 48, and Pal. N. Y., vol. 3, p. 362, Low. Held. Gr.
ohioensis, Meek & Worthen, 1871, Proc. Acad. Nat. Sci. Phil., p. 91, and Ohio Pal., vol. 1, p. 234, Up. Held. Gr.
phacoptyx, Hall, 1888, Pal. N. Y., vol. 7, p. 31, Up. Held. Gr.
pleione, Hall, 1862, 15th Rep. N. Y. St. Mus. Nat. Hist., p. 62, and Illust. Devon. Foss., pl. 16, Up. Held. Gr.
pleuropteryx, Green, 1832, (Asaphus pleuropteryx,) Monograph Trilobites, p. 55, and Pal. N. Y., vol. 3, p. 356, Low. Held. Gr.
pygmæus, Hall, 1888, Pal. N. Y., vol. 7, p. 56, Up. Held. Gr.
regalis, Hall, 1876, Illust. Devon. Foss., pl. 11, Schoharie grit.
selenurus, Eaton, 1832, (Asaphus selenurus,) Geo. Text Book, p. 31, and Illust. Devon. Foss., pl. 12, Corniferous Gr.
tridens, Hall, 1859, Pal. N. Y., vol. 3, p. 361, Low. Held. Gr.
tridentiferus, Shumard, 1855, Geo. Rep. Mo., p. 199, Low. Held. Gr.
troosti, Safford. Not defined.
verrucosus, Hall, 1863, Trans. Alb. Inst., vol. 4, p. 218, Niagara Gr.

vigilans, Hall, 1861, Rep. Prog. Geo. Sur. Wis., p. 51, Niagara Gr.
werthneri, Foerste, 1885, Bull. Sci. Lab. Denison Univ., p. 116. Not well defined.

DICELLOCEPHALUS, Owen, 1852, Geo. Sur. Wis., Iowa, and Min., p. 573, (written by Owen Dikelocephalus.) [Ety. *dikella*, mattock; *kephale*, head.] Cephalic shield sublunate or semicircular, rather flat; glabella oblong; sides parallel, rounded in front, transverse behind; three lateral furrows on each side, the posterior two crossing the glabella and dividing it into three lobes; facial sutures arise in the center of the anterior border, run parallel with the same to the front of the eyes, are then directed backward, make a sigmoid flexure over each eye, and when near the neck segment abruptly curve laterally, reaching the posterior border near the posterior spines of the cephalic shield; thorax with nine segments, axis narrower than lateral lobes; pygidium with a flattened border, produced posteriorly on each side, and rounded in the middle; axis extended only about half the length, with four to six segments, which become obsolete on the lateral lobes. Type *D. minnesotensis*.

affinis, Billings, 1865, Pal. Foss., vol. 1, p. 197, Quebec Gr. or Up. Taconic.
angustifrons, Walcott, 1885, Monogr. U. S. Geo. Sur., vol. 8, p. 42, Potsdam Gr.
barabuensis, Whitfield, 1878, Ann. Rep. Geo. Sur. Wis., p. 63, and Geo. Wis., vol. 4, p. 201, Low. Magnesian Gr.
belli, Billings, 1860, Can. Nat. and Geo., vol. 5, p. 301, Quebec Gr. or Up. Taconic.
bilobatus, Hall & Whitfield, 1877, U. S. Geo. Expl. 40th Parallel, vol. 4, p. 226, Potsdam Gr.
(?) *corax*, Billings, 1865, Pal. Foss., vol. 1, p. 334, Quebec Gr. or Up. Taconic.
crassimarginatus, Whitfield, 1882, Geo. Wis., vol. 4, p. 344, Potsdam Gr.
cristatus, Billings, 1860, Can. Nat. and Geo., vol. 5, p. 301, Quebec Gr. or Up. Taconic.
devinei, Billings, 1865, Pal. Foss., vol. 1, p. 195, Quebec Gr. or Up. Taconic.
eatoni, Whitfield, 1878, Ann. Rep. Geo. Sur. Wis., p. 65, and Geo. Wis., vol. 4, p. 202, Low. Magnesian Gr.
expansus, Walcott, 1885, Monogr. U. S. Geo. Sur., vol. 8, p. 45, Potsdam Gr.
finalis, Walcott, 1885, Monogr. U. S. Geo. Sur., vol. 8, p. 89, Up. Taconic.
flabellifer, Hall & Whitfield, 1877, U. S. Geo. Expl. 40th Parallel, vol. 4, p. 227, Potsdam Gr.
(?) *flagricaudus*, White, 1874, Rep. Invert. Foss., p. 12, and Geo. Sur. W. 100th Mer., vol. 4, p. 60, Quebec Gr. or Up. Taconic.
gothicus, Hall & Whitfield, 1877, U. S. Geo. Expl. 40th Parallel, vol. 4, p. 242, Up. Taconic. Probably a syn. for *Olenoides wahsatchensis*.

granulosus, see *Ptychaspis granulosa*.
hisingeri, Billings, 1865, Pal. Foss., vol. 1, p. 196, Quebec Gr. or Up. Taconic.
inexpectans, Walcott, 1885, Monogr. U. S. Geo. Sur., vol. 8, p. 90, Quebec Gr. or Up. Taconic.
irole, Walcott, 1885, Monogr. U. S. Geo. Sur., vol. 8, p. 43, Potsdam Gr. or Up. Taconic.
latifrons, Shumard, 1863, Trans. St. Louis Acad. Sci., vol. 2, p. 101, Potsdam Gr.
lodensis, Whitfield, 1880, Ann. Rep. Geo. Sur. Wis., p. 51, and Geo. Wis., vol. 4, p. 189, Potsdam Gr.
magnificus, Billings, 1860, Can. Nat. and Geo., vol. 5, p. 301, Quebec Gr. or Up. Taconic.
marconi, Whitfield, 1884, Bull. Am. Mus. Nat. Hist., vol. 1, p. 139, Up. Taconic.
marica, Walcott, 1885, Monogr. U. S. Geo. Sur., vol. 8, p. 44, Potsdam Gr.
megalops, Billings, 1860, Can. Nat. and Geo., vol. 5, p. 301, Quebec Gr. or Up. Taconic.
miniscensis, see *Ptychaspis miniscensis*.

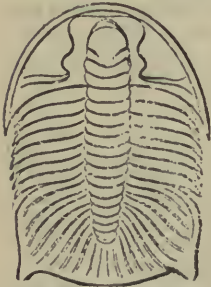


FIG. 999.—*Diectiocephalus minnesotensis*.

minnesotensis, Owen, 1852, Rep. Wis., Iowa, and Minn., p. 574, Potsdam Gr.
minnesotensis var. *limbatus*, Hall, 1863, 16th Rep. N. Y. St. Mus. Nat. Hist., p. 141, Potsdam Gr.
misa, Hall, 1863, 16th Rep. N. Y. St. Mus. Nat. Hist., p. 144, Potsdam Gr.
missisquoi, Billings, 1865, Pal. Foss., vol. 1, p. 199, Quebec Gr. or Up. Taconic.
multicinctus, Hall & Whitfield, 1877, U. S. Geo. Expl. 40th Parallel, vol. 4, p. 226, Potsdam Gr.
nasutus, Walcott, 1885, Monogr. U. S. Geo. Sur., vol. 8, p. 44, Potsdam Gr.
osceola, Hall, 1863, 16th Rep. N. Y. St. Mus. Nat. Hist., p. 146, Potsdam Gr.
oweni, Billings, 1860, Can. Nat. and Geo., vol. 5, p. 301, Quebec Gr. or Up. Taconic.
pauper, Billings, 1865, Pal. Foss., vol. 1, p. 200, Quebec Gr. or Up. Taconic.
pepinensis, Owen, 1852, Geo. Wis., Iowa, and Minn., p. 574, Potsdam Gr.
planifrons, Billings, 1860, Can. Nat. and Geo., vol. 5, p. 301, Quebec Gr. or Up. Taconic.
pogonipensis, Hall & Whitfield, 1877, U. S. Geo. Expl. 40th Parallel, vol. 4, p. 243, Potsdam Gr.
quadriceps, see *Olenoides quadriceps*.
richmondensis, Walcott, 1885, Monogr. U. S. Geo. Sur., vol. 8, p. 41, Potsdam Gr.
roemeri, Shumard, 1861, Am. Jour. Sci., vol. 32, p. 220, Potsdam Gr.
selectus, Billings, 1865, Pal. Foss., vol. 1, p. 199, Quebec Gr. or Up. Taconic.

sesostris, see *Ptychaspis sesostris*.
spiniger, Hall, 1863, 16th Rep. N. Y. St. Mus. Nat. Hist., p. 143, Potsdam Gr.
wahsatchensis, see *Olenoides wahsatchensis*.

Dicranurus, syn. for *Acidaspis*.
hamatus, see *Acidaspis hamata*.
 DIONIDE, Barrande, 1847, in Lith. Proc. [Ety. from the mythological name *Dione*.] Body oval, tapering behind, trilobed, faintly convex; cephalic shield short, wide, semicircular, or crescentiform, produced at the postero-lateral angles into spines; glabella short, wide, strongly convex, smooth, no lateral furrows; two longitudinal furrows, making it trilobate; cheeks wide, with perforated margin; no eyes; no facial suture; hypostoma elliptical, with two bow-shaped wings in front, and posterior margin entire; six thoracic segments, with nodes on each side of the axial lobe; pygidium subtriangular, rounded behind axis, with numerous segments, and lateral lobes with radial furrows. Type *D. formosa*.
 (?) *perplexa*, Billings, 1866, Catal. Sil. Foss. Antic., p. 67, Anticosti Gr.
 DIPELTS, Packard, 1885, Am. Nat., vol. 19, p. 291. [Ety. *dis*, double; *pelte*, small shield.] Cyclus-like in form; suborbicular, flattened, disk-like, sloping from the median area to the edge; divided in two parts, a cephalic shield and abdomen; integument thin, showing no segments. Type *D. diplodiscus*.
diplodiscus, Packard, 1885, Am. Nat., vol. 19, p. 291, Coal Meas. Poorly defined.
Dipleura, Green, syn. for *Homalonotus*.
dekayi, see *Homalonotus dekayi*.
 DIPLOCYNITES, Dawson, 1863, Am. Jour. Sci. and Arts, 3d ser., vol. 5, p. 19. [Ety. *diploos*, double; *ichnos*, foot-print.] Consisting of two rows of impressions, each about an inch long and one-fourth of an inch wide, placed close together, while the rows are six inches apart, and the intermediate space smooth, as if a flat body had been drawn over it. Type *D. ænigma*.
ænigma, Dawson, 1863, Am. Jour. Sci. and Arts, 3d ser., vol. 5, p. 19, Coal Meas.
 DIPLOSTYLUS, Salter, 1863, Quar. Jour. Geo. Soc., vol. 19, p. 76. [Ety. *Diplostylus*, double tail, in allusion to the two pairs of appendages to the telson.] Carapace unknown; body segments arched, and with minute pleuræ; tail segment large, triangular,

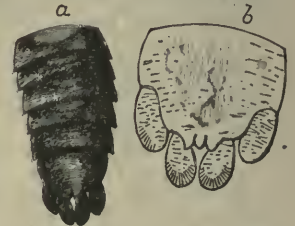


FIG. 1000.—*Diplostylus dawsoni*. a, Tail, nat. size; b, terminal joint, enlarged.

spinous, with two pairs of simple, ovate appendages. Type *D. dawsoni*.

dawsoni, Salter, 1863, Quar. Jour. Geo. Soc., vol. 19, p. 77, and Acad. Geol., p. 207, Coal Meas.

DIPTEROCARIS, Clarke, 1883, Am. Jour. Sci. and Arts, 3d ser., vol. 25, p. 121. [Ety. *dipteros*, two-winged; *karis*, shrimp.] Carapace elongate, divided along the major axis into two wings; greatest width anteriorly; wings united medially for one-third to one-fifth the length of the carapace; ankylosed, but separated toward the ends. Surface marked concentrically. Type *D. pennidædali*.

pennidædali, Clarke, 1883, Am. Jour. Sci. and Arts, 3d ser., vol. 25, p. 122, Chemung Gr.

pescervæ, Clarke, 1883, Am. Jour. Sci. and Arts, 3d ser., vol. 25, p. 123, Chemung Gr.

procne, Clarke, 1883, Am. Jour. Sci. and Arts, 3d ser., vol. 25, p. 122, Chemung Gr.



FIG. 1001.—*Dithyrocaris corbonaria*. Telson and stylets.

DITHYROCARI, Scouler, 1844, Syn. Carb. Foss., Ireland & McCoy, 1855, British Pal. Rocks, p. 181. [Ety. *dithyros*, having two valves; *karis*, shrimp.] Carapace semioval; anterior end rounded, sometimes notched; posterior end subtruncate, with latrunculate,

eral angles produced into spines; surface with faint imbricating striae, margins thickened and corrugated, with three longitudinal ridges, one in the middle extending the entire length, the others not reaching the margin; tail terminating in three triangular spines. Type *D. scouleri*.

belli, see *Mesothyra belli*.

carbonaria, Meek & Worthen, 1870, Proc. Acad. Nat. Sci. Phil., p. 55, and Geo. Sur. Ill., vol. 5, p. 618, Coal Meas.

neptuni, see *Mesothyra neptuni*.

Dolichocephala, Claypole, 1883, Proc. Am. Phil. Soc., p. 238, syn. for *Stylonurus*.

lacoana, syn. for *Stylonurus excelsior*.

DOLICHOMETOPUS, Angelin, 1852, Paleontologia Scandinavica. [Ety. *dolichos*, long; *metope*, panel or space between two hollows.] Cephalic shield with tumid margin; eyes large, narrow, lunate; glabella wider in front, smooth, no lateral furrows; neck furrow-marked; facial sutures, beginning at the posterior margin near the lateral angles, are directed toward the eyes, passing which, they diverge to the anterior margin; pygidium semicircular, strongly

convex, margin entire, axis almost semicylindrical, with two or more furrows. Type *D. suecicus*. It is doubtful about this being an American genus, as the identifications have been made alone on the pygidium.

? *convexus*, Billings, 1865, Pal. Foss., vol. 1, p. 269, Quebec Gr. or Up. Taconic.

? *gibberulus*, Billings, 1865, Pal. Foss., vol. 1, p. 269, Quebec Gr. or Up. Taconic.

? *rarus*, Billings, 1865, Pal. Foss., vol. 1, p. 352, Calciferous Gr.

DOLICHOPTERUS, Hall, 1859, Pal. N. Y., vol. 3, p. 414. [Ety. *dolichos*, long; *pteron*, wing.] Cephalic, thoracic, and caudal portions similar to *Eurypterus*; post-oral plate lyrate or cordiform lyrate; central thoracic appendage from the first thoracic segment, strong, thick, and simple, in its anterior part; anterior feet composed of strong, thick joints, with curved terminal spines; natatory organs having the joints elongate, the seventh and eighth little dilated, and the terminal palette extremely developed. Type *D. macrochirus*.

macrochirus, Hall, 1859, Pal. N. Y., vol. 3, p. 414, Waterlime Gr.

mansfieldi, Hall, 1877, Trans. Am. Phil. Soc., p. 621, Lower Coal Meas.

ECHINOCARIS, Whitfield, 1880, Am. Jour. Sci. and Arts, 3d ser., vol. 19, p. 34.

[Ety. *echinos*, sea urchin; *karis*, shrimp.] Carapace bivalve; valves subovate, united dorsally by a straight hinge, anterior, posterior, and basal margins rounded; surface marked by longitudinal ridges or representative nodes or ridges; abdomen naked, composed of several segments and a caudal plate, which is produced into an elongated

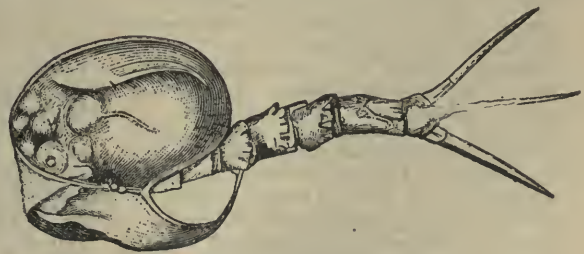


FIG. 1002.—*Echinocaris punctata*.

spine, with a lateral movable spine on each side; posterior margin of the abdominal segments bearing spines. Type *E. sublævis*.

condylepis, Hall, 1888, Pal. N. Y., vol. 7, p. 173, Chemung Gr.

longicauda, Hall, 1863, (*Ceratiocaris longicauda*), 16th Rep. N. Y. St. Mus. Nat. Hist., p. 73, Genesee Slate.

multinodosa, Whitfield, 1880, Am. Jour. Sci. and Arts, 3d ser., vol. 19, p. 33, Erie shales.

- punctata, Hall, 1863, (Ceratiocaris punctata,) 16th Rep. N. Y. St. Mus. Nat. Hist., p. 74, Ham. Gr.
- pustulosa, Whitfield, 1880, Am. Jour. Sci. and Arts, 3d ser., vol. 19, p. 38, Erie shales.
- socialis, Beecher, 1884, Rep. of Prog. Pa. Geo. Sur. PPP, p. 10, Chemung Gr.
- sublævis, Whitfield, 1880, Am. Jour. Sci. and Arts, 3d ser., vol. 19, p. 36, Erie shales.
- whitfieldi, Clarke, 1885, Bull. U. S. Geo. Sur. No. 16, p. 45, Ham. Gr.
- wrightana, Dawson, 1881, (Equisetides wrightanus,) Quar. Jour. Geo. Soc., vol. 37, p. 301, Portage Gr.
- ECHINOGNATHIUS**, Walcott, 1882, Am. Jour. Sci. and Arts, 3d ser., vol. 23, p. 213. [Ety. *echinos*, sea urchin; *gnathos*, jaw.] Founded upon fragments; endognathary limbs (one or more pairs) formed of eight or nine joints, six of which carry long, backward curving spines, articulated to their posterior side; terminal joint slender, elongate, acuminate; surface of body with scale-like markings. Type *E. clevelandi*.
- clevelandi, Walcott, 1882, Am. Jour. Sci. and Arts, 3d ser., vol. 23, p. 213, Utica Slate Gr.
- ELLIPSOCEPHALUS**, Zenker, 1833, Beitrage zur Naturgeschichte der Urwelt, p. 51. [Ety. *ellipsis*, ellipse; *kephale*, head.] Broadly ovate; cephalic shield semicircular, depressed, without spines; glabella subquadrangular, rounded in front, without transverse furrows; eyes oblong, lunate, narrow, projecting outward; facial sutures short, commencing at the anterior margin, in front of the eyes, and curving over them toward the posterior angles; thoracic segments twelve, axis nearly as broad as lateral lobes; pygidium small, semicircular, trilobed. Type *E. hoffi*.
- ?curtus, Whitfield, 1877, Ann. Rep. Geo. Sur. Wis., p. 58, and Geo. Wis., vol. 4, p. 191, Potsdam Gr. Founded upon a fragment of the cephalic shield, and the generic reference is very doubtful.
- ELLIPTOCEPHALA**, Emmons, 1844, Taconic System, p. 21. [Ety. *ellipsis*, ellipse; *kephale*, head.] Ovate; cephalic shield lunate, more than twice as wide as long, posterior angles produced in spines; groove and border on the anterior and lateral margins; glabella nearly equal in width throughout, and marked with three pairs of furrows; eyes large, elongate, semilunate, extending from near the base of the shield more than half way to the anterior margin; hypostoma broadly ovate; thirteen or fourteen articulations in the thorax, axis convex, lateral lobes flattened, last segments directed backward; pygidium narrow, elongated, axis acutely pointed. Type *E. asaphoides*. This generic name can stand in accordance with rule *n* of

the British Association of 1842, and the established laws of nomenclature adhered to by reputable scientists since that time, notwithstanding it is recommended to naturalists in selecting names to avoid such as too closely approximate words already adopted. It is true the masculine form of the word was preoccupied by Zenker, but the same can be said of Goniophora of Phillips, for Agassiz had preceded him in using the word Goniophorus; Schizodon was used for a mammal before King used Schizodus for a Lamelli-branch; Gray used Acrophylla before Nicholson used Acrophyllum; and we might mention a hundred other instances where generic names, differing only in gender or termination, have been introduced and accepted by the best naturalists, and have come into such general use as to constitute part of the nomenclature of science. Olenellus can not be used to supplant Elliptocephala upon any ground of discovery, definition, or law.

asaphoides, Emmons, 1844, Taconic System, p. 21, and Pal. N. Y., vol. 1, p. 256, Up. Taconic.

gilberti, Meek, 1874, (Olenellus gilberti,) Rep. Invert. Foss., p. 7, and Geo. Sur. 100th Mer., vol. 4, p. 44, Up. Taconic.

howelli, Meek, 1875, (Olenellus howelli,) Rep. Invert. Foss., p. 8, and Geo. Sur. 100th Mer., vol. 4, p. 47, Up. Taconic.

iddingsi, Walcott, 1885, (Olenellus iddingsi,) Monogr. U. S. Geo. Sur., vol. 8, p. 28, Up. Taconic.

thompsoni, Hall, 1859, (Olenellus thompsoni,) 12th Rep. N. Y. St. Mus. Nat. Hist., p. 59, Up. Taconic.

undulostrata, Hall, 1847, (Olenus undulostratus,) Pal. N. Y., vol. 1, p. 258, Up. Taconic. Poorly defined.

ELYMOCARIS, Beecher, 1884, Rep. Pa. Geo. Sur. PPP, p. 13. [Ety. *elymos*, pod; *karis*, shrimp.] Carapace bivalve; elongate, longitudinally subquadrangular, dorsal line nearly as long as the valves; margins thickened; optic node near the anterior end, behind which are two elevations; two segments in the abdomen; telson a short, broad spine, with two lateral spines, crenulated on



FIG. 1003.—Elliptocephala thompsoni.

the inner margins for fimbria. Type *E. siliqua*.

capsella, Hall, 1888, Pal. N. Y., vol. 7, p. 181, Ham. Gr.

siliqua, Beecher, 1884, Rep. Pa. Geo. Sur. PPP, p. 13, Chemung Gr.

Embolanus rotundatus, Rominger, syn. for *Bathyriscus howelli*.

spinosa, Rominger, syn. for *Olenoides spinosus*.

ENCRINURUS, Emmrich, 1845, Neues Jahrb. f. Mineral, p. 42. [Ety. *en*, prefix; *krino*, parted; *oura*, tail.] Cephalic shield semielliptical, tuberculated; lateral angles produced into spines; glabella pyriform, three furrows at each side toward the base; cheeks flattened, triangular; eyes in the middle of the cheeks, elevated on foot-stalks; facial suture behind the eye cuts the outer margin in front of the angles; thorax with eleven segments; pygidium triangular, lateral lobes with about eight segments, deflected, sometimes pointed; axis narrow, convex, with numerous segmental lines. Type *E. punctatus*.

deltoides, Shumard, 1855, Geo. Sur. Mo., p. 198, Up. Sil.



FIG. 1004.—*Encrinurus egani*.

egani, S. A. Miller, 1880, Jour. Cin. Soc. Nat. Hist., vol. 2, p. 254, Niagara Gr.

elegantulus, Billings, 1866, Catal. Sil. Foss. Antic., p. 62, Anticosti Gr.

excedrens, Safford, Not defined.

lævis, Angelin, 1852, (Cryptonymus *lævis*.) Palæontologia Scandinavica, p. 4, Up. Sil.

mirus, Billings, 1865, Pal. Foss., vol. 1, p. 292, Quebec Gr. or Up. Taconic.

multisegmentatus, Portlock, 1843, (Amphion multisegmentatus,) Rep. Geo. of Londonderry, etc., Anticosti Gr.

nerus, Hall, 1867, 20th Rep. N. Y. St. Mus. Nat. Hist., p. 425, Niagara Gr.

ornatus, Hall & Whitfield, 1875, Ohio Pal., vol. 2, p. 154, Niagara Gr.

phlyctainodes, Green, 1837, (Calymene phlyctainodes,) Am. Jour. Sci. and Arts, vol. 32, p. 167, and Pal. N. Y., vol. 2, p. 314, Niagara Gr.

punctatus, Wahlenberg, 1821, Nova Acta Soc. Upsal., Anticosti Gr.

trentonensis, Walcott, 1877, Rep. N. Y. St. Mus. Nat. Hist., p. 68, Trenton Gr.

varicostatus, Walcott, 1877, 31st Rep. N. Y. St. Mus. Nat. Hist., p. 69, Trenton Gr.

vigilans, Hall, 1847, (*Ceraurus vigilans*),

Pal. N. Y., vol. 1, p. 245, Black Riv. and Trenton Grs.

Endymion, Billings, 1862. The name being preoccupied for a genus of plants, the author proposed *Endymionia*.

meeki, see *Endymionia meeki*.

ENDYMIONIA, Billings, 1865, Pal. Foss., vol. 1, pp. 93, 281. [Ety. proper name.] Cephalic shield semioval, convex; glabella ovate, convex, an elongate oval tubercle on each



FIG. 1006.—*Endymionia meeki*.

side; thorax of six or seven segments, axis convex, side lobes flat, groove crossing them diagonally; pygidium semioval, trilobed and divided by furrows into segments; distinguished from *Trinucleus* by the absence of a punctured border on the head shield, and from *Ampyx* by the form of the glabella, which has a tubercle on each side, and is destitute of a rostrum. Type *E. meeki*.

meeki, Billings, 1862, (*Endymion meeki*.) Pal. Foss., vol. 1, pp. 93, 281, Quebec Gr. or Up. Taconic.

Enoploura, Wetherby, 1878, Jour. Cin. Soc. Nat. Hist., vol. 1, p. 163. Proposed instead of *Anomalocystites*, upon the ground that it is a Crustacean, instead of a Cystidean.

ESTHERIA, Ruppell, and Straus-Durckheim, 1837, Mus. Senckenberg., vol. 2, p. 119. [Ety. proper name.] Carapace valves oval, globose, with a definite hinge-line, well marked umbones and concentric ridges, valves inequilateral, subtrigonal or subovate, umbo near anterior end. Type *E. dahalacensis*. A living genus, and probably not Palæozoic.

pulex, Clarke, 1882, Am. Jour. Sci. and Arts, 3d ser., vol. 23, p. 466, Ham. Gr.

EUPROOPS, Meek, 1867, Am. Jour. Sci., vol. 43, p. 394. [Ety. *eu*, very; *pro*, forward; *ops*, eye.] Cephalo-thoracic shield crescentic, more than twice as wide as long, convex, lateral angles terminating in spines; posterior margin concave, from the lateral angles two-thirds of the distance to the middle, the central part being straight or slightly concave; the ocular ridge surrounds a crown-shaped or subquadrangular area, occupying the central third of the shield; the sides are slightly concave, in front there is a central emargination, and posteriorly the ridge is continued in a spine, on each side, directed back over the abdomen; eyes small, compound, located at the anterolateral angles of the crown-shaped central area; mesial lobe small, narrowing forward and reaching the ocular ridge, in a linear carina; it bears a tubercle on the posterior part; abdomen transversely subelliptical, mesial lobe nar-



FIG. 1005.—*Encrinurus egani*. Cephalic shield.

row; lateral lobes wide, flattened on the margins; segments defined by linear ridges, which are produced beyond the flattened borders in curved mucronate spines; telson subtrigonal, gradually tapering. Type *E. danæ*.

colletti, White, 1884, 13th Rep. Ind. Geo. Sur. Nat. Hist., p. 172, Coal Meas.

danæ, Meek & Worthen, 1865, (Bellinurus *danæ*.) Proc. Acad. Nat. Sci. Phil., p. 43, and Geo. Sur. Ill., vol. 2, p. 395, Coal Meas.

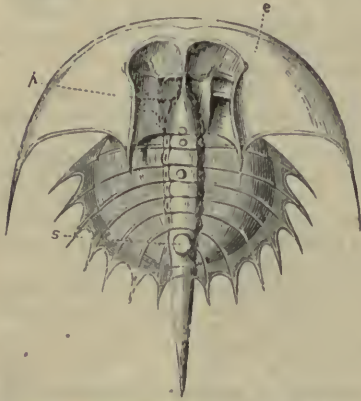


FIG. 1007.—*Euproops danæ*. e, Eyes; p, pits; s, node.

longispina, Packard, 1885, Am. Naturalist, vol. 19, p. 291, Coal Meas.

EURYPTOKELLA, Matthew, 1888, Trans. Roy. Soc. Can., p. 60. [Ety. diminutive of *Eurypterus*.] Minute; body ovate-elongate, obscurely divided into three regions, and faintly trilobed; head subtriangular, rounded at the outer corners, emarginate behind, seemingly composed of three anchylosed segments;

thorax subquadrate, four segments, first one with a median ridge; abdomen elongately triangular, several segments, produced in a long, flexible tail; surface tuberculated. Type *E. ornata*.

ornata, Matthew, 1888, Trans. Roy. Soc. Can., p. 60, Lower Devonian.

EURYPTERUS, DeKay, 1825, Ann. Lyc. Nat. Hist. N. Y., vol. 1, p. 375. [Ety. *euros*, breadth; *pteron*, wing.] Body ovate-lanceolate, gradually attenuate behind, terminating in a spiniform tail; carapace on the upper side entire; eyes two distant, sessile, within the margin of the carapace, two simple oculiform tubercles or corneæ situated subcentrally; thoracic and caudal portions composed of thirteen joints, the first narrow and the last prolonged in a triangular spine, with serrated edges; the first two articulations are anchylosed on the lower side, and from the central part a locomotive appendage is directed backward to the 3d or 4th articulation, terminating in two slender processes; mouth

central, beneath the carapace, surrounded by four pairs of jointed feet and a fifth larger pair; the three anterior pairs are similar; several joints bear a small articulating spine at the distal extremities, and the terminal joint consists of a spine; the fourth pair is longer, more slender, without spines, except on the terminal joint; the fifth pair are natatory, longer, more dilated, and placed beneath the posterior part of the carapace, basal joints composed of broad rhomboidal plates covering the posterior part of the carapace, over the inner edges of which there is a longitudinally ovate plate, at the anterior sinuate margin of which is the entrance to the mouth. Type *E. remipes*.

becheri, Hall, 1884, Geo. Sur. Pa. PPP, p. 30, Chemung Gr.

boylei, Whiteaves, 1884, Pal. Foss., vol. 3, p. 42, Guelph Gr.

dekayi, Hall, 1859, Pal. N. Y., vol. 3, p. 411, Waterlime Gr.

erianis, Whitfield, 1882, Ann. N. Y. Acad. Sci., vol. 2, p. 196, Low. Held. Gr.

giganteus, Pohlman, 1882, Bull. Buff. Soc. Nat. Sci., vol. 4, p. 41, Waterlime Gr.

grandis, Grote & Pitt, 1875, (*Eusarcus grandis*.) Bull. Buff. Soc. Nat. Hist., vol. 3, p. 17, Waterlime Gr.

lacustris, Harlan, 1834, Trans. Geo. Soc. Penn., vol. 1, p. 98, and Pal. N. Y., vol. 3, p. 407, Waterlime Gr.

lacustris var. *robustus*, Hall, 1859, Pal. N. Y., vol. 3, p. 410, Waterlime Gr.

mazonensis, Meek & Worthen, 1868, Am. Jour. Sci., vol. 46, p. 21, and Geo. Sur. Ill., vol. 3, p. 544, Coal Meas.

microphthalmus, Hall, 1859, Pal. N. Y., vol. 3, p. 407, Low. Held. Gr.

pachychirus, Hall, 1859, Pal. N. Y., vol. 3, p. 412, Waterlime Gr.

pennsylvanicus, Hall, 1877, Proc. Am. Phil. Soc., p. 621, Carboniferous.

potens, Hall, 1884, Geo. Sur. Pa. PPP, p. 37, Carboniferous.

prominens, Hall, 1884, Proc. Am. Ass. Sci., vol. 33, p. 420, and Pal. N. Y., vol. 7, p. 137, Clinton Gr.

pulicaris, Salter, 1863, Quar. Jour. Geo. Soc., vol. 19, p. 78, and Acad. Geol., p. 523, Up. Devonian.

pustulosus, Hall, 1859, Pal. N. Y., vol. 3, p. 413, Waterlime Gr.

remipes, DeKay, 1825, Ann. Lyc. Nat. Hist. N. Y., p. 375, and Pal. N. Y., vol. 3, p. 404, Waterlime Gr.

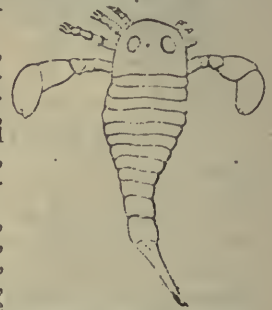


FIG. 1008.—*Eurypterus remipes*. Diagram of small specimen.

remipes, DeKay, 1825, Ann. Lyc. Nat. Hist. N. Y., p. 375, and Pal. N. Y., vol. 3, p. 404, Waterlime Gr.

scorpionis, Grote & Pitt, 1875, (Eusarcus scorpionis,) Bull. Buff. Soc. Nat. Hist., vol. 3, p. 1, Waterlime Gr.
 stylus, Hall, 1884, Geo. Sur. Pa., PPP, p. 34, Low. Coal Meas.

tetragonophthalmus, Fischer, 1839, Bull. Soc. Imper. Nat. Moscou., Waterlime Gr.

Eusarcus, Grote & Pitt, 1875, Bull. Buff. Soc. Nat. Hist., vol. 3, p. 1, syn. for *Eurypterus*.

grandis, see *Eurypterus grandis*.
scorpionis, see *Eurypterus scorpionis*.

FABERIA, n. gen. [Ety. proper name.] Minute crustaceans inclosed in a shell with openings on the edge for the protrusion of the feet and antennæ. They are referred to the Ostracoda, because the test is like that of *Leperditia* and *Beyrichia*, but they are distinguished by being closed in a single shell; they are evidently globose, depressed or variable in form. Type *F. anomala*.

anomala, n. sp. Minute, subcircular in outline, and flattened on each side; thickness about one-fourth the diameter; one edge somewhat sharpened; a slit or opening, about eight times as long as wide, exists on the thicker edge of the shell; and at less

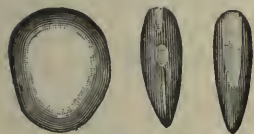


FIG. 1009.—*Faberia anomala*. Three views, mag. 5 diam.

than the thickness of the shell distant from the slit, there is a circular opening on the edge of the shell, and below this reaching nearly to the thinner edge of the shell, there is a very narrow slit that does not seem to penetrate the test. Found in the upper part of the Hud. Riv. Gr., in Butler County, Ohio, and now in the collection of Charles Faber.

HARPES, Goldfuss, 1839, Nova Acta Physico medica Academiæ Cæsareæ Leopoldino Carolinae Naturæ Curiosorum, vol. 19, p. 358. [Ety. *harpe*, a hook or sickle.] Cephalic shield horseshoe-shaped,

very convex centrally, flatly expanded on the external margin, and posterior angles produced in long spines; glabella very prominent, short, front subquadrate, posterior part contracted, a curved lateral furrow on each side separating two elliptical lobes from the posterior half; eyes small, near the anterior part of the glabella; facial sutures from the posterior angles, curving through the



FIG. 1010.—*Harpes unguula*.

eyes and then to the antero-lateral margins, thoracic segments numerous. Type *H. unguula*.

antiquatus, Billings, 1859, Can. Nat. and Geo., vol. 4, p. 468, Chazy Gr.

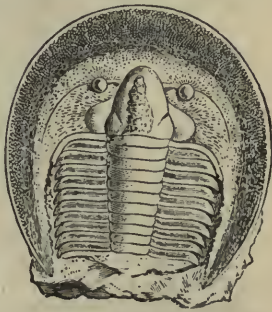
consuetus, Billings, 1866, Catal. Sil. Foss. Antic., p. 64, Anticosti Gr.

dentoni, Billings, 1863, Can. Nat. and Geo., vol. 8, p. 36, Hud. Riv. Gr.

escanabæ, Hall, 1851, Geo. Lake Sup. Land Dist., vol. 2, p. 211, Trenton Gr.

granti, Billings, 1865, Pal. Foss., vol. 1, p. 326, Quebec Gr.

ottawensis, Billings, 1865, Pal.



Foss., vol. 1, FIG. 1011.—*Harpes ottawensis*, p. 182, Trenton Gr.

HARPIDES, Beyrich, 1846, Untersuchungen Trilobiten als Fort. [Ety. from resemblance to the genus *Harpes*.] Cephalic shield semicircular, margin wide and flat, spines at posterior lateral angles; glabella short, narrow, granular; lobe on each side at base; cheeks have radiating striæ; eyes small, joining the front end of the glabella by a small ridge; thorax with 22 segments, pleuræ three times as wide as the axis. Type *H. rugosus*. Only fragments have been referred to this genus in America.

atlanticus, Billings, 1865, Pal. Foss., vol. 1, p. 281, Quebec Gr. or Up. Taconic.

concentricus, Billings, 1865, Pal. Foss., vol. 1, p. 282, Quebec Gr. or Up. Taconic.

? *desertus*, Billings, 1865, Pal. Foss., vol. 1, p. 333, Quebec Gr. or Up. Taconic.

HARTIA, Walcott, 1884, Bull. U. S. Geo. Sur. vol. 2, p. 283. [Ety. proper name.] Distinguished from *Conocoryphe* by having a lobe or elevation in the front of the glabella, small pygidium, and sloping front to the cheeks and frontal lobes. Type *H. matthewi*.

matthewi, Hartt, 1868, (Conoccephalites matthewi,) Acad. Geol., p. 646, St. John Gr.

hausmannia, Hall, 1888, FIG. 1012 — *Harttia matthewi*. Cephalic shield.

synonym for *Dalmanites*.

Hemicrypturus, Green, syn. for *Asaphus*.

clintoni, Vanuxem, 1843, Geo. Rep. 3d Dist. N. Y., p. 79, Clinton Gr. Generic relation not determined.

rasoumowski, syn. for *Asaphus expansus*.

HIPPONICHARION, Matthew, 1885, Trans. Roy. Soc. Can., p. 64. Breadth nearly equals the length; broadly semi-elliptical to-



ward the base, flattened, crossed by three symmetrical ridges; the middle one is inconspicuous. Type *H. eos*.
eos, Matthew, 1885, Trans. Roy. Soc. Can., p. 64, St. John Gr.



FIG. 1013.—*Holometopus angelini*. Head and side view.

HOLOMETOPUS, Angelin, 1852, Palæontologia Scandinavica. [Ety. *holos*, entire; *metopon*, space between the eyes.] Cephalic shield

semicircular; glabella long, narrow, convex, widened in front, separated from cheeks by deep furrows; cheeks tumid; eyes small, situated well to the posterior; neck furrow distinct; facial sutures curved a little outward, in front of the eye. Type *H. limbatus*.

angelini, Billings, 1862, Pal. Foss., p. 95, Quebec Gr. or Up. Taconic.

HOMALONOTUS, Konig, 1825, Icones. Foss. Sectiles, p. 4. [Ety. *homalos*, on the same level; *notos*, back.] Cephalic shield hyperbolic, anterior angle subacute, margins rounded, surface convex; glabella subquadrate, short, wider posteriorly, no furrows; eyes opposite the

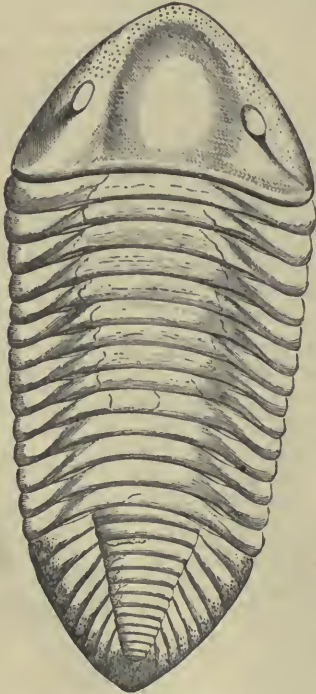


FIG. 1014.—*Homalonotus delphinocephalus*.

central part of the glabella, small; facial suture, from the anterior angle to the margin, following the border of the margin, and curving like the letter S, it reaches the eye, and by a like curve passes to the posterior lateral angle;

thoracic segments 13, axis wider than the lateral lobes, which have subtruncate ends, with large distinct facets; pygidium hyperbolic and terminating in a spine. Type *H. knighti*.

atlas, Castelnau, 1843, Syst. Sil., p. 20. Not recognized.

dawsoni, Hall, 1860, Can. Nat. and Geo., vol. 5, p. 155, and Acad. Geol., p. 607, Up. Silurian.

dekayi, Green, 1832, (Dipleura *dekayi*.) Monograph Trilobites, p. 79, and Illust. Devon. Foss., pl. 25, Ham. Gr.

delphinocephalus, Green, 1832, (Trimerus *delphinocephalus*.) Monograph of Trilobites, p. 82, and Pal. N. Y., vol. 2, p. 309, Niagara Gr.

giganteus, Castelnau, 1843, Syst. Sil., p. 20. Not recognized.

herculeanus, Castelnau, 1843, Syst. Sil., p. 20. Not recognized.

jacksoni, Green, 1837, (Trimerus *jacksoni*.) Am. Jour. Sci., vol. 32, p. 347, Up. Sil.

knighti, Konig, 1825, Icones. Foss. Sectiles, pl. 7, fig. 85, Low. Held. Gr.

major, Whitfield, 1885, Bull. Am. Mus. Nat. Hist., vol. 1, p. 193, Oriskany Gr.

vanuxemi, Hall, 1859, Pal. N. Y., vol. 3, p. 352, Low. Held. Gr.

ILLÆNURUS, Hall, 1863, 16th Rep. N. Y. Mus. Nat. Hist., p. 176. [Ety. from the genus *Illænus*; *oura*, tail.] Body broadly elliptical; cephalic shield short, convex, semi-elliptical; glabella subquadrate, convex, smooth, without distinct dorsal furrow; palpebral lobe marginal; cheeks wide; facial suture nearly vertical, slightly diverging, anterior to the eye; movable

cheeks wide and short; thoracic segments convex, central lobe wide, lateral lobes narrow, pygidium short, narrow, subelliptical, convex in front, more curved behind. Type *I. quadratus*.

convexus, Whitfield, 1878, Ann. Rep. Geo. Sur. Wis., p. 66, and Geo. Wis., vol. 4, p. 203, Low. Mag. Gr.

eurekensis, Walcott, 1885, Monogr. U. S. Geo. Sur., vol. 8, p. 97, Potsdam Gr.

quadratus, Hall, 1863, 16th Rep. N. Y. St. Mus. Nat. Hist., p. 176, Potsdam Gr.

ILLÆNUS, Dalman, 1828, ueber die Palæaden oder die sogenannten Trilobiten, p. 51. [Ety. *illaino*, to look awry, to squint.]

Cephalic shield very convex and like one-fourth of a sphere, with the anterior margin slightly produced; glabella defined only as a slight convexity, between subparallel lines, on the posterior part of the shield; eyes semilunate, near the lateral margins smooth; facial suture makes a gentle curve from the antero-lateral margin to the eye, and then to the margin midway of the lateral lobes of the thorax; thoracic segments 9 or ten, broad; pygidium much like the cephalic shield. Type *I. crassicauda*.

ambiguus, Foerste, 1885, Bull. Sci. Lab. Denison Univ., p. 106, Niagara Gr.

americanus, Billings, 1859, Can. Nat. and Geol., vol. 4, p. 371, Trenton Gr.
 angusticollis, Billings, 1859, Can. Nat. and Geol., vol. 4, p. 376, Black Riv. Gr.
 arcturus, Hall, 1847, Pal. N. Y., vol. 1, p. 23, Chazy and Black Riv. Grs.
 arcuatus, Billings, 1865, Pal. Foss., vol. 1, p. 279, Quebec Gr.
 armatus, Hall, 1867, 20th Rep. N. Y. St. Mus. Nat. Hist., p. 418, Niagara Gr.
 barriensis, Murch. 1839, Sil. Syst. The species formerly identified with this is *Illænus ioxus*.
 bayfieldi, Billings, 1859, Can. Nat. and Geol., vol. 4, p. 369, Chazy Gr.
 clavifrons, Billings, 1859, Can. Nat. and Geol., vol. 4, p. 379, Chazy and Black Riv. Grs.
 conifrons, Billings, 1859, Can. Nat. and Geol., vol. 4, p. 378, Black Riv. Gr.
 conradi, Billings, 1859, Can. Nat. and Geol., vol. 4, p. 372, Black Riv. Gr.
 consimilis, Billings, 1865, Pal. Foss., vol. 1, p. 277, Quebec Gr.
 consobrinus, Billings, 1865, Pal. Foss., vol. 1, p. 280, Quebec Gr.
 cornigerus, Hall, 1872, 24th Rep. N. Y. St. Mus. Nat. Hist., p. 186, Niagara Gr.
 crassicauda, Wahlenberg, 1821, (Entomostracites crassicauda.) Nov. Act. Soc. Upsal., vol. 8, p. 27, and Pal. N. Y., vol. 1, p. 229, Trenton and Galena Grs.



FIG. 1015.—*Illænus globosus*. Two views.

cuniculus, Hall, 1867, 20th Rep. N. Y. St. Mus. Nat. Hist., p. 421, Niagara Gr.
 daytonensis, Hall & Whitfield, 1875, Ohio Pal., vol. 2, p. 119, Niagara Gr.
 fraternus, Billings, 1865, Pal. Foss., vol. 1, p. 276, Quebec Gr.

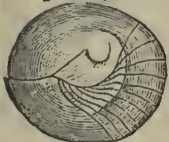


FIG. 1016.—*Illænus globosus*. Side view.

globosus, Billings, 1859, Can. Nat. and Geol., vol. 4, p. 367, Chazy Gr.
 graftonensis, Meek & Worthen, 1869, Proc. Acad. Nat. Sci. Phil. and Geo. Sur. Ill., vol. 6, p. 508, Niagara Gr.
 grandis, Billings, 1859, Can. Nat. and Geol., vol. 4, p. 380, Hud. Riv. Gr. and Mid. Sil.
 herricki, Foerste, 1887, 15th Rep. Geo. and Nat. Hist. of Minn., p. 479, Trenton Gr.
 imperator, Hall, 1861, Rep. of Progr. Wis., p. 49, and 20th Rep. N. Y. St. Mus. Nat. Hist., p. 332, Niagara Gr.
 incertus, Billings, 1865, Pal. Foss., vol. 1, p. 332, Quebec Gr.
 indeterminatus, Walcott, 1877, 31st Rep. N. Y. St. Mus. Nat. Hist., p. 70, Black Riv. Gr.

insignis, Hall, 1864, 20th Rep. N. Y. St. Mus. Nat. Hist., p. 331, Niagara Gr.
 ioxus, Hall, 1867, 20th Rep. N. Y. St. Mus. Nat. Hist., p. 420, Niagara Gr.
 latidorsatus, Hall, 1847, Pal. N. Y., vol. 1, p. 230, Trenton Gr.
 madisonanus, Whitfield, 1882, Geo. Wis., vol. 4, p. 307, Niagara Gr.
 milleri, Billings, 1859, Can. Nat. and Geol., vol. 4, p. 375, Black Riv. and Trenton Grs.
 minnesotensis, Foerste, 1887, 15th Rep. Geo. and Nat. Hist. of Minn., p. 478, Trenton Gr.
 niagarensis, Whitfield, 1880, Ann. Rep. Geo. Sur. Wis., p. 68, Niagara Gr.
 orbicaudatus, Billings, 1859, Can. Nat. and Geol., vol. 4, p. 379, Hud. Riv. Gr. and Mid. Sil.
 ovatus, Conrad, 1843, (Thaleops ovatus.) Proc. Acad. Nat. Sci. Phil., vol. 1, p. 332, and Pal. N. Y., vol. 1, p. 259, Black Riv. Gr.
 pteroccephalus, Whitfield, 1878, Ann. Rep. Geo. Sur. Wis., p. 87, and Geo. Wis., vol. 4, p. 309, Niagara Gr.
 simulator, Billings, 1865, Pal. Foss., vol. 1, p. 327, Quebec Gr.



FIG. 1017.—*Illænus taurus*.

taurus, Hall, 1861, Rep. of Progr. Wis. Sur., p. 49, and Geo. Sur. Ill., vol. 3, p. 320, Trenton and Galena Grs.
 trentonensis, Emmons, 1842, (Bumastus trentonensis.) Geo. Rep. N. Y., p. 390, and Pal. N. Y., vol. 1, p. 230, Trenton Gr.
 tumidifrons, Billings, 1865, Pal. Foss., vol. 1, p. 278, Quebec Gr.
 vindex, Billings, 1865, Pal. Foss., vol. 1, p. 179, Chazy Gr.
 worthenanus, syn. for *Illænus insignis*.
 ISOCHILINA, Jones, 1858, Can. Org. Rem., Decade 3, p. 197. [Ety. *isos*, equal; *cheilos*, lip.] Equivalve, the margins of the valves meeting uniformly, not overlapping, as in *Leperditia* greatest convexity central or toward the anterior end, eye tubercle present; muscular spot not distinct, externally. Type I. ottawa.

armata, Walcott, 1883, 35th Rep. N. Y. St. Mus. Nat. Hist., p. 213, Trenton Gr.

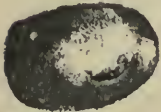


FIG. 1018.—*Isochilina jonesi*.

cylindrica, Hall, 1852, (Cytherina cylindrica,) Pal. N. Y., vol. 2, p. 14, Medina Gr.
gracilis, Jones, 1858, Can. Org. Rem. Decade 3, p. 98, Black Riv. and Trenton Grs.

jonesi, Wetherby, 1881, Jour. Cin. Soc. Nat. Hist., vol. 4, p. 80, Trenton Gr.

labrosa, Jones, 1889, Ann. and Mag. Nat. Hist., 6th ser., vol. 3, p. 383, Low. Held. Gr.

ottawa, Jones, 1858, Can. Org. Rem., Decade 3, p. 97, Black Riv. Gr.

Isotelus, DeKay, 1825, Annals Lyceum Nat. Hist. N. Y., vol. 1, p. 174. [Ety. *isos*, equal; *telos*, end.] A subgenus of *Asaphus*.

canalis, see *Asaphus canalis*.

gigas, see *Asaphus gigas*.

maximus, see *Asaphus megistus*.

megistus, see *Asaphus megistus*.

vigilans, see *Asaphus vigilans*.

LEAIA, Jones, 1862, App. to Mon. Foss. Estheria., p. 116. [Ety. proper name.]

Carapace bivalve, subquadrate; thin, horny, truncated and slightly curved behind, rounded in front, straight on the dorsal edge; surface concentrically ridged and finely reticulated in the furrows; each valve crossed by one, two, or three ridges; the first and most conspicuous crosses from the anterior part of the umbo to the antero-ventral angle; the second, when it exists, reaches the postero-ventral angle, and the third lies along the dorsal margin. Type *L. leidy*.

leidy, Lea, 1856, (Cypricardia leidy,) Proc. Acad. Nat. Sci., vol. 7, p. 341, Coal Meas.

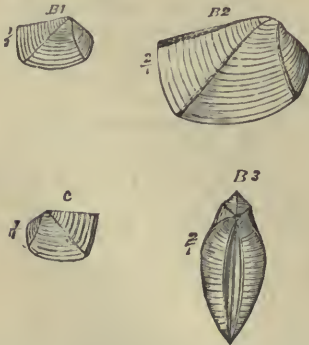


FIG.—1019.—*Leaia tricarinata*. B1, right valve; B2, enlarged; B3, dorsal view; C, left valve.

tricarinata, Meek & Worthen, 1868, Geo. Sur. Ill., vol. 3, p. 541, Coal Meas.

LEPERDITIA, Rouault, 1851, Bull. Soc. Geo. France, 2d ser., t. 8, p. 377. [Ety. *lepis*, scale; *ditto*, double.] Carapace bivalve,

inequivalve, right valve larger than the left, and overlapping the ventral border, and to some extent the anterior and posterior borders of the left valve; valves smooth, convex, horny, oblong, longer than broad, bean-shaped, inequilateral, posterior half the broader; dorsal border straight; ventral border semi-circular. Type *L. britannica*.

alta, Conrad, 1843, (Cytherina alta,) Geo. Rep. 3d Dist. N. Y., p. 112, and Pal. N. Y., vol. 3, p. 373, Low. Held. Gr.

amygdalina, Jones, 1858, Can. Org. Rem., Decade 3, p. 97, Chazy Gr.

angulifera, Whitfield, 1882, Ann. N. Y. Acad. Sci., vol. 2, p. 197, Low. Held. Gr.

anna, Jones, 1858, Can. Org. Rem., Decade 3, p. 96, Hud. Riv. Gr.

anticostiana, Jones, 1858, (*L. canadensis* var. *anticostiana*.) Can. Org. Rem., Decade 3, p. 95, Hud. Riv. Gr.

arctica, Jones, 1856, Ann. and Mag. Nat. Hist., 2d ser., vol. 17, p. 87, Up. Sil.

argenta, Walcott, 1886, Bull. U. S. Geo. Sur., No. 30, p. 146, Up. Taconic.

billingsi, Jones, 1881, Ann. and Mag. Nat. Hist., 5th ser., vol. 18, Trenton Gr.

bivertex, Ulrich, 1879, Jour. Cin. Soc. Nat. Hist., vol. 2, p. 11, Utica Slate Gr.

bivia, White, 1874, Rep. Invert. Foss., p. 11, and Geo. Sur. W. 100th Mer., vol. 4, p. 58, Quebec Gr.

byrnesi, S. A. Miller, 1874, Cin. Quar. Jour. Sci., vol. 1, p. 123, Utica Slate Gr.

cæcigena, S. A. Miller, 1881, Jour. Cin. Soc. Nat. Hist., vol. 4, p. 262, Hud. Riv. Gr.

canadensis, Jones, 1858, Ann. Nat. Hist., 3d ser., vol. 1, p. 244, Chazy to Trenton Gr.

capax, Safford. Not defined.

carbonaria, Hall, 1858, (Cythere carbonaria,) Trans. Alb. Inst., vol. 4, p. 33, and Bull. Am. Mus. Nat. Hist., p. 94, Warsaw Gr.

cayuga, Hall, 1862, 15th Rep. N. Y. St. Mus. Nat. Hist., p. 83, Cornif. Gr.

concinnulla, Billings, 1865, Pal. Foss., vol. 1, p. 299, Quebec Gr. or Up. Taconic.

crepiformis, Ulrich, 1879, Jour. Cin. Soc. Nat. Hist., vol. 2, p. 10, Hud. Riv. Gr.

cylindrica, Hall, 1871, 24th Rep. N. Y. St. Mus. Nat. Hist., p. 231, Utica Slate and Hud. Riv. Grs.

dermatoides, Walcott, 1887, Am. Jour. Sci. and Arts, 3d ser., vol. 34, p. 192, Up. Taconic.

ebinina, Dwight, 1889, Am. Jour. Sci. and Arts, 3d ser., vol. 38, p. 144, Up. Taconic.

faba, Hall, 1876, 28th Rep. N. Y. St. Mus. Nat. Hist., p. 186, Niagara Gr.

gigas, Jones, 1858, Can. Org. Rem., Decade 3, p. 96, Hud. Riv. Gr.

gracilis, Jones, 1858, Can. Org. Rem., Decade 3, p. 98, Black Riv. and Trenton Grs.

highlandi, Jones, 1858, Can. Org. Rem., Decade 3, p. 97, Chazy Gr.

inequivalve, right valve larger than the left, and overlapping the ventral border, and to some extent the anterior and posterior borders of the left valve; valves smooth, convex, horny, oblong, longer than broad, bean-shaped, inequilateral, posterior half the broader; dorsal border straight; ventral border semi-circular. Type *L. britannica*.

labrosa, Jones, 1889, Ann. and Mag. Nat. Hist., 6th ser., vol. 3, p. 383, Low. Held. Gr.

leidy, Lea, 1856, (Cypricardia leidy,) Proc. Acad. Nat. Sci., vol. 7, p. 341, Coal Meas.

lepis, see *Asaphus lepis*.



FIG. 1020.—*Leperditia byrnesi*. Mag.



FIG. 1021.—*Leperditia cæcigena*. Natural size and magnified.

fabulites, Conrad, 1843, (Cytherina fabulites,) Proc. Acad. Nat. Sci. Phil., p. 332, Trenton Gr.

fonticola, Hall, 1867, 20th Rep. N. Y. St. Mus. Nat. Hist., p. 428, Niagara Gr.

gibbera, Jones, 1856, Ann. and Mag. Nat. Hist., 2d ser., vol. 17, p. 90, Niagara Gr.

gibbera var. scalaris, see *L. scalaris*.

gracilis, see *Isochilina gracilis*.

hudsonica, Hall, 1859, Pal. N. Y., vol. 3, p. 375, Low. Held. Gr.

jonesi, Hall, 1859, Pal. N. Y., vol. 3, p. 372, Low. Held. Gr.

josephana, Jones, 1858, (*L. canadensis var. josephana*.) Can. Org. Rem., Decade 3, p. 94, Black Riv. to Trenton Gr.

labrosa, Jones, 1858, (*L. canadensis var. labrosa*.) Can. Org. Rem., Decade 3, p. 93, Chazy Gr.

louckana, Jones, 1858, (*L. canadensis var. louckana*.) Can. Org. Rem., Decade 3, p. 93, Black Riv. Gr.

marginata, Keyserling, 1846, Wissenschaftliche Beobachtungen, etc., Niagara Gr.

minutissima, Hall, 1871, 24th Rep. N. Y. St. Mus. Nat. Hist., p. 231, Utica Slate and Hud. Riv. Gr.

morgani, Safford. Not defined.

nana, Jones, 1858, (*L. canadensis var. nana*.) Can. Org. Rem., Decade 3, p. 92, Calciferous Gr.

okeni, Munster, 1830, (Cythere *okeni*.) Jahrbuch fur Min., Geo. und Petrif. Carboniferous.

ottawa, see *Isochilina ottawa*.

ovata, Jones, 1858, Ann. and Mag. Nat. Hist., 3d ser., vol. 1, p. 252, Black Riv. Gr.

pauquettana, Jones, 1858, (*L. canadensis var. pauquettana*.) Can. Org. Rem., Decade 3, p. 94, Black Riv. Gr.

parasitica, Hall, 1859, Pal. N. Y., vol. 3, p. 276, Low. Held. Gr.

parvula, Hall, 1859, Pal. N. Y., vol. 3, p. 376, Low. Held. Gr.

pennsylvanica, Jones, 1858, Ann. and Mag. Nat. Hist., 3d ser., vol. 1, p. 251, Clinton Gr.

punctulifera, Hall, 1860, 13th Rep. N. Y. St. Mus. Nat. Hist., p. 92, Ham. Gr.

radiata, Ulrich, 1879, Jour. Cin. Soc. Nat. Hist., vol. 2, p. 9, Utica Slate Gr.

rotundata, Walcott, 1885, Monogr. U. S. Geo. Sur., vol. 8, p. 206, Devonian.

scalaris Jones, 1858, (*L. gibbera var. scalaris*.) Ann. and Mag. Nat. Hist., 3d ser., vol. 1, p. 250, Waterlime Gr.

seneca, Hall, 1862, 15th Rep. N. Y. St. Mus. Nat. Hist., p. 84, Ham. Gr.

sinuata, Hall, 1860, Can. Nat. and Geo., vol. 5, p. 158, Up. Silurian.

spinulifera, Hall, 1862, 15th Rep. N. Y. St. Mus. Nat. Hist., p. 83, Up. Held Gr.

sublævis, Shumard, 1855, (Cythere *sublævis*.) Geo. Rep. Mo., p. 195, Low. Magnesian Gr.

troyensis, see *Aristozoe troyensis*.

turgida, Billings, 1865, Pal. Foss., vol. 1, p. 299, Quebec Gr.

ventralis, Billings, 1865, Pal. Foss., vol. 1, p. 300, Quebec Gr.

unicornis, Ulrich, 1879, Jour. Cin. Soc. Nat. Hist., vol. 2, p. 10, Utica Slate Gr.

LEPIDILLA, Matthew, 1885, Trans. Roy. Soc. Can., p. 62. [Ety. *lepis*, a scale.] Bivalve; hinge-line straight, projecting from the general contour of the shell; umbo and hinge-line separated from the valve by a sinus, behind which there is a foramen. Type *L. anomala*.

anomala, Matthew, 1885, Trans. Roy. Soc. Can., p. 62, St. John Gr.

LEPIDITTA, Matthew, 1885, Trans. Roy. Soc. Can., p. 61. [Ety. *lepis*, scale; *ditto*, double.] Minute, obliquely semicircular, wider on the anterior half, hinge straight; umbones in the middle, low. Type *L. alata*.

alata, Matthew, 1885, Trans. Roy. Soc. Can., p. 61, St. John Gr.

curta, Matthew, 1885, Trans. Roy. Soc. Can., p. 62, St. John Gr.

LEPIDOCOLEUS,
Faber, 1886,
Jour. Cin.
Soc. Nat.
Hist., vol. 9,
p. 15. [Ety.
lepis, scale;
coleos,
sheath.]
Body elongate, composed of two series of thin, imbricating, angular plates, interlocking and overlapping along the basal edges; plates small, more or less triangular in outline; one side always longer than either of the others; one side usually sigmoidal; entire outer surface marked with striæ. Type *L. jamesi*.

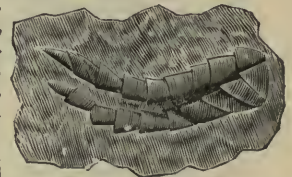


FIG. 1022.—*Lepidocoleus jamesi*. Mag. 2 diam. Lebanon specimen.



FIG. 1023.—*Lepidocoleus jamesi*. Faber's Cincinnati specimen.

jamesi, Hall & Whitfield, 1875, (Plumulites *jamesi*.) Ohio Pal., vol. 2, p. 106, Hud. Riv. Gr.

LICHAS, Dalman, 1826, Ueber die Palæaden oder die Sogenannten Trilobiten, p. 71. [Ety. mythological name.] Body subovate, flat, granulated; cephalic shield somewhat lunate, often pointed in front; glabella large, convex, a furrow curving inward and backward from the anterior third on each side, and cutting off or partly inclosing two oval spaces; cheeks small; eyes large, reniform; eye-line

cutting the outer margin in front of the angles; thorax of ten segments; pleuræ flat, falcate, each with a furrow not reaching the margin; pygidium, side lobes flat, two falcate ribs on each side projecting beyond the margin, each with a mesial duplicating groove, middle lobe, semielliptical, pointed. Type *L. laciniatus*.

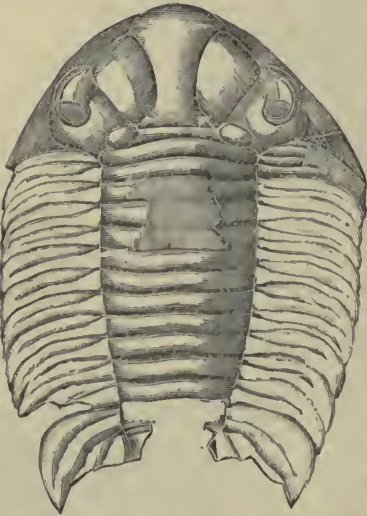


FIG. 1024.—*Lichas faberi*. Mag. 2 diam.

armatus, Hall, 1862. Preoccupied; changed to *L. eriopsis*.
biggsbyi, Hall, 1859, Pal. N. Y., vol. 3, p. 364, Low. Held. Gr.
boltoni, Bigsby, 1825, (*Paradoxides boltoni*.) Jour. Acad. Nat. Sci., vol. 4, p. 365, and Pal. N. Y., vol. 2, p. 311, Niagara Gr.
boltoni var. *occidentalis*, Hall, 1863, Trans. Alb. Inst., vol. 4, p. 223, and 11th Rep. Ind. Geo. Sur., p. 344, Niagara Gr.
breviceps, Hall, 1863, Trans. Alb. Inst., vol. 4, p. 222, and 11th Rep. Ind. Geo. Sur., p. 343, Niagara Gr.
canadensis, Billings, 1866, Catal. Sil. Foss. Antic., p. 65, Antic. Gr.
chAMPLAINENSIS, Whitfield, 1886, Bull. Am. Mus. Nat. Hist., vol. 1, p. 342, Birdseye Gr.
cucullus, Meek & Worthen, 1865, Proc. Acad. Nat. Sci. Phil., p. 266, and Geo. Sur. Ill., vol. 3, p. 299, Trenton Gr.
decepiens, Winchell & Marcy, 1865, Mem. Bost. Soc. Nat. Hist., p. 104, Niagara Gr.
dracon, Hall, 1888, Pal. N. Y., vol. 7, p. 85, Up. Held. Gr.
emarginatus, Hall, 1879, 28th Rep. N. Y. St. Mus. Nat. Hist., p. 199, Niagara Gr.
eriopsis, see *Terataspis eriopsis*.

faberi, n. sp. Broadly elliptical, granulated; head somewhat crescentiform, slightly pointed in front, very convex, posterior angles terminating in short, obtuse spines; glabella very convex, divided into three lobes; central lobe contracted in the middle, widely expanded in front, and less expanded behind, and a slight furrow cuts off a small lobe from the postero-lateral angles; lateral lobes reniform; and another small lobe is separated from the posterior part of the cheeks by a stronger furrow; eyes prominent, reniform, and directed backward; occipital ring wide; axial lobe of thorax wider than the lateral lobes; pygidium lacinate, axis with two narrow articulations in front, and a longer posterior one that slopes backward and becomes confluent with the expanded border; lateral lobes composed of three expanded articulations, which terminate in acute points, and are marked in the central part by a groove for three-fourths of their length, which is represented by a rib on the under side; central lobe grooved in like manner, and bifid at the posterior extremity. The pygidium will readily distinguish it from *L. trentonensis*, beside the broader axial lobe of the thorax and somewhat different cephalic shield. Hud. Riv. Gr. at Cincinnati, Ohio. The specimen illustrated is from the collection of Charles Faber.



FIG. 1025.—*Lichas faberi*. Large and small pygidium.

grandis, see *Terataspis grandis*.
gryps, Hall, 1888, Pal. N. Y., vol. 7, p. 84, Up. Held. Gr.
harrisi, S. A. Miller, 1878, Jour. Cin. Soc. Nat. Hist., vol. 1, p. 106, Hud. Riv. Gr.
hispidus, Hall, 1888, Pal. N. Y., vol. 7, p. 77, Up. Held. Gr.
hyleus, Hall, 1888, Pal. N. Y., vol. 7, p. 81, Up. Held. Gr.
jukesi, Billings, 1865, Pal. Foss., vol. 1, pp. 282 and 335, Quebec Gr.
minganensis, Billings, 1865, Pal. Foss., vol. 1, p. 181, Chazy or Black Riv. Gr.
neruus, Hall, 1863, 16th Rep. N. Y. St. Mus. Nat. Hist., p. 226, Niagara Gr.
obvius, Hall, 1868, 20th Rep. N. Y. St. Mus. Nat. Hist., p. 424, Niagara Gr.
ptyonurus, Hall, 1888, Pal. N. Y., vol. 7, p. 86, Niagara Gr.
pugnax, Winchell & Marcy, 1865, Mem. Bost. Soc. Nat. Hist., p. 103, Niagara Gr.

pustulosus, Hall, 1859, Pal. N. Y., vol. 3, p. 366, Low. Held. Gr.

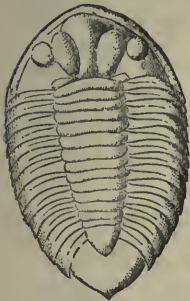


FIG. 1026.—*Lichas trentonensis*.

Body elongate; test smooth or with microscopic punctures; glabella elevated, furrows faint; dorsal furrow faint in front; fixed cheek arched downward at the sides; front limb concave; occipital ring aculeate; head at the genal angle rounded; ends of the pleuræ of the thorax rounded; pygidium minute, having few segments. Type *L. aculeatus*.

aurora, Hartt, 1868, (*Conocephalites aurora*.) Acad. Geol., p. 653, St. John Gr.

linnarsoni, Brogger, 1878, *Paradoxides skifrene* vid Kreckling, p. 47, St. John Gr.

linnarsoni var. *alata*, Matthew, 1887, Trans. Roy. Soc. Can., p. 147, St. John Gr.

neglectus, Hartt, 1868, (*Conocephalites neglectus*.) Acad. Geol., p. 652, St. John Gr. Probably a syn. for *L. tener*.

ouangondianus, Hartt, 1868, (*Conocephalites ouangondianus*.) Acad. Geol., p. 648, St. John Gr.

ouangondianus var. *gibbus*, Matthew, 1887, Trans. Roy. Soc. Can., p. 140, St. John Gr.

ouangondianus var. *immarginata*, Matthew, 1887, Trans. Roy. Soc. Can., p. 139, St. John Gr.

ouangondianus var. *planus*, Matthew, 1887, Trans. Roy. Soc. Can., p. 140, St. John Gr.

quadratus, Hartt, 1868, (*Conocephalites quadratus*.) Acad. Geol., p. 654, St. John Gr.

tener, Hartt, 1868, (*Conocephalites tener*.) Acad. Geol., p. 652, St. John Gr.

Lisgocaris, Clarke, syn. for *Spathiocaris lutheri*, see *Spathiocaris lutheri*.

LONGHOCEPHALUS, Owen, 1852, Geo. Wis., Iowa, and Minn., p. 575. [Ety. *longus*, long; *cephale*, head.] Cephalic shield, having a wide frontal limb; posterior

superbus, Billings, 1875, Can. Nat. and Geol., vol. 7, p. 239, Up. Held. Gr.
trentonensis, Conrad, 1842, (*Asaphus trentonensis*.) Jour. Acad. Nat. Sci., vol. 8, p. 277, and Pal. N. Y., vol. 1, p. 235, Black Riv. and Trenton Grs.

LIOSTRACUS, Angelin, 1852, Palæontologia Scandinavica, p. 23. [Ety. *leiostrakos*, smooth-shelled.]



FIG. 1027.—*Liostracus aculeatus*.

angle of each cheek terminating in a spine; glabella short, subquadrate, or truncato-conical, highly arched; two or three obscure furrows on each side; base projected backward, in a spine of greater or less length, in the median line, over the thoracic segments; facial sutures cut the anterior margin in front of the eyes, and gently curve outward and then inward to the anterior angles of the palpebral lobes; thence curving to the base of the eyes, they are directed backward and slightly outward to the posterior margin; pygidium supposed to be semilunar, with little or no border, and having four segments in the axial lobe. Type *L. chippewensis*.

chippewensis, Owen, 1852, Geo. Wis., Iowa, and Minn., p. 576, Potsdam Gr.

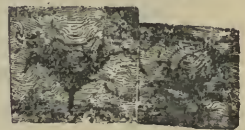


FIG. 1028.—*Lonchocephalus chippewensis*.

hamulus, Owen, 1852, Geo. Wis., Iowa, and Minn., p. 576, Potsdam Gr.

wisconsinensis, Owen, 1852, Geo. Wis., Iowa, and Minn., p. 576, and 16th Rep. N. Y. St. Mus. Nat. Hist., p. 146, Potsdam Gr.

LOGANELLUS, Devine, 1863, Can. Nat. and Geo., vol. 8, p. 95. [Ety. proper name.]

General form ovate; cephalic shield lunate; glabella convex, conical, two or three oblique furrows on each side; facial suture behind the eye curving outward, and cutting the posterior margin inside the angle and in front of the eye, curving outward to the frontal margin; thorax broad, side lobes flat,

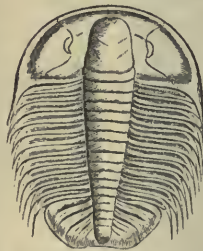


FIG. 1029.—*Loganellus quebecensis*.

pleuræ about twelve; groove running along the middle nearly to the extremities; pygidium with a well-defined axis, side lobes depressed, and with four to six ribs; distinguished from *Olenus* by having the facial suture curved outward in front of the eye.

Type *L. quebecensis*. This is one of the forms often referred to *Conocoryphe* or to *Ptychoparia*, but the genus may be worth preserving.

quebecensis, Devine, 1863, Can. Nat. and Geo., vol. 8, p. 95, Quebec Gr. or Up. Taconic.

MEGALASPIS, Angelin, 1852, Palæontologia Scandinavica. [Ety. *megale*, great; *aspis*, shield.] Body subelliptical; cephalic shield obtusely pointed in front, genal angles spined; glabella convex,

expanded anteriorly, no lateral furrows, eyes large and close, posterior;



FIG. 1030.—*Megalaspis belemnura*. Pygidium.

facial sutures commencing at the anterior apex of the shield, curving laterally, and then contracting to the eyes in front and making a sigmoidal flexure, cut the posterior margin midway between the dorsal furrows and the genal spines; pygidium subtriangular, outer margin bordered, and terminating in a spine. Type *M. limbata*.

belemnura, White, 1874, Rep. Invert. Foss., p. 11, and Geo. Sur. W. 100th Mer., vol. 4, p. 59, Quebec Gr. or Up. Taconic.



FIG. 1031.—*Mesonacis vermontana*.

MENOCEPHALUS, Owen, 1852, Geo. Sur. Wis., Iowa, and Minn., p. 577. [Ety. *menos*, strength; *kephale*, head.] Cephalic shield semicircular, with a narrow border all around; glabella highly convex, hemispherical or ovate, with a broadly rounded front, sometimes showing two inconspicuous lateral furrows

on each side; cheeks tumid; eyes distant from the middle of the glabella; facial suture cuts the front margin a little inside a line drawn lengthwise of the body and through the eye, and cuts the posterior margin a little outside this line; thoracic segments six or seven, axis convex, tapering a little narrower than the side lobes; pygidium semicircular, axis and side lobes divided by segmental furrows. Type *M. minnesotensis*.

?*globosus*, Billings, 1860, Can. Nat. and Geo., vol. 5, p. 301, and Pal. Foss., vol. 1, p. 408, Quebec Gr. or Up. Taconic.

minnesotensis, Owen, 1852, Geo. Sur. Wis., Iowa, and Minn., p. 577, Potsdam Gr.

(?) *salteri*, Devine, 1863, Can. Nat. and Geo., vol. 8, p. 210, and Pal. Foss., vol. 1, p. 203, Up. Taconic.



FIG. 1032. *Menocephalus salteri*.

?*sedgwicki*, Billings, 1860, Can. Nat. and Geo., vol. 5, p. 301, and Pal. Foss., vol. 1, p. 407, Quebec Gr. or Up. Taconic.

MESONACIS, Walcott, 1885, Am. Jour. Sci. and Arts, 3d ser., vol. 29, p. 328. [Ety. *mesos*, middle; *akis*, point, spear.] Head and first fourteen segments like *Elliptocephala*, and the pygidium and ten posterior segments like *Paradoxides*. Type *M. vermontana*.

vermontana, Hall, 1859, (Olenus *vermontanus*.) 12th Rep. N. Y. St. Mus. Nat. Hist., p. 60, Up. Taconic, Georgia Gr.

MESOTHYRA, Hall, 1888, Pal. N. Y., vol. 7, p. lvi. [Ety. *mesos*, middle; *thyris*, small door.] Carapace subquadrate; valves in contact at the apices of two broad, subtriangular extensions, situated on the dorsal line opposite the eye nodes, forming a broad and short anterior or rostral cleft, and a long posterior cleft; test broadly infolded on the lower surface, thickened and produced into a conspicuous and acute posterior spine; posterior margin incurved and produced into a short spine at the dorsal line; surface with a single strong carina on each valve; abdomen consisting of two somites, of which the posterior is the longer; post-abdomen with a broad caudal plate, which is produced into a relatively short telson; lateral spines long and setaceous. Type *M. oceani*. *belli*, Woodward, 1870, (Dithyrocaris *belli*), Geo. Mag., vol. 8, p. 106, Mid. Devonian.

neptuni, Hall, 1863, (Dithyrocaris *neptuni*.) 16th Rep. N. Y. St. Mus. Nat. Hist., p. 75, Ham. Gr.

oceani, Hall, 1888, Pal. N. Y., vol. 7, p. 187, Portage Gr.

spumæa, Hall, 1888, Pal. N. Y., vol. 7, p. 193, Ham. Gr.

veneris, Hall, 1888, Pal. N. Y., vol. 7, p. 193, Ham. Gr.

MICRODISCUS, Emmons, 1856, Am. Geol., p. 116. [Ety. *mikros*, small; *diskos*, quoit.] Subelliptical; cephalic shield semicircular; glabella narrow, convex, rounded in front, more or less pointed behind, without furrows or occipital groove; cheeks more or less convex, no eyes or trace of sutures; thorax with four articulations, axis narrow, convex, lateral lobes wider, depressed; pygidium shorter than the cephalic shield, subtrigonal or rounded posteriorly, trilobed, axis divided into four or six segments, and having a border. Type *M. quadricostatus*.

connexus, Walcott, 1887, Am. Jour. Sci. and Arts, 3d ser., vol. 34, p. 194, Up. Taconic.

dawsoni, Hartt, 1868, Acad. Geo., p. 654, St. John Gr.

lobatus, Hall, 1847, (*Agnostus lobatus*), Pal. N. Y., vol. 1, p. 258, Up. Taconic.

meeki, Ford, 1876, Am. Jour. Sci. and Arts, 3d ser., vol. 11, p. 371, Up. Taconic.

parkeri, Walcott, 1886, Bull. U. S. Geo. Sur. No. 30, p. 157, Up. Taconic.

pulchellus, Hartt, 1885, Trans. Roy. Soc. Can., p. 74, St. John Gr.

pulchellus var. *præcursor*, Matthew, 1885, Trans. Roy. Soc. Can., p. 75, St. John Gr.

quadricostatus, Emmons, 1856, Am. Geol., p. 116, Up. Taconic.

speciosus, Ford, 1873, Am. Jour. Sci. and Arts, 3d ser., vol. 6, p. 137, Up. Taconic.



FIG. 1033.—*Microdiscus quadricostatus*. Magnified 5 diam.

NILEUS, Dalman, 1826, Ueber die Palæaden oder die Sogenannten Trilobiten, p. 49. [Ety. mythological name.] Cephalic shield twice as wide as long, convex, lateral angles broadly rounded; glabella subquadrate, undefined anteriorly, no lateral furrows, convex, sloping in all directions from the central part; facial sutures in front, nearly parallel with, and almost reaching, the anterior margin, each forming a sigmoid flexure to the anterior part of the eye, then forming a semicircular eye-lobe from the posterior angle of the eye, and directed laterally to the posterior margin within the broadly rounded angle of the cephalic shield; eyes very large, lunate, with many lenses; eight thoracic segments, indistinctly trilobate, axial lobe the broader; pygidium twice as wide as long, not trilobate, no segments, broadly rounded posteriorly. Type *N. armadillo*.



FIG. 1034.
Nileus macrops.

affinis, Billings, 1865, Pal. Foss., vol. 1, p. 275, Quebec Gr. or Up. Taconic.

macrops, Billings, 1865, Pal. Foss., vol. 1, p. 273, Quebec Gr. or Up. Taconic.

scrutator, Billings, 1865, Pal. Foss., vol. 1, p. 274, Quebec Gr. or Up. Taconic.

Nothozoe, Barrande, Whitfield referred some ovate bodies found in the Potsdam sandstone, without characteristics, to this genus, under the name of *Nothozoe vermontana*. See Bull. Am. Mus. Nat. Hist., 1884, vol. 1, p. 144.

Nuttainia, syn. for *Trinucleus*.

concentrica, see *Trinucleus concentricus*.

sparsa, syn. for *Homalonotus dekeyi*.

Odontocephalus, Conrad, 1840, Am. Geo. Rep. N. Y. Not properly defined.

selenurus, see *Dalmanites selenurus*.

Odontochile, syn. for *Dalmanites*.

OGYGIA, Brongniart, 1822, Hist. Nat. Crust.

Foss., p. 28. [Ety. mythological name.]

Flat or slightly convex; cephalic shield semicircular; glabella wider in front, with three lateral furrows on each side; eyes large, lunate, affixed centrally near the glabella, facial suture marginal in front, curving like the letter S, and terminating posteriorly midway between the outer angle of the cephalic shield and thoracic axis; thorax with narrow axis, pointed pleure, grooved, obscure, and remote fulcrum; eight segments; pygidium many segments, sides with radiating furrows, the interstices of which are divided by half rays. Type *O. guettardi*.

klotzi, Rominger, 1887, Proc. Acad. Nat. Sci. Phil., p. 12, Potsdam Gr.

parabola, Hall & Whitfield, syn. for *Bathyriscus productus*.

problematica, Walcott, 1885, Monogr. U. S. Geo. Sur., vol. 8, p. 63, Potsdam Gr.

serrata, Rominger, syn. for *Olenoides nevadensis*.

producta, Hall & Whitfield, see *Bathyriscus productus*.

spinosa, see *Olenoides spinosus*.

vetusta see *Asaphus vetustus*.

Olenellus, Hall, 1862, 15th Rep. N. Y. St. Mus.

Nat. Hist., p. 86, syn. for *Elliptocephala*.

asaphoides, see *Elliptocephala asaphoides*.

gilberti, see *Elliptocephala gilberti*.

howelli, see *Elliptocephala howelli*.

iddingsi, see *Elliptocephala iddingsi*.

vermontanus, Hall, 1859, see *Mesonacis vermontana*.

OLENOIDES, Meek, 1877, Geol. Expl. 40th Par., vol. 4, p. 25. [Ety. *Olenus*, and *oides* form.]

Ovate, head large, semicircular; glabella straight or slightly expanded in front; three pairs of furrows; eyes elongate; facial sutures extend obliquely outward from the anterior base of the eyes and cut the frontal margin; posteriorly they cut the margin at the pleural angle, and run subparallel to the margin to the posterior end of the eye; thorax with eight or more segments; axis strong, pleural groove broad, and lobes well defined; pygidium marked transversely on the

axis, and lateral segments directed backward. Type *O. nevadensis*.

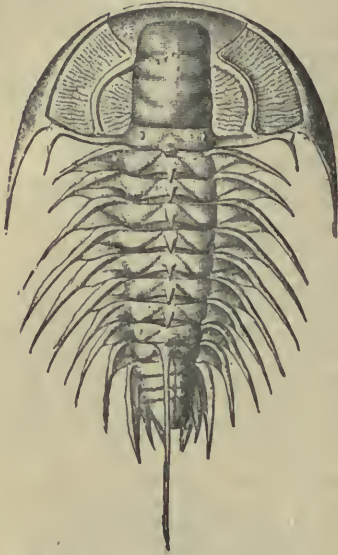


FIG. 1035.—*Olenoides typicalis*;

fordi, Walcott, 1887, *Am. Jour. Sci. and Arts*, 3d ser., vol. 34, p. 195, Up. Taconic.
levis, Walcott, 1886, *Bull. U. S. Geo. Sur.*, No. 30, p. 187, Up. Taconic.

nevadensis, Meek, 1870, (*Paradoxides nevadensis*), *Proc. Acad. Nat. Sci. Phil.*, p. 62, and *Geol. Expl.* 40th Par., vol. 4, p. 23, Up. Taconic.

quadriiceps, Hall & Whitfield, 1877, (*Dicelloccephalus quadriiceps*), *Geol. Expl.* 40th Par., vol. 4, p. 240, Up. Taconic.

spinus, Walcott, 1885, (*Ogygia spinosa*), *Mon. U. S. Geo. Sur.*, vol. 8, p. 63, Up. Taconic.

stissingensis, Dwight, 1889, *Am. Jour. Sci. and Arts*, 3d ser., vol. 38, p. 147, Up. Taconic.

typicalis, Walcott, 1886, *Bull. U. S. Geo. Sur.* No. 30, p. 183, Up. Taconic.

wahsatchensis, Hall & Whitfield, 1877, (*Dicelloccephalus wahsatchensis*), *Geol. Expl.* 40th Par., vol. 4, p. 241, Up. Taconic.

Olenus, Dalman, 1826, *Über die Palæoden oder die sogenannten Trilobiten*, p. 54. Not an American genus.

† *logani*, see *Loganellus quebecensis*.

thompsoni, see *Elliptocephala thompsoni*.

undulostriatus, see *Elliptocephala undulostriata*.

vermontana, see *Mesonacis vermontana*.

ORYCTOCEPHALUS, Walcott, 1886, *Bull. U. S. Geo. Sur.* No. 30, p. 210. [Ety. *oryktos*, furrowed; *kephale*, head.] Glabella ob-

long, transversely lobed; eyes central, narrow, ocular ridges connecting them with the axial furrow about the glabella; facial suture marginal in front, and cutting the posterior margin within



FIG. 1036.—*Oryctocephalus primus*. Cephalic shield.

the postero-lateral angles; free cheeks spinous; pygidium with segmented axis and pleural lobes; margin spinous. Type *O. primus*.

primus, Walcott, 1886, *Bull. U. S. Geo. Sur.* No. 30, p. 210, Up. Taconic.

PALÆOCARIS, Meek & Worthen, 1865, *Proc. Acad. Nat. Sci. Phil.*, p. 48.

[Ety. *palaios*, ancient; *karis*, shrimp.] Inner and outer pairs of antennæ of nearly equal length'



FIG. 1037.—*Oryctocephalus primus*. Pygidium.

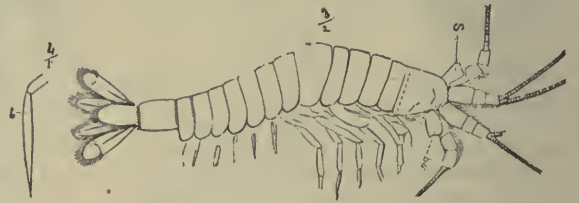


FIG. 1038.—*Palæocaris typus*. 3 diam.

the former each bearing a well developed accessory appendage; peduncles of both pairs shorter than the flagella; head about as long as the first two abdominal segments; thoracic legs long and slender, anterior pair not chelate; telson long, tapering, and horizontally flattened; styl-

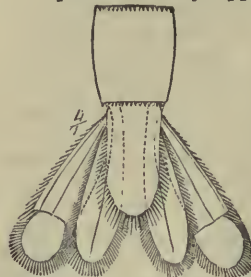


FIG. 1039.—*Palæocaris typus*. Caudal part 4 diam.

lets with first joint very small, second double, and also flattened horizontally. Type *P. typus*.

typus, Meek & Worthen, 1865, *Proc. Acad. Nat. Sci. Phil.*, p. 49, and *Geo. Sur. Ill.*, vol 2, p. 405, *Coal Meas.*

PALÆOCREUSIA, Clarke, 1888, Pal. N. Y., vol. 7, p. 210. [Ety. *palaaios*, ancient; *Creusis*, a genus.] Capitulum ovate, patelliform, surface conical; apex truncated by a horizontal plane, forming a large central aperture; surface striated; basis tubuliform, subcylindrical or cup-shaped. Type *P. devonica*.

devonica, Clarke, 1888, Pal. N. Y., vol. 7, p. 210, Up. Held. Gr.

PALÆOPALÆMON, Whitfield, 1880, Am. Jour. Sci. and Arts, 3d ser., vol. 19, p. 40. [Ety. *palaaios*, ancient; *palæmon*, a genus.] Shrimp-like, thoracic carapace narrowed, but not rostrate in front and keeled on the back and sides; abdomen, six segments terminated by an elongated, triangular, and pointed telson; segments arched; pleuræ smooth, not lobed or expanded, extremities rounded; sixth segment bearing caudal flaps, one on each side, composed of five visible elements, the outer four apparently ankylosed to form a triangular plate on each side of the telson; thoracic ambulatory appendages elongated, smooth and filiform, except the upper second joint, which is laterally compressed; abdominal appendages short; antennæ large and strong. Type *P. newberryi*.

newberryi, Whitfield, 1880, Am. Jour. Sci. and Arts, 3d ser., vol. 19, p. 41, Erie shales.

PARADOXIDES, Brongniart, 1822, Hist. Nat. Crust. Foss., p. 31. [Ety. *paradoxos*, marvelous, paradoxical.] Cephalic shield lunate, margin thickened, not reflexed; glabella clavate or oval, moderately convex, enlarged anteriorly, three curved furrows cross it, dividing it into four parts; fixed cheeks tumid; eyes oblong, lunate, distant and opposite the second division of the glabella; facial suture, cutting the margin in front of the eye and curving S-like to the eye, and curving in like manner to the posterior margin directly behind the eye; movable cheek tumid and prolonged in a spine; thorax 16 to 20; segments, axis convex, narrower than the lateral lobes, lateral lobes flattened and turned backward; pygidium circular or oval; axis segmented, short, lateral lobes flattened and projected backward. Type *P. tescini*.



FIG. 1040.—*Paradoxides bohemicus*.

abrenacus, Matthew, 1885, Trans. Roy.

Soc. Can., p. 78, St. John Gr.
acadicus, Matthew, 1883, Trans. Roy. Soc. Can., p. 103, St. John Gr.

acadicus var. *suricus*, Matthew, 1885, Trans. Roy. Soc. Can., p. 77, St. John Gr.

arcuatus, Harlan, 1835, Trans. Geo. Soc., syn. for *Triarthrus becki*.

barberi, N. H. Winchell, 1885, 13th Ann. Rep. Geo. Sur. Minn., p. 67, Potsdam Gr. Not a *Paradoxides*.

bennetti, Salter, 1859, Quar. Jour. Geo. Soc., vol. 15, p. 552, Up. Taconic.

boltoni, see *Lichas boltoni*.



FIG. 1041.—*Paradoxides harlani*.

decorus, Billings, 1874, Pal. Foss., vol. 2, p. 75, Up. Taconic.

eatoni, syn. for *Triarthrus becki*.

etemnicus, Matthew, 1883, Trans. Roy. Soc. Can. pp. 92, 271, St. John Gr.

etemnicus var. *breviatus*, Matthew, 1883, Trans. Roy. Soc. Can., p. 99, St. John Gr.

etemnicus var. *malicitus*, Matthew, Trans. Roy. Soc. Can., p. 101, St. John Gr.

etemnicus var. *pontificalis*, Matthew, 1883, Trans. Roy. Soc. Can., p. 102, St. John Gr.

etemnicus var. *quacoensis*, Matthew, 1883, Trans. Roy. Soc. Can., p. 102, St. John Gr.

etemnicus var. *suricoides*, Matthew, 1883, Trans. Roy. Soc. Can., p. 106, St. John Gr.

harlani, Green, 1834, Am. Jour. Sci., vol. 25, p. 336, Up. Taconic.

lamellatus, Hartt, 1868, Acad. Geol., p. 656, St. John Gr.

lamellatus var. *loricatus*, Matthew, 1883, Trans. Roy. Soc. Can., p. 106, St. John Gr.

micmac, Hartt, 1868, Acad. Geol., p. 657, and Trans. Roy. Soc. Can., vol. 2, p. 101, St. John Gr.

nevadensis, Meek, see *Olenoides nevadensis*.
quadriscopinosus, Emmons, syn. for *Bathynotus hologyga*.
regina, Matthew, 1887, Am. Jour. Sci. and Arts, 3d ser., vol. 33, p. 389, and Trans. Roy. Soc. Canada, p. 115, St. John Gr.
tenellus, Billings, 1874, Pal. Foss., vol. 2, Up. Taconic.
thompsoni, see *Elliptocephala thompsoni*.
triarthrus, Harlan, syn. for *Triarthrus becki*.
vermontana, see *Mesonacis vermontana*.
Peltura, M. Edwards, 1840, Hist. Nat. Crust., t. 3, p. 344. Type *P. scarabaeoides*.
hologyga, see *Bathynotus, hologyga*.
PEMPPIGASPIIS, Hall, 1863, 16th Rep. N. Y. St. Mus. Nat. Hist., p. 221. [Ety. *pemp-phix*, pustule; *aspis*, shield.] Founded upon part of a shield somewhat resembling the pygidium of a trilobite; a narrow, straight, annulated axis extends to the margin posteriorly; side lobes wider, ovate and ventricose. Type *P. bullata*.
bullata, Hall, 1863, 16th Rep. N. Y. St. Mus. Nat. Hist., p. 211, Potsdam Gr.
PHACOPS, Emmrich, 1839, de Trilobites, Dissertatio Inauguralis, p. 19. [Ety. *phakos*, lens; *ops*, eye.] Form compact, glabella inflated and expanded in front; the two front pairs of furrows are obscure; eyes large, numerous lenses; genal rounded; pleure rounded, pygidium moderate, of few (often coalesced) segments with an even border, never produced. Type *P. latifrons*.
bufo, Green, 1832, (Calymene bufo,) Monograph of Trilobites, p. 41, and Illust. Devon. Foss., pl. 8, Ham. Gr.
bombifrons, Hall, 1862, 15th Rep. N. Y. St. Mus. Nat. Hist., p. 67, Up. Held. Gr.
cacapona, Hall, 1862, 15th Rep. N. Y. St. Mus. Nat. Hist. p. 68, Up. Held. Gr.
callicephalata, see *Dalmanites callicephalus*.
cristata, Hall, 1862, 15th Rep. N. Y. St. Mus. Nat. Hist., p. 67, Up. Held. Gr.
cristata var. *pipa*, Hall, 1888, Pal. N. Y., vol. 7, p. 18, Up. Held. Gr.
hudsonica, Hall, 1859, Pal. N. Y., vol. 3, p. 355, Low. Held. Gr.
laticaudus, see *Dalmanites laticaudus*.
logani, Hall, 1859, Pal. N. Y., vol. 3, p. 353, Low. Held. Gr.
nupera, Hall, 1843, (Calymene nupera,) Geo. Rep. 4th Dist. N. Y., p. 262, and Illust. Devon. Foss., pl. 8, Chemung Gr.
orestes, Billings, 1860, Can. Nat. and Geol., vol. 4, p. 65, Mid. Sil.



FIG. 1042.—Phacops bufo.

rana, Green, 1832, (Calymene bufo var. rana,) Monograph of Trilobites, p. 42, and Illust. Devon. Foss., pl. 7, Ham. Gr.
trajanus, Billings, 1863, Proc. Port. Soc. Nat. Hist., vol. 1, p. 124, Low. Held. Gr.
trisculcata, Hall, 1843, (Calymene (?) trisculcata,) Geo. Rep. 4th Dist. N. Y., p. 74, and Pal. N. Y., vol. 2, p. 300, Clinton Gr.

PHÆTHONIDES, Angelin, 1878, Palæontologia Scandinavica, p. 21. [Ety. *phæthion*, radiant.] Head shield resembling *Cyphaspis*, the frontal area more concave, and lateral glabellar furrows stronger and generally duplicate; thorax having seven or more narrow segments; axis wide; pygidium resembling *Proetus*, relatively large, 8 to 12 annulations on the axis, and 8 or 9 on the pleuræ; these extend to the margin, and are duplicate the entire length. Type *P. stokesi*.

arenicolus, Hall, 1888, Pal. N. Y., vol. 7, p. 134, Up. Held. Gr.
cyclurus, Hall, 1888, Pal. N. Y., vol. 7, p. 137, Low. Held. Gr.
denticulatus, Meek, 1877, (Proetus denticulatus,) Geol. Expl. 40th Par., p. 49, Devonian.
gemmæus, Hall, 1888, Pal. N. Y., vol. 7, p. 136, Low. Held. Gr.
varicella, Hall, 1888, Pal. N. Y., vol. 7, p. 135, Up. Held. Gr.

PHILLIPSIA, Portlock, 1843, Rep. Geol. Londonderry, p. 305. [Ety. proper name.]

Cephalic shield subsemicircular, angles terminating in spines; glabella subcylindrical, not contracted at base, three furrows on each side; eyes large, reniform, reticulated; thorax of 9 segments having pleural grooves and distinct facets; pygidium semioval, axis and lateral lobes furrowed, margin entire, smooth. Type *P. gemmulifera*.



FIG. 1043.—Phillipsia gemmulifera.

auriculatus, Hall, 1862, (Proetus auriculatus,) 15th Rep. N. Y. St. Mus. Nat. Hist., p. 79, Waverly Gr. bufo, Meek & Worthen, 1870, Proc. Acad. Nat. Sci., p. 52, and Geo. Sur. Ill., vol. 5, p. 528, Keokuk Gr.
cliftonensis, Shumard, 1858, Trans. St. Louis Acad. Sci., vol. 1, p. 227, Coal Meas.
coronata, Hall, syn. for *Cyphaspis ornata*.
doris, Hall, 1860, (Proetus doris,) 13th Rep. N. Y. St. Mus. Nat. Hist., p. 112, Waverly Gr.
howi, Billings, 1863, Can. Nat. and Geol., vol. 8, p. 209, Carboniferous.

insignis, Winchell, 1863, Proc. Acad. Nat. Sci., p. 24, Burlington Gr.
lævis, see *Cyphaspsis lævis*.



FIG. 1044.—*Phillipsia lodensis*.

- lodiensis*, Meek, 1875, Ohio Pal., vol. 2, p. 323, Waverly Gr.
major, Shumard, 1858, Trans. St. Louis Acad. Sci., vol. 1, p. 226, and Pal. E. Neb., p. 238, Coal Meas.
meramecensis, Shumard, 1855, Geo. Rep. Mo., p. 199, Archimedes limestone or Keokuk Gr.
minuscula, see *Cyphaspsis minuscula*.
missouriensis, Shumard, 1858, Trans. St. Louis Acad. Sci., vol. 1, p. 225, Coal Meas.
ornata, Hall, see *Cyphaspsis ornata*.
perannulata, Shumard, 1858, Trans. St. Louis Acad. Sci., vol. 1, p. 296, Permian Gr.
portlocki, Meek & Worthen, 1865, Proc. Acad. Nat. Sci., p. 268, and Geo. Sur. Ill., vol. 5, p. 525, Keokuk Gr.
rockfordensis, Winchell, 1865, Proc. Acad. Nat. Sci., p. 133, Kinderhook Gr.
sangamonensis, Meek & Worthen, 1865, Proc. Acad. Nat. Sci., p. 271, and Geo. Sur. Ill., vol. 5, p. 615, Coal Meas.
scitula, Meek & Worthen, 1865, Proc. Acad. Nat. Sci., p. 270, and Geo. Sur. Ill., vol. 5, p. 612, Coal Meas.
stevensoni, Meek, 1871, Reg. Rep. University W. Va., Kaskaskia Gr.
swallowi, Shumard, 1855, (Proetus swallowi,) Geo. Rep. Mo., p. 196, Waverly Gr.
tennesseensis, Winchell, 1869, Geo. of Tenn., p. 445, Waverly Gr.
tuberculata, Meek & Worthen, 1870, Proc. Acad. Nat. Sci., p. 52, Burlington Gr.
vindobonensis, Hartt, 1868, Acad. Geol., p. 313, Carboniferous.
Piliolites, Cozzens, 1848. Not identified.
ohioensis, Cozzens, 1848. Not identified, but probably the fragment of a *Dalmanites*.
Platymotus, syn for *Lichas*.
boltoni, see *Lichas boltoni*.
trentonensis, see *Lichas trentonensis*.
Plumulites, Barrande, syn. for *Turrilepas*.
devonicus, see *Turrilepas devonicus*.
gracillimus, see *Turrilepas gracillimus*.
jamesi, see *Lepidocoleus jamesi*.
newberryi, see *Turrilepas newberryi*.
Prestwichia, Woodward, 1867, Quar. Jour. Geo. Soc. Lond., vol. 23. Not known in America.
eriensis, see *Protolimulus eriensis*.
PRIMITIA, Jones, 1865, Ann. and Mag. Nat. Hist., 3d ser., vol. 16, p. 415. [Ety. *primitia*, first of the kind.] Carapace minute; bivalve, equivalve, convex oblong; hinge straight; surface of each valve impressed, on the dorsal region either medially or toward the anterior extremity, with a vertical sulcus, variable in size. Type *P. stragulata*.
acadica, Matthew, 1885, Trans. Roy. Soc. Can. p. 66, St. John Gr.
æqualis, Jones & Hall, 1886, Ann. and Mag. Nat. Hist., 5th ser., vol. 17, p. 411, Low. Held. Gr.
cincinnatiensis, S. A. Miller, 1875, (Beyrichia *cincinnatiensis*.) Cin. Quar. Jour. Sci., vol. 2, p. 350, Hud. Riv. Gr. ①
concinna, Jones, 1858, (Cytheropsis *concinna*.) Ann. and Mag. Nat. Hist., 3d ser., vol. 1, p. 249, Black Riv. Gr.
cristata, Whitfield, 1889, Bull. Am. Mus. Nat. Hist., vol. 2, p. 59, Calciferous Gr.
gregaria, Whitfield, 1889, Bull. Am. Mus. Nat. Hist., vol. 2, p. 58, Calciferous Gr.
logani, Jones, 1858, (Beyrichia *logani*.) Ann. and Mag. Nat. Hist., 3d ser., vol. 1, p. 244, Chazy Gr.
leperditioides, Jones, 1858, (Beyrichia *logani* var. *leperditioides*.) Can. Org. Rem., Decade 3, p. 91, Chazy Gr.
mundula, Jones, 1855, Ann. and Mag. Nat. Hist., 2d ser., vol. 16, p. 90, Low. Devonian.
muta, Jones, 1865, Ann. and Mag. Nat. Hist., 3d ser., vol. 16, p. 425, Up. Sil.
reniformis, Jones, 1858, (Beyrichia *logani* var. *reniformis*.) Can. Org. Rem., Decade 3, p. 91, Chazy Gr.
rugulifera, Jones, 1858, (Beyrichia *rugulifera*.) Ann. and Mag. Nat. Hist., 3d ser., vol. 1, p. 242, Niagara Gr.
scaphoides, Jones, 1889, Ann. and Mag. Nat. Hist., 6th ser., vol. 3, p. 377, Low. Devonian.
seeleyi, Whitfield, 1889, Bull. Am. Mus. Nat. Hist., vol. 2, p. 60, Calciferous Gr.
sigillata, Jones, 1858, (Beyrichia *sigillata*.) Ann. and Mag. Nat. Hist., 3d ser., vol. 1, p. 242, Niagara Gr.
PROETUS, Steininger, 1830, Bemerkungen über die Versteinerungen welche im Uebergangs-Gebirge der Eifel, p. 4. [Ety. mythological name.] Subelliptical; cephalic shield semicircular, margin thickened; glabella very convex, parabolic, rounded anteriorly, no lateral furrows; neck furrow well marked; eyes prominent, smooth, close to glabella; facial suture, on a line with the eyes in front, curves gently backward and reaches the posterior margin, within the genal angle; thoracic segments 10, convex, lateral lobes, with an oblique indentation; pygidium tri-

FIG. 1045.—*Primitia cincinnatiensis*.

lobed, segmented, semicircular; axis very convex, short. Type *P. cuvieri*.



FIG. 1046.—*Proetus alaricus*.

- alaricus*, Billings, 1860, *Can. Nat. and Geo.*, vol. 5, p. 68, Hud. Riv. Gr.
- angustifrons*, Hall, 1862, 15th Rep. N. Y. St. Mus. Nat. Hist., p. 70, Schoharie grit.
- auriculatus*, see *Phillipsia auriculatus*.
- canaliculatus*, Hall, 1862, 15th Rep. N. Y. St. Mus. Nat. Hist., p. 73, Up. Held. Gr.
- clarus*, Hall, 1862, 15th Rep. N. Y. St. Mus. Nat. Hist., p. 71, Up. Held. Gr.
- conradi*, Hall, 1862, 15th Rep. N. Y. St. Mus. Nat. Hist., p. 69, and *Illust. Devon. Foss.*, pl. 20, Schoharie grit.
- corycæus*, Conrad, 1842, (*Asaphus corycæus*), *Jour. Acad. Nat. Sci.*, vol. 8, p. 277, and *Pal. N. Y.*, vol. 2, p. 315, Niagara Gr.
- crassimarginatus*, Hall, 1843, (*Calymene crassimarginata*), *Geo. Rep. 4th Dist. N. Y.*, p. 172, and *Illust. Devon. Foss.*, pl. 20, Up. Held. Gr.
- curvmarginatus*, Hall, 1888, *Pal. N. Y.*, vol. 7, p. 94, Up. Held. Gr.
- davenportensis*, Barris, 1879, *Proc. Dav. Acad. Sci.*, vol. 2, p. 287, syn. for *P. prouti*.
- delphinulus*, Hall, 1888, *Pal. N. Y.*, vol. 7, p. 111, Up. Held. Gr.
- denticulatus*, see *Phæthonides denticulatus*.
- doris*, see *Phillipsia doris*.
- ellipticus*, Meek & Worthen, 1865, *Proc. Acad. Nat. Sci.*, p. 267, and *Geo. Sur. Ill.*, vol. 3, p. 460, Kinderhook Gr.
- folliceus*, Hall, 1888, *Pal. N. Y.*, vol. 7, p. 101, Up. Held. Gr.
- granulatus*, Wetherby, 1881, *Jour. Cin. Soc. Nat. Hist.*, vol. 4, p. 81, Kaskaskia Gr.
- haldemani*, Hall, 1862, 15th Rep. N. Y. St. Mus. Nat. Hist., p. 74, Ham. Gr.
- hesione*, Hall, 1862, 15th Rep. N. Y. St. Mus. Nat. Hist., p. 70, and *Illust. Devon. Foss.*, pl. 20, Schoharie grit.
- jejunus*, Hall, 1888, *Pal. N. Y.*, vol. 7, p. 124, Ham. Gr.
- junius*, Billings, 1863, *Proc. Port. Soc. Nat. Hist.*, vol. 1, p. 122, Low. Held. Gr.
- latimarginatus*, Hall, 1888, *Pal. N. Y.*, vol. 7, p. 97, Up. Held. Gr.
- loganensis*, Hall & Whitfield, 1877, *U. S. Geo. Exp. 40th Par.*, vol. 4, p. 264, Waverly Gr.
- longicaudus*, Hall, 1862, 15th Rep. N. Y. St. Mus. Nat. Hist., p. 108, and *Illust. Devon. Foss.*, pl. 20, Ham. Gr.
- macrobius*, Billings, 1863, *Proc. Port. Soc. Nat. Hist.*, vol. 1, p. 123, Low. Held. Gr.

- macrocephalus*, Hall, 1862, 15th Rep. N. Y. St. Mus. Nat. Hist., p. 77, Ham. Gr.
- marginalis*, Conrad, 1839, (*Calymene marginalis*), *Ann. Geo. Rep. N. Y.*, p. 66, and *Illust. Devon. Foss.*, pl. 21, Tully limestone.
- microgemma*, Hall, 1888, *Pal. N. Y.*, vol. 7, p. 109, Up. Held. Gr.
- missouriensis*, Shumard, 1855, *Geo. Rep. Mo.*, p. 110, Waverly or Chocteau Gr.
- nevadæ*, Hall, 1888, *Pal. N. Y.*, vol. 7, p. 129, Low. Devonian.
- occidens*, Hall, 1862, 15th Rep. N. Y. St. Mus. Nat. Hist., p. 80, Ham. Gr.
- ovifrons*, Hall, 1888, *Pal. N. Y.*, vol. 7, p. 110, Up. Held. Gr.
- parviusculus*, Hall, 1860, 13th Rep. N. Y. St. Mus. Nat. Hist., p. 120, and 24th Rep., p. 223, Hud. Riv. Gr.
- peroccidens*, Hall & Whitfield, 1877, *U. S. Geo. Expl. 40th Par.*, vol. 4, p. 262, Waverly Gr.
- phocion*, Billings, 1874, *Pal. Foss.*, vol. 2, p. 63, Gaspe limestone No. 8, Devonian.
- planimarginatus*, Meek, 1871, *Proc. Acad. Nat. Sci. Phil.*, p. 89, and *Ohio Pal.*, vol. 1, p. 223, Up. Held. Gr.
- protuberans*, Hall, 1859, *Pal. N. Y.*, vol. 3, p. 351, Low. Held. Gr.
- prouti*, Shumard, 1863, *Trans. St. Louis Acad. Sci.*, vol. 2, p. 110, Ham. Gr.
- rowii*, Green, 1838, (*Calymene rowii*), *Am. Jour. Sci.*, vol. 33, p. 406, and *Illust. Devon. Foss.*, pl. 21, Ham. Gr.
- spurlocki*, Meek, 1872, *Am. Jour. Sci.*, 3d ser., p. 426, and *Ohio Pal.*, vol. 1, p. 161, Hud. Riv. Gr. The young of an *Asaphus*.
- stenopyge*, Hall, 1888, *Pal. N. Y.*, vol. 7, p. 110, Up. Held. Gr.
- stokesi*, Murchison, 1839, (*Asaphus stokesi*), *Sil. Syst.*, p. 625, and *Pal. N. Y.*, vol. 2, p. 316, Niagara Gr.
- swallovi*, see *Phillipsia swallowi*.
- tumidus*, Hall, 1888, *Pal. N. Y.*, vol. 7, p. 113, Up. Held. Gr.
- verneuili*, Hall, 1861, 15th Rep. N. Y. St. Mus. Nat. Hist., p. 73, and *Illust. Dev. Foss.*, pl. 20, Up. Held. Gr.
- PROTIGNITES**, Owen, 1852, *Jour. Geo. Soc.*, vol. 8, p. 214. [Ety. *protos*, first; *ichnos*, foot-print; *lithos*, stone.] It consists of two rows of tracks or depressions, several inches apart; each row consists of numerous irregular and subcircular depressions, sometimes elongated; between the rows there is frequently a groove, and at other times, the surface

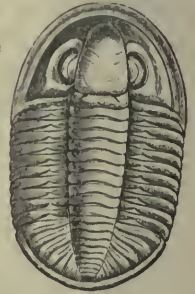


FIG. 1047.—*Proetus phocion*.

has apparently been pressed smooth.
Type *P. septemnotatus*.



FIG. 1048.—*Protichnites septemnotatus*.

- alternans*, Owen, 1852, Jour. Geo. Soc., vol. 8, pl. 14, Potsdam Gr.
- latus*, Owen, 1852, Jour. Geo. Soc., vol. 8, pl. 11, Potsdam Gr.
- lineatus*, Owen, 1852, Jour. Geo. Soc., vol. 8, pl. 13, Potsdam Gr.
- logananus*, Marsh, 1869, Am. Jour. Sci. and Arts, 2d ser., vol. 48, Potsdam Gr.
- multinotatus*, Owen, 1852, Jour. Geo. Soc., vol. 8, pl. 12, Potsdam Gr.
- octonotatus*, Owen, 1852, Jour. Geo. Soc., vol. 8, pl. 10, Potsdam Gr.
- septemnotatus*, Owen, 1852, Jour. Geo. Soc., vol. 8, pl. 9, Potsdam Gr.

PROTOBALANUS, Whitfield, 1888, Pal. N. Y., vol. 7, p. lxii. [Ety. *protos*, first; *Balanus*,

genus.] Shell ovate about the basis; composed of 12 plates of which the carina is largest and most elevated; rostrum small; lateralia five on each side; radial areas between the lateralia broad. Type *P. hamiltonensis*.

hamiltonensis, Whitfield, 1888, Pal. N. Y., vol. 7, p. 209, Ham. Gr.

PROTOCARIS, Walcott, 1884, Bull. U. S. Geo. Sur., vol. 2, p. 283. [Ety. *protos*, first; *karis*, shrimp.] Carapace without evidence of a dorsal suture, rounded on the dorsal line, and bent downward on the sides; no rostrum; body many jointed, 31 segments extending out from beneath the carapace, the last segment broader than the preceding, and terminating in two spines. Type *p. marshi*.

marshi, Walcott, 1884, Bull. U. S. Geo. Sur. vol. 2, p. 283, Georgia Gr.

PROTOLIMULUS, Packard, 1886, Mem. Nat. Acad. Sci., p. 150. [Ety. *protos*, first; *Limulus*, a genus.] Cephalothorax large, subsemicircular; genal angles produced; cephalic appendages small; terminal segments of the posterior members foliaceous; abdomen composed of six (?) segments, including the large caudal spine. Type *P. eriensis*.

eriensis, Williams, 1885, (Prestwichia eriensis,) Am. Jour. Sci. and Arts, 3d ser., vol. 30, p. 46, Chemung Gr.

PROTOTYPUS, Walcott, 1886, Bull. U. S. Geo. Sur., No. 30, p. 211. [Ety. *protos*, first; *typus*, type.] Body ovate; head broad,

semicircular; glabella large, sides parallel, rounded in front, no furrows; frontal limb narrow, in front of the



FIG. 1049.—*Protocaris marshi*.

glabella and bordered; fixed cheeks crossed in front of the eyes by an ocular ridge; eyes large, reniform; occipital ring narrow; movable cheeks curved on the outer margin and terminating

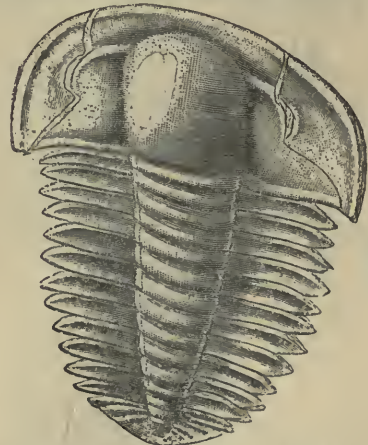


FIG. 1050.—*Prototypus hitcheocki*.

in spines; facial suture passing very little outward from the eye to the anterior margin, which it cuts at nearly right angles; behind the eye, it passes obliquely outward and backward, with

slight curvature, to just within the cheek spine; thorax, twelve segments, strongly trilobed; pleura straight, broadly channeled and pointed; pygidium small, semielliptical, and marked by three furrows on the small axis and lateral areas. Type *P. hitchcocki*.

hitchcocki, Whitfield, 1884, (*Angelina hitchcocki*.) Bull. Am. Mus. Nat. Hist., vol. 1, p. 148, Up. Taconic.

PTEROCEPHALIA, Roemer, 1849, Texas, mit naturwissenth. Anhang. Bonn., and afterward in 1852, Kreid von Texas, p. 92. [Ety. *pteron*, wing; *kephale*, head.] Cephalic shield semicircular, nearly flat; glabella less than half the length of the head shield, with a flat, wing-like projection in front; two or three furrows on each side; neck furrow distinct; facial sutures directed nearly straight back from the anterior margin to the eye, after passing which it is directed at an angle laterally of about forty-five degrees to the posterior margin; eyes situate nearly opposite the posterior lobe of the glabella; pygidium subcircular, margin flattened and produced; axial lobe narrow, about ten segments. Type *P. sanctisabæ*.

laticeps, Hall & Whitfield, 1877, (*Conocephalites laticeps*.) Geo. Expl. 40th Par., vol. 4, p. 221, Potsdam Gr.

occidens, Walcott, 1884, Mon. U. S. Geo. Sur., vol. 8, p. 58, Potsdam Gr.

sanctisabæ, Roemer, 1849, Texas, mit naturwissenth. Anhang., and in 1852, Kreid von Texas, p. 92, Potsdam Gr.

PTERYGOTUS, Agassiz, 1839, Murch. Sil. Syst., p. 605. [Ety. *pteron*, wing; *ous*, ear.] Distinguished from *Eurypterus* by having eyes marginal instead of within the



FIG. 1051.—*Pterygotus problematicus*.

carapace, twelve segments instead of thirteen in the body, a bilobate caudal extremity and chelate antennæ at the anterior part of the carapace. Type *P. problematicus*.

acuticaudatus, Pohlman, 1882, Bull. Buf. Soc. Nat. Sci., vol. 4, p. 42, Waterlime Gr.

buffaloensis, Pohlman, Bull. Buf. Soc. Nat. Hist., vol. 4, p. 17, Waterlime Gr.

cobbi, Hall, 1859, Pal. N. Y., vol. 3, p. 417, Waterlime Gr.

cummingsi, Grote & Pitt, 1875, Bull. Buf. Soc. Nat. Hist., vol. 4, p. 18, Waterlime Gr.

globicaudatus, Pohlman, 1882, Bull. Buf. Soc. Nat. Hist., vol. 4, p. 42, Waterlime Gr.

macrophthalmus, Hall, 1859, Pal. N. Y., vol. 3, p. 418, Waterlime Gr.

osborni, Hall, 1859, Pal. N. Y., vol. 3, p. 419, Waterlime Gr.

quadraticaudatus, Pohlman, 1882, Bull. Buf. Soc. Nat. Hist., vol. 4, p. 43, Waterlime Gr.

PTYCHASPIS, Hall, 1863, 16th Rep. N. Y. St. Mus. Nat. Hist., p. 170. [Ety. *ptyche*, fold; *aspis*, shield.] Cephalic shield broad, with wide depressed convex cheeks; glabella cylindrical, convex, transversely lobed, prominent in front; eyes anterior to the middle; facial suture cutting the anterior border almost in front of the eye, and from below the eye it proceeds obliquely to the base a little without the center of the cheek, leaving the movable cheek near the size of the fixed cheek; movable cheek subtrapezoidal, border thickened, and extended backward in a spine. Type *P. miniscensis*.

barabuensis, Winchell, 1864, Am. Jour. Sci. and Arts, 2d ser., vol. 37, p. 230, Potsdam Gr.

granulosa, Owen, 1852, (*Dikelocephalus granulosa*.) Geo. Wis., Iowa, and Minn., p. 575, Potsdam Gr.

miniscensis, Owen, 1852, (*Dikelocephalus miniscaensis*.) Geo. Wis., Iowa, and Minn., p. 574, Potsdam Gr.

minuta, Whitfield, 1878, Ann. Rep. Geo. Sur. Wis., p. 55, and Geo. of Wis., vol. 4, p. 186, Potsdam Gr.

pustulosa, Hall & Whitfield, 1877, U. S. Geo. Expl. 40th Par., vol. 4, p. 223, Potsdam Gr.

sesostris, Billings, 1865, (*Dikelocephalus sesostris*), Pal. Foss., vol. 1, p. 198, Quebec Gr. or Up. Taconic.

speciosa, Walcott, 1879, 32d Rep. N. Y. St. Mus. Nat. Hist., p. 131, Calciferous Gr.

striata, Whitfield, 1878, Ann. Rep. Geo. Sur. Wis., p. 55, Potsdam Gr.

PTYCHOPARIA, Corda, 1847, Prodr. einer Monographie der bohmischen Trilobiten, p. 141. [Ety. *ptyche*, fold.] Cephalic shield semilunar; genal angle spined or pointed; glabella narrow anteriorly, elevated; furrows four, distinct, directed forward; facial sutures widely separated, extending and converging



FIG. 1052.—*Ptychaspis sesostris*.

striata, Whitfield, 1878, Ann. Rep. Geo. Sur. Wis., p. 55, Potsdam Gr.

PTYCHOPARIA, Corda, 1847, Prodr. einer Monographie der bohmischen Trilobiten, p. 141. [Ety. *ptyche*, fold.] Cephalic shield semilunar; genal angle spined or pointed; glabella narrow anteriorly, elevated; furrows four, distinct, directed forward; facial sutures widely separated, extending and converging

forward from the eyes, so as to intersect the anterior margin within a point where a line would cut it if drawn through each eye parallel with the axis (Corda's figure makes the facial sutures cut the margin laterally, in a line drawn at right angles to the anterior end of the glabella); these lines extend themselves from the eyes to the posterior margin by making a double curve, and cut the margin within or near the lateral angles; fixed cheek arched downward at the sides; occipital ring spined; thoracic segments fourteen; ends of pleuræ pointed or rounded; pygidium medium size, six or seven articulations in the axis; surface of test with minute punctures or scattered tubercles. Type *P. striata*.

- affinis*, Walcott, 1884, Mon. U. S. Geo. Sur., p. 54, Potsdam Gr.
- anatina*, Hall, 1863, (Conocephalites *anatinus*), 16th Rep. N. Y. St. Mus. Nat. Hist., p. 158, Potsdam Gr.
- (?) *annectans*, Walcott, 1884, Mon. U. S. Geo. Sur., vol. 8, p. 91, Pogonip Gr.
- antiquatus*, Salter, 1859, (Conocephalites *antiquatus*), Jour. Geo. Soc., vol. 15, p. 554, Up. Taconic.
- arenosa*, Billings, 1861, (Conocephalites *arenosus*), Pal. Foss., vol. 1, p. 15, Potsdam Gr.
- billingsi*, Shumard, 1861, (Conocephalites *billingsi*), Am. Jour. Sci. and Arts, vol. 32, p. 220, Potsdam Gr.
- binodosa*, Hall, 1863, (Conocephalites *binodosa*), 16th Rep. N. Y. St. Mus. Nat. Hist., p. 160, Potsdam Gr.
- breviceps*, Walcott, 1884, Mon. U. S. Geo. Sur., vol. 8, p. 49, Potsdam Gr.
- calciferus*, Walcott, 1879, (Conocephalites *calciferus*), 32d Rep. N. Y. St. Mus. Nat. Hist., p. 129, Calciferous Gr.
- calymenoides*, Whitfield, 1877, Geo. Sur. Wis., vol. 4, p. 179, Potsdam Gr.
- clavata*, Walcott, 1877, Am. Jour. Sci., 3d ser., vol. 34, p. 198, Up. Taconic.
- cordillerae*, Rominger, 1887, (Conocephalites *cordillerae*), Proc. Acad. Nat. Sci. Phil., p. 12, Potsdam Gr.
- depressa*, Shumard, 1861, (Conocephalites *depressus*), Am. Jour. Sci., vol. 32, p. 219, Potsdam Gr.
- dissimilis*, Walcott, 1884, Mon. U. S. Geo. Sur., vol. 8, p. 51, Up. Taconic, Prospect Mountain Gr.
- eryon*, Hall, 1863, (Conocephalites *eryon*), 16th Rep. N. Y. St. Mus. Nat. Hist., p. 157, Potsdam Gr.
- explanata*, Whitfield, 1882, (Conocephalites *explanatus*), Geo. Sur. Wis., vol. 4, p. 181, Potsdam Gr.
- fitchi*, Walcott, 1887, Am. Jour. Sci., 3d ser., vol. 34, p. 197, Up. Taconic.
- hartti*, Walcott, 1879, (Conocephalites *hartti*), 32d Rep. N. Y. St. Mus. Nat. Hist., p. 130, Calciferous Gr.
- housesensis*, Walcott, 1886, Bull. U. S. Geo. Sur., No. 30, p. 201, Up. Taconic.
- laeviceps*, Walcott, 1884, Mon. U. S. Geo. Sur., p. 54, Potsdam Gr.
- (?) *linnarsoni*, Walcott, 1884, Mon. U. S. Geo. Sur. Terr., vol. 8, p. 47, Up. Taconic.
- minor*, Shumard, 1863, (Conocephalites *minor*), Trans. St. Louis Acad. Sci., vol. 2, p. 105, Potsdam Gr.
- minuta*, Bradley, 1860, (Conocephalites *minutus*), Am. Jour. Sci., 2d ser., vol. 30, p. 242, Potsdam Gr.
- nasuta*, Hall, 1863, (Conocephalites *nasutus*), 16th Rep. N. Y. St. Mus. Nat. Hist., p. 155, Potsdam Gr.
- occidentalis*, Walcott, 1884, Mon. U. S. Geo. Sur., vol. 8, p. 51, Potsdam Gr.
- oweni*, Hall, 1863, 16th Rep. N. Y. St. Mus. Nat. Hist., p. 155, Potsdam Gr.
- patersoni*, Hall, 1863, (Conocephalites *patersoni*), 16th Rep. N. Y. St. Mus. Nat. Hist., p. 159, Potsdam Gr.
- pernasuta*, Walcott, 1884, Mon. U. S. Geo. Sur., vol. 8, p. 49, Potsdam Gr.
- perseus*, Hall, 1863, (Conocephalites *perseus*), 16th Rep. N. Y. St. Mus. Nat. Hist., p. 153, Potsdam Gr.
- piochensis*, Walcott, 1886, Bull. U. S. Geo. Sur., No. 30, p. 201, Up. Taconic.
- (?) *prospectensis*, Walcott, 1884, Mon. U. S. Geo. Sur., vol. 8, p. 46, Up. Taconic—Prospect Mountain Gr.
- (?) *quadrata*, Whitfield, 1880, (Conocephalites *quadratus*), Geo. Sur. Wis., vol. 4, p. 180, Potsdam Gr.
- rogersi*, Walcott, 1884, Bull. U. S. Geo. Sur., vol. 2, p. 283, Up. Taconic.
- shumardi*, Hall, 1863, (Conocephalites *shumardi*), 16th Rep. N. Y. St. Mus. Nat. Hist., p. 154, Potsdam Gr.
- similis*, Walcott, 1884, Monogr. U. S. Geo. Sur., vol. 8, p. 52, Potsdam Gr.
- similis var. robusta*, Walcott, 1884, Mon. U. S. Geo. Sur., vol. 8, p. 53, Potsdam Gr.
- subcoronata*, Hall & Whitfield, 1877, (Conocephalites *subcoronatus*), Geo. 40th Par., vol. 4, p. 237, Up. Taconic.
- teucer*, Billings, 1861, (Conocephalites *teucer*), Geo. Vt., vol. 2, p. 951, Georgia Gr.
- verrucosa*, Whitfield, 1884, (Conocephalites *verrucosus*), Bull. Am. Mus. Nat. Hist., vol. 1, p. 139, Potsdam Gr.
- winona*, Hall, 1863, (Conocephalites *winona*), 16th Rep. N. Y. St. Mus. Nat. Hist., p. 161, Potsdam Gr.
- zenkeri*, Billings, 1860, (Conocephalites *zenkeri*), Can. Nat. and Geo., vol. 5, and Pal. Foss., vol. 1, p. 398, Up. Taconic.



FIG. 1053.—*Ptychoparia zenkeri*.

REMOPLEURIDES, Portlock, 1843, Rep. Geol. Lond., p. 254. [Ety. *remus*, oar; *pleura*, rib.] Cephalic shield subcircular or transversely subelliptical; glabella large,

convex, oval, narrower anteriorly and abruptly bent down over the front; eyes large, semilunar, reaching the neck segment; rostral suture marked; free cheeks, small, narrow, subtriangular, and produced posteriorly in spines; thorax with ten segments, axial lobe very wide, and gradually tapering posteriorly; side lobes narrow, pleurae short, falcate, directed backward; pygidium small and terminating in two short spines.



FIG. 1054. — Remopleurides striatulus. a, b, Hypostoma.

Type *R. colbi*.

affinis, Billings, 1865, Pal. Foss., vol. 1, p. 325, Quebec Gr.

canadensis, Billings, 1865, Pal. Foss., vol. 1, p. 182, Chazy Gr.

panderi, Billings, 1865, Pal. Foss., vol. 1, p. 293, Quebec Gr.

schlothemi, Billings, 1865, Pal. Foss., vol. 1, p. 294, Quebec Gr.

striatulus, Walcott, 1875, Cin. Quar. Jour. Sci., vol. 2, p. 347, Trenton Gr.

Rhabdichnites, Dawson, 1873, Am. Jour. Sci. and Arts, 3d ser., vol. 5, p. 20. A name proposed for certain markings on the rocks which are not the remains of organisms.

RHACHURA, Scudder, 1878, Proc. Bost. Soc. Nat. Hist., vol. 19, p. 296. [Ety. *rachis*, ridge; *oura*, tail.] Type *R. venosa*.

venosa, Scudder, 1878, Proc. Bost. Soc. Nat. Hist., vol. 19, p. 296, Coal Meas.

RHINOCARIS, Clarke, 1888, Pal. N. Y., vol. 7, p. lviii. [Ety. *rhine*, file; *karis*, shrimp.] Cephalothorax univalvular, laterally appressed; outline as in *Ceraticaris*; anterior extremity produced into a narrow, vertically flattened prora, continuous with substance of the carapace; axial line with a low ridge; abdomen composed of not less than four sub-cylindrical somites; post-abdomen bearing three spines, of which the telson is elongate and conical, and the cercopods flattened. Type *R. columbina*.

columbina, Clarke, 1888, Pal. N. Y., vol. 7, p. 195, Ham. Gr.

scaphoptera, Hall, 1888, Pal. N. Y., vol. 7, p. 197, Ham. Gr.

RIBEIRIA, Sharp, 1853, Jour. Geo. Soc., vol. 9, p. 157. [Ety. proper name.] Elongated, laterally compressed in the form of a Pholas; open at both ends and along the pedal margin, with a thick, transverse, internal plate near the anterior extremity, behind which is a cor-

rugated boss for the attachment of a muscle. Type *R. pholadiformis*.

calcifera, Billings, 1865,

Pal. Foss., vol. 1, p.

340, Calciferous Gr.

compressa, Whitfield,

1886, Bull. Am. Mus.

Nat. Hist., vol. 1,

Birdseye Gr.

longiusecula, Billings, Pal. Foss., vol. 1, p.

341, Calciferous Gr.

ventricosa, Whitfield, 1886, Bull. Am. Mus.

Nat. Hist., vol. 1, p. 344, Birdseye Gr.

RUSICHNITES, Dawson,

1861, Can. Nat. and

Geo., vol. 1, p. 363.

Ety. *rusos*, wrinkled;

ichnos, track.] Sup-

posed by the author

to be the track of a

Crustacean, like the

Limulus, and consist-

ing of two undulated,

rounded, contiguous furrows; but the

type resembles a fucoid quite as much,

if not more, than it does a track, and if

related to *Rusophycus*, which is clearly

a fucoid, then it should be referred to

the vegetable kingdom. Type *R.*

acadicus.

acadicus, Dawson, 1861, Can. Nat. and

Geo., vol. 1, p. 363, and Acad. Geol., p.

410, Coal Meas.

carbonarius, Dawson, 1868, Acad. Geol.,

p. 257, Carboniferous.

Salteria, Walcott, 1884. The name was

preoccupied, and is a synonym for

Bailiella.

Sao, Barrande, 1846, and Syst. Sil. Boh., vol.

2. Type *Sao hirsuta*, a primordial form

unknown in America.

? *lamottensis*, Whitfield, 1886, Bull. Am.

Mus. Nat. Hist., vol. 1, p. 334, Birds-

eye Gr.

SCHIZODISCUS, Clarke, 1888, Pal. N. Y., vol.

7, p. 62. [Ety. *schiza*, cleft; *diskos*,

quoit.] Carapace valves separable along

the hinge; outline circular or ovate,

narrow posteriorly; surface convex or

depressed, elevated at the beaks, which

are prominent, slightly incurved, and

situated anteriorly, hinge-line equaling

in length the greatest diameter of the

carapace; edge parallel, not gaping,

surface concentrically wrinkled. Type

S. capsa.

capsa, Clarke, 1888, Pal. N. Y., vol. 7, p.

207, Ham. Gr.

SHUMARDIA, Billings, 1862, Pal.

Foss., vol. 1, p. 92. [Ety.

proper name.] Cephalic

shield semicircular; gla-

bella convex, subcylind-

rical, no eyes, pygidium

semielliptical, axis cylind-

ro-conical, ribbed, side

lobes ribbed, distinguished

from *Agnostus* by the ribs on the

pygidium. Type *S. granulosa*.



FIG. 1055. — Ribetia calcifera.

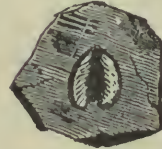


FIG. 1056. — Rusichnites carbonarius.



FIG. 1057. Shumardia granulosa.

glacialis, Billings, 1865, Pal. Foss., vol. 1, p. 283, Up. Taconic.
 granulosa, Billings, 1862, Pal. Foss., vol. 1, p. 92, Quebec Gr. or Up. Taconic.
 SOLENOCARIS, Meek, 1872, Proc. Acad. Nat. Sci. Phil., p. 355. [Ety. *solen*, a genus of shells; *karis*, shrimp.] Posterior end subtruncated backward from below, but not sinuous, as in *Colpocaris*; ocular tubercle obsolete, and no indications of having its valves anchylosed along the dorsal margin. Type *S. strigata*. This name was preoccupied for another crustacean by Young, in 1868, in Proc. Nat. Hist. Glasgow, vol. 1, p. 171.

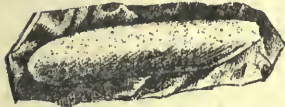


FIG. 1058.—*Solenocaris strigata*. Cast of interior of left valve.

stludo vici, Worthen, 1884, Bull. No. 2, Ill. St. Mus. Nat. Hist., p. 3, and Geo. Sur. Ill., vol. 8, p. 153, St. Louis Gr.
strigata, Meek, 1872, Proc. Acad. Nat. Sci. Phil., p. 335, and Ohio Pal., vol. 2, p. 321, Waverly Gr.

SOLENOPLEURA, Angelin, 1852, Palæontologia Suecica, p. 26. [Ety. *selene*, moon; *pleuron*, side.] Body ovate, test granulated or tuberculous; head wide, semi-circular; glabella prominent, furrows distinct, dorsal furrows deep and continuous; fixed cheeks, elevated in the middle, front limb convex; occipital ring bearing a tubercle; genal angle pointed; thoracic segments fourteen; ends of pleuræ bluntly rounded; pygidium medium size, few segments. Type *S. canaliculata*.

acadica, Whiteaves, 1887, Trans. Roy. Soc. Can., p. 157, St. John Gr.
acadica var. *elongata*, Matthew, 1887, Trans. Roy. Soc. Can., p. 159, St. John Gr.
communis, Billings, 1874, Pal. Foss., vol. 2, p. 72, Up. Taconic.
formosa, Hartt, 1868, (*Conocephalites formosus*), Acad. Geol., p. 654, St. John Gr.
halli, Hartt, 1868, (*Conocephalites halli*), Acad. Geol., p. 654, St. John Gr.
nana, Ford, 1878, Am. Jour. Sci. and Arts, 3d ser., vol. 15, p. 126, Up. Taconic.

orestes, Hartt, 1868, (*Conocephalites orestes*), Acad. Geol., p. 649, St. John Gr.
robbei, Hartt, 1868, (*Conocephalites robbei*), Acad. Geol., p. 648, St. John Gr.



FIG. 1059.—*Solenopleura nana*. Magnified.

thyrsites, Hartt, 1868, (*Conocephalites thyrsites*), Acad. Geol., p. 653, St. John Gr.

tumida, Walcott, 1887, Am. Jour. Sci. and Arts, 3d ser., vol. 34, p. 196, Up. Taconic.
 SPATHIOCARIS, Clarke, 1882, Am. Jour. Sci. and Arts, 3d ser., vol. 23, p. 477. [Ety. *spathe*, spathe; *karis*, shrimp.] Carapace in one piece, oblong elliptical, convex, apical point near the focus of the ellipse, from which point a cleft extends backward, widening to the margin. Type *S. emersoni*.

emersoni, Clarke, 1882, Am. Jour. Sci. and Arts, 3d ser., vol. 23, p. 478, Portage Gr.
lutheri, Clarke, 1882, (*Lisgocaris lutheri*), Am. Jour. Sci. and Arts, 3d ser., vol. 23, p. 478, Ham. Gr.

SPHÆREXOCHUS, Beyrich, 1845, Euber einige Bohm. Tril., p. 21. [Ety. *sphaira*, ball; *exochos*, prominent.] Cephalic shield very convex, almost globular; cheeks not scrobiculate; glabella nearly spherical, three furrows on each side, two upper obscure, lower strong and curved down to the neck furrow; eyes faceted minutely; facial suture ending on the external margin near the angles, in front continuous and submarginal; thorax 11 joints; pygidium 3 segments, free at their ends; labrum subtrigonal, with a marginal furrow; no rostral shield. Type *S. mirus*.

canadensis, Billings, 1866, Catal. Sil. Foss. Antic., p. 64, Anticosti Gr.
mirus, not American.



FIG. 1060.—*Sphærexochus parvus*. Upper and side view of glabella.

parvus, Billings, 1865, Pal. Foss., vol. 1, p. 180, Chazy or Black Riv. Gr.
romingeri, Hall, 1867, 20th Rep. N. Y. St. Mus. Nat. Hist., p. 425, Niagara Gr.

SPHÆROCORYPHE, Angelin, 1852, Palæontologia Scandinavica. [Ety. *sphaira*, ball; *koryphe*, top of the head.] Cephalic shield convex, genal angles spined; glabella spheroidal anteriorly, two lateral furrows; eyes prominent; facial sutures cut the lateral margins posteriorly; thorax with ten segments, axial lobe narrower than lateral lobes; pleuræ terminate in short spines; pygidium composed of three segments, anterior one produced in two spines. Type *S. granulata*.

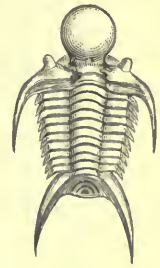


FIG. 1061.—*Sphærocoryphe robusta*.

robusta, Walcott, 1875, Cin. Quar. Jour. Sci., vol. 2, p. 273, Trenton Gr.
salteri, Billings, 1866, Catal. Sil. Foss. Antic., p. 63, Anticosti Gr.

- STROBILEPIS**, Clarke, 1888, Pal. N. Y., vol. 7, p. 63. [Ety. *strobilos*, cone-shaped; *lepis*, scale.] Capitulum composed of four vertical ranges of plates having in general a trihedral form, but varying in size and contour; each plate articulated with or overlapping the next preceding; anterior extremity terminated by a large, circular, conical plate; plates thick and ornamented. Type *S. spinigera*.
- spinigera*, Clarke, 1888, Pal. N. Y., vol. 7, p. 212, Ham. Gr.
- STYLONURUS**, Page, 1856, Geological Text Book, p. 190. [Ety. *stylos*, a mast or spar; *oura*, tail.] General form like *Eurypterus*, but distinguished by the peculiar development of the two posterior foot pairs; these are alike, long, thin, and consist of 9 segments, of which the two last form a small claw; the posterior pair reach to the middle of the long posterior spine. Type *S. powrieli*.
- excelsior*, Hall, 1884, 36th Rep. N. Y. St. Mus. Nat. Hist., p. 77, Catskill Gr.
- SYMPHYRURUS**, Goldfuss, 1843, Neues Jahrb. f. Mineral. [Ety. *symphysis*, growing together; *oura*, tail.] Elliptical; genal angles rounded; cephalic shield semicircular, convex; glabella convex, subquadrate, smooth, no lateral furrows; eyes lunate; facial sutures arching in front of the glabella, and cutting the posterior part of the cephalic shield near the genal angles; 8 thoracic segments; pygidium somewhat semicircular, no segments, border flattened. Type *S. leviceps*.
- goldfussi* (?), Walcott, 1885, Monogr. U. S. Geo. Sur., vol. 8, p. 95, Trenton Gr. This species is founded on a glabella with fixed cheeks, and probably it does not belong to this genus.
- TELEPHUS**, Barrande, 1852, Syst. Sil. Boh. [Ety. mythological name.] Glabella strongly convex, margined by deeply impressed bow-shaped furrows; neck segment tumid; cheeks subtriangular, or subrescentiform, small posteriorly, wider in front; pygidium small, strongly convex, hemispherical, margin tumid, axis with three segments. Type *T. fractus*. Only recognized in America by fragments of glabella.
- americanus*, Billings, 1865, Pal. Foss., vol. 1, p. 291, Quebec Gr.
- TERATASPIS**, Hall, 1863, 16th Rep. N. Y. St. Mus. Nat. Hist., p. 223. [Ety. *teras*, marvel; *aspis*, shield.] Distinguished from *Acidaspis*, which it resembles by the prominent ellipsoidal frontal lobe of the glabella, posterior spines of the lateral lobes and nodes of the occipital ring, and from *Lichas* by the spines of the pygidium being themselves bearers of lateral spines. Type *T. grandis*.
- grandis*, Hall, 1862, 15th Rep. N. Y. St. Mus. Nat. Hist., p. 82, and Illust. Devon. Foss., pl. 17, (*Lichas grandis*) Schoharie grit.
- eriopis*, Hall, 1863, (*Lichas eriopis*), 16th Rep. N. Y. St. Mus. Nat. Hist., p. 226, and Illust. Devon. Foss., pl. 19, Up. Held. Gr.
- Thaleops*, Conrad, syn. for *Iliaenus*. *ovata*, see *Iliaenus ovatus*.
- TRIRATHRELLA**, Hall, 1863, 16th Rep. N. Y. St. Mus. Nat. Hist., p. 177. [Ety. diminutive of *Triarthrus*.] Glabella elongate, semioval, with the fixed cheeks wide and spreading in the posterior limb, and very narrow in front, an obscure indentation at the margin; general expression like *Triarthrus*. Type *T. auroralis*.
- auroralis*, Hall, 1863, 16th Rep. N. Y. St. Mus. Nat. Hist., p. 177, Potsdam Gr.
- TRIRATHRUS**, Green, 1832, Monograph of *Trilobites*, p. 87. [Ety. *triarthrus*, three-jointed.] Subelliptical; cephalic shield somewhat semicircular or sublunate; glabella moderately convex, sides straight, rounded in front, deeply trilobate on each side by the lateral furrows, with a prominent occipital groove near the base, and occipital ring, from the center of which a spine sometimes arises; eyes small and placed on the anterio-lateral margin; free cheeks forming a narrow rim; thorax with from 13 to 16 articulations; central axis convex, wider than the lateral lobes; pygidium with 5 to 7 segments in the axis and one or two less in the lateral lobes. Type *T. becki*.
- becki*, Green, 1832, Monograph of *Trilobites*, p. 87, and Pal. N. Y., vol. 1, p. 237, Utica Slate Gr.
- canadensis*, Smith, 1861, Can. Jour., vol. 6, p. 275, Utica Slate Gr.
- fisheri*, see *Atops fisheri*.
- glaber*, Billings, 1859, Can. Nat. and Geol., vol. 4, p. 382, and Can. Geol., p. 202, Utica Slate Gr.
- spinus*, Billings, 1857, Rep. of Progr. Geo. Sur. Can., FIG. 1062.—Tri-p. 340, and Can. Geol., p. *arthrus becki*. 202, Utica Slate Gr.
- Trimerus*, syn. for *Homalonotus*. *delphinocephalus*, see *Homalonotus delphinocephalus*.
- jacksoni*, see *Homalonotus jacksoni*.
- TRINUCLEUS**, Lhwyd, (or, as he spelt it, Llhwydd,) 1698, Phil. Trans., vol. 20, p. 279. [Ety. *trinucleus*, three-kerneled.] Cephalic shield highly convex, a wide border impressed with several rows of deep puncta and posterior angles, terminating in spines; glabella pyriform, pointed behind, no lateral furrows; cheeks convex; no eyes or facial sutures; neck furrow distinct; thorax with six articulations, axis narrow,



convex; side lobes wide, flat, straight, pleural groove not reaching the margin; pygidium subtriangular, margin deflected, axis conical, about six furrows; side lobes flat, with about the same number of furrows. Type *T. concentricus*.



FIG. 1063.—*Trinucleus concentricus*.

bellulus, Ulrich, 1878, Jour. Cin. Soc. Nat. Hist., vol. 1, p. 99. The young of *T. concentricus*.

concentricus, Eaton, 1832, (Nuttainia concentrica,) Geo. Text-Book, p. 128, and Pal. N. Y., vol. 1, p. 249, Trenton to Hud. Riv. Gr.

TROPIDOCARIS, Beecher, 1884, Geo. Sur. Pa., vol. PPP, p. 15. [Ety. *tropis*, a keel; *karis*, a shrimp.] Carapace bivalve, semioval or semielliptical, obliquely truncated behind; valves about twice as long as wide, having one or more longitudinal ridges; cephalic region indicated by elevations at the anterior end; optic node situate on a ridge; two segments of the abdomen. Type *T. bicarinata*.

alternata, Beecher, 1884, Geo. Sur. Pa., vol. PPP, p. 19, Waverly Gr.

bicarinata, Beecher, 1884, Geo. Sur. Pa., vol. PPP, p. 16, Chemung Gr.

interrupta, Beecher, 1884, Geo. Sur. Pa., vol. PPP, p. 18, Chemung Gr.

TURRILEPAS, Woodward, 1865, Quar. Jour. Geol. Soc., vol. 21, p. 486. [Ety. *turris*, tower; *lepas*, scale.] Elongate, cone-shaped bodies, composed of from 4 to 6 vertical ranges of scale-like, subtriangular plates covered with elevated concentric lines; plates of middle range convex and bearing a median carina. Type *T. wrightana*.

cancellatus, Hall, 1888, Pal. N. Y., vol. 7, p. 216, Up. Held. Gr.

devonicus, Clarke, 1882, (Plumulites devonicus,) Am. Jour. Sci., 3d ser., vol. 24, p. 55, Ham. Gr.

flexuosus, Hall, 1888, Pal. N. Y., vol. 7, p. 215, Up. Held. Gr.

foliatus, Hall, 1888, Pal. N. Y., vol. 7, p. 218, Ham. Gr.

gracillimus, Ringueberg, 1888, (Plumulites gracillimus,) Proc. Acad. Nat. Sci. Phil., p. 136, Niagara Gr.

newberryi, Whitfield, 1882, (Plumulites newberryi,) Ann. N. Y. Acad. Sci., vol. 2, p. 217, Portage Gr.

nitidulus, Hall, 1888, Pal. N. Y., vol. 7, p. 218, Ham. Gr.

squama, Hall, 1888, Pal. N. Y., vol. 7, p. 217, Ham. Gr.

tener, Hall, 1888, Pal. N. Y., vol. 7, p. 219, Ham. Gr.

ZACANTHOIDES, Walcott, 1888, Am. Jour. Sci., 3d ser., vol. 36, p. 165. Proposed to receive *Olenoides lævis*, *O. spinosus*, *O. flagricaudatus*, and *O. typicalis*, but not defined.

CLASS ARACHNIDA.

THE animals, forming the class Arachnida, include the spiders, scorpions, and many offensive parasites and microscopic forms. They are generally possessed of four pairs of legs attached to the anterior division of the body, but have no antennæ. The Palæozoic fossils are nearly all referred to an extinct order, Anthracomarti, but a few are referred to the living orders, Pedipalpi and Scorpiones. The Pedipalpi have arm-like prehensile organs, terminating in a movable claw, annulated abdomen, and long flexible limbs. They inhabit tropical countries, and have a forbidding aspect. The Scorpiones have large palpi or arm-like prehensile organs, terminated by a pair of nippers, and an elongated, tail-like abdomen, which ends in a sharp claw; and when the animal is in motion, this is carried over the back in a threatening manner. The poison glands are situated at the base of the claw, and when the animal stings, a portion of the venom is thrown into the wound. The scorpions are inhabitants of tropical countries. The Order Anthracomarti is defined as follows: Body more or less depressed; cephalothorax and abdomen distinctly separable; cephalothorax frequently made up in large part of pedigerous segments,

more or less wedge-shaped, and visible above as well as below, the arrangement of which corresponds to that of the coxæ. The abdomen forms a single mass, and is composed of a variable number of visible segments, ranging from four to nine. Palpi not much longer than the legs, simply terminated.

ORDER ANTHRACOMARTI.

FAMILY ARCHITARVIDÆ.—*Anthracomartus*, *Architarbus*, *Geraphrynus*.

FAMILY ARTHROLYCOSIDÆ.—*Arthrolycosa*.

FAMILY POLIOCHERIDÆ.—*Poliochera*.

ORDER PEDIPALPI.

FAMILY GERALINURIDÆ.—*Geralinura*.

ORDER SCORPIONES.

FAMILY EOSCORPIONIDÆ.—*Eoscorpium*, *Mazonia*.

ANTHRACOMARTUS, Karsch, 1882, *Zeitschr. deutsch. geol. Gesellsch.*, p. 556. [Ety. *anthrax*, coal; *Martos*, proper name.] Cephalothorax quadrate, the front square or scarcely convex, about half the size of the abdomen; coxæ radiating from a broad triangular sternal plate, the base of which forms the posterior margin; sides of body constricted so as to show a distinct though slight separation of cephalothorax and abdomen; abdomen orbicular, composed of seven segments of similar length throughout. Type A. volkelianus.

pustulatus, Scudder, 1884, *Proc. Am. Acad. Arts and Sci.*, p. 13, *Low. Coal Meas.*

trilobitus, Scudder, 1884, *Proc. Am. Acad. Arts and Sci.*, p. 13, *Coal Meas.*

ARCHITARBUS, Scudder, 1868, *Geo. Sur. Ill.*, vol. 3, p. 568. [Ety. *archaios*, ancient; *tarbos*, object of alarm.] Cephalothorax orbicular, broadly rounded in front,



FIG. 1064.—*Architarbus rotundatus*.

much smaller than the abdomen, but not separated from it by a marked lateral constriction; coxæ radiating from a central pit; abdomen oval, composed of nine segments, of which those on the basal half are very much shorter than the others, and on the dorsal surface are forced still more closely together by the large post-thoracic plate; no abdominal appendages. Type A. rotundatus.

rotundatus, Scudder, 1868, *Geo. Sur. Ill.*, vol. 3, p. 568, *Coal. Meas.*

ARTHROLYCOSA, Harger, 1874, *Am. Jour. Sci. and Arts*, 3d ser., vol. 7, p. 219.

[Ety. *arthron*, a joint; *lykos*, a spider.]

Cephalothorax orbicular, twice as large as the abdomen; Coxæ radiating from a central pit; abdomen oval much narrower at the base than the cephalothorax, with no longitudinal sculpturing, and composed of seven segments; no abdominal appendages. Type A. antiqua.



FIG. 1065.—*Arthrolycosa antiqua*.

antiqua, Harger, 1874, *Am. Jour. Sci. and Arts*, 3d ser., vol. 7, p. 219, *Coal Meas.*

EOSCORPIUS, Meek & Worthen, 1868, *Am. Jour. Sci and Arts*, 2d. ser., vol. 46, p. 25, and *Geo. Sur. Ill.*, vol 3, p. 560.

[Ety. *eos*, dawn; *scorpius*, a scorpion.] Cephalothorax quadrangular, somewhat wider behind than long; mesial and lateral furrows between which the surface bears granules; mandibles stout, without teeth or serrations; movable finger curved and sharp at the point; legs stout, divisions long; abdomen twice as long as as cephalothorax; segments gradually increase in size to the sixth, while the seventh and last is $2\frac{1}{2}$ times as long as the sixth, but rapidly contracts, and is truncated for the attachment of the tail; the anterior margin of each of the first six segments is rounded; the three tail, segments preserved are stout, oblong, and covered with granules; the comb-like organ shows 11 or 12 divisions. Type E. carbonarius.

carbonarius, Meek & Worthen, 1868, Am. Jour. Sci. and Arts, 2d ser., vol. 46, p. 24, and Geo. Sur. Ill., vol. 3, p. 560, Coal Meas.

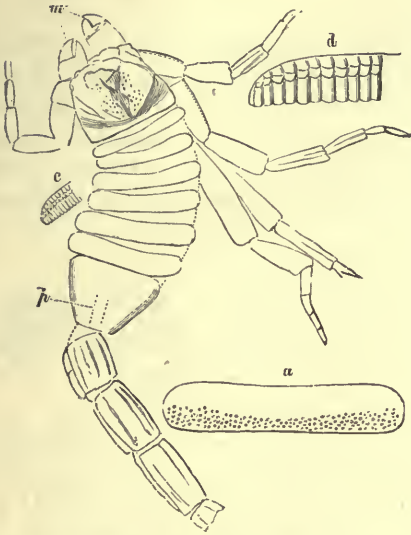


FIG. 1066.—*Eoscorpilus carbonarius*. Natural size; *a*, body segment enlarged; *c*, comb; *d*, same enlarged; *m*, mandibles; *p*, pils.

GERALINURA, Scudder, 1884, Proc. Am. Acad. Arts and Sci., p. 13. [Ety. *geras*, old; *linon*, linen; *oura*, tail.] Cephalothorax ovate, the front rounded, one-third as broad as hinder portion; palpi large and robust, with interior spines; first two pairs of legs slender, the hinder stout and broad; abdomen composed of nine joints, the basal three rather short, the others subequal and longer. Type *S. carbonaria*.

carbonaria, Scudder, 1884, Proc. Am. Acad. Arts and Sci., p. 13, Coal Meas.

GERAPHRYNUS, Scudder, 1884, Proc. Am. Acad. Arts and Sci., p. 13. [Ety. *geras*, old; *Phrymus*, a genus.] Cephalothorax fusiform, angulated in front, nearly as large as the abdomen; coxæ radiating from a median line; palpi slenderer than the legs, longer than the cephalothorax, springing from its extreme front, and of uniform size throughout; abdomen subfusiform, composed of nine segments, rounded behind, with no constriction at the base; a large triangular post-thoracic plate, crowding the middle of the first five short segments out of a straight transverse line;

readily distinguished from *Architarbus* by its produced and angulate cephalothorax. Type *G. carbonarius*.

carbonarius, Scudder, 1884, Proc. Am. Acad. Arts and Sci., p. 13, Coal Meas.

MAZONIA, Meek & Worthen, 1868, Geo. Sur. Ill., vol. 3, p. 563. [Ety. proper name.] Cephalothorax moderately convex, subquadrangular; anterior lateral margins rounded, and anterior margin truncated on each side of a small mesial triangular projection; mesial furrow extends forward from the posterior margin, widening and deepening to the front, where it occupies one-third of the breadth, and is partly filled by the oculiferous prominence, which bears on each side a large eye; eyes circular, convex, arranged for looking obliquely forward, outward, and upward; seven or eight abdominal segments, the last one truncated for the tail. Type *M. woodana*.

woodana, Meek & Worthen, 1868, Geo. Sur. Ill., vol. 3, p. 563, Coal Meas.

POLIOCHERA, Scudder, 1884, Proc. Am. Acad. Arts and Sci., p. 13. [Ety. *polios*, hoary; *cheras*, to be bereft.] Cephalothorax scarcely longer than broad, slightly narrowing anteriorly, the front square; coxæ radiating from a median line; legs stout, moderately long; abdomen full, at base as broad as the cephalothorax, broadening slightly behind, fully rounded, composed of four segments, the first segment about one-third the length of the others, which are equal; no abdominal appendages. Type *P. punctulata*.

punctulata, Scudder, 1884, Proc. Am. Acad. Arts and Sci., p. 13, Coal Meas.

Proscorpius, Whitfield, 1885, Bull. Am. Mus. Nat. Hist., vol. 1, p. 183. [Ety. *pro*, before; *scorpius*, a genus.] Cephalothorax with large dorsal eye-lobe; eyes small, one on each side of the median line; lateral eyes on ridges, as in living scorpions; sixth ventral segment of the preabdomen, counting from behind, large, equal in length and breadth to the corresponding dorsal segment; anterior walking limb terminating in a bifid claw; postabdomen not reversed as in living scorpions. Type *P. osborni*. Good authorities say this is merely an *Eurypterus*, with no affinity or resemblance to a scorpion. With this view the author coincides.

osborni, Whitfield, 1885, Bull. Am. Mus. Nat. Hist., vol. 1, p. 184, Waterlime Gr. Synonym, probably, for *Eurypterus remipes*.

CLASS MYRIAPODA.

THE animals composing the Class Myriapoda are elongated, and composed of numerous segments, all of which are substantially alike except the first and last. The articulations of the body each bear one or two pairs of jointed legs. The common centipede and long-jointed worms, with numerous legs, found in damp places and on trunks of trees, some of which coil up when alarmed, are examples. Only a few Palæozoic fossils are referred to this Class, and these belong to extinct Orders.

ORDER ARCHIPOLYPODA.

FAMILY ARCHULIDÆ.—*Archiulus*, *Trichiulus*, *Xylobius*.

FAMILY EUPHOBERIDÆ.—*Acantherpestes*, *Amynilespes*, *Anthracerpes*, *Eileticus*, *Euphoberia*.

FAMILY UNCERTAIN.—*Archæoscolex*.

ORDER PROTOSYNGNATHA.

FAMILY PALÆOCAMPIDÆ.—*Palæocampa*.

ACANTHERPESTES, Meek & Worthen, 1868, *Geo. Sur. Ill.*, vol. 3, p. 559. [Ety. *akantha*, a spine; *erpestes*, a creeper.] Spines bifurcate at tip, and arranged in dorsal, pleurodorsal, and lateral rows; segments three, or more than three times as broad as long. Type *A. major*.

major, Meek & Worthen, 1868, (*Euphoberia major*.) *Am. Jour. Sci. and Arts*, 2d. ser., vol. 46, p. 26, and *Geo. Sur. Ill.*, vol. 3, p. 558, *Coal Meas.*

rows; segments four times as broad as long. Type *A. wortheni*.

wortheni, Scudder, 1885, in *Zittel's Handbuch der Pal.*, vol. 2, p. 729, *Coal Meas.*

ANTHRACERPES, Meek &

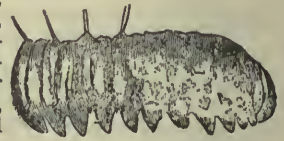


FIG. 1068.—*Amynilespes wortheni*.

Worthen, 1865, *Proc. Acad. Nat. Sci. Phil.*, p. 51. [Ety. *anthrax*, coal;

erpo, to creep, in allusion to its carboniferous age and probable habits.] Founded upon an articulated body of nineteen segments and part of another. The last segment terminates in three or four short, slender, hair-like or spine-like appendages. Below the middle of each segment there is a small prominence, marking the spiracles, or breathing apertures, which pertain to the Myriapoda. Type *A. typus*.

typus, Meek & Worthen, 1865, *Proc. Acad. Nat. Sci. Phil.*, p. 51, and *Geo. Sur. Ill.*, vol. 2, p. 409, *Coal Meas.*

ARCHÆOSCOLEX, Matthew, 1888, *Trans. Roy. Soc. Can.*, p. 59. [Ety. *archaios*, ancient; *skolex*, worm.] Cylindrical, tapering behind the middle, and also at the three anterior segments; head small, somewhat conical; thorax of three joints, increasing in width back-

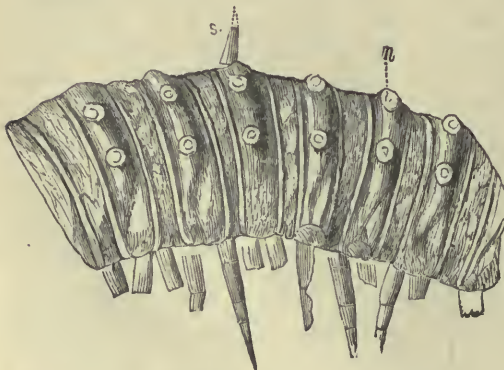


FIG. 1067.—*Acantherpestes major*. Fragment. *s*, spine; *n*, base of spine.

AMYNILESPES, Scudder, 1885, in *Zittel's Handbuch der Pal.*, p. 729. [Ety. *amuno*, to keep off; *illuspaomai*, to crawl.] Spines simple, arranged in dorsolateral

ward, but decreasing in length; limbs tapering, posterior pair as long as the thorax, and larger and stronger than those in front; abdomen of eleven visible segments, those at the anterior end wider and those of the middle longer; basal segment has an oblong scar near the posterior edge; crust chitonous. Type *A. corneus*.

corneus, Matthew, 1888, Trans. Roy. Soc. Can., p. 59, Devonian.



FIG. 1069.—*Archiulus xylobioides*. Anterior part enlarged.

relative proportions, but generally from two to three times broader than long, furnished with only a few papillæ, perhaps supporting spiny hairs. Type *A. xylobioides*.

xylobioides, Scudder, 1868, Mem. Bost. Soc. Nat. Hist., vol. 2, p. 236, and Acad. Geol., p. 496, Coal Meas.

EILETICUS, Scudder, Mem. Bost. Soc. Nat. Hist. [Ety. *eiletikos*, rolling one's self.] No spines, but large, low tubercles, serially arranged; segments few, less than twice as broad as long. Type *E. anthracinus*.

anthracinus, Scudder, Mem. Bost. Soc. Nat. Hist., Coal Meas.

EUPHOBERIA, Meek & Worthen, 1868, Am. Jour. Sci. and Arts, 2d ser., vol. 46, p. 26. [Ety. *eu*, very; *phoberos*, formidable.] Head semicircular; body long, slender, very slightly tapering, and terminating abruptly; segments seventy-five or more on the ventral side

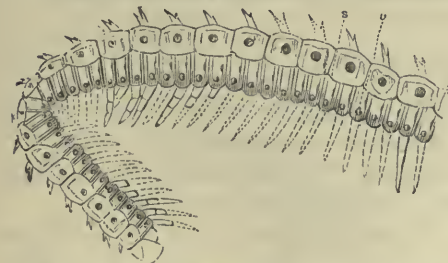


FIG. 1070.—*Euphoberia armigera*. Part of a large specimen.

and half as many on the dorsal; dorsal half of the segments rounded, and each supporting three or four spines, curved slightly backward, and arranged in

rows on the back, spines spinuliferous; ventral half of the segments each bears a pair of small slender-jointed legs. Type *E. armigera*.

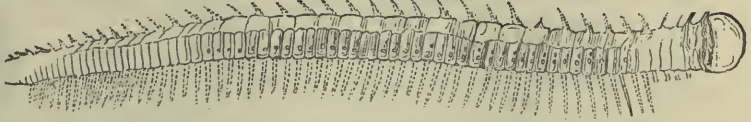


FIG. 1071.—*Euphoberia armigera*. Entire specimen.

anguilla, Scudder, 1880, Mem. Bost. Soc. Nat. Hist., vol. 3, p. 177, Coal Meas.
armigera, Meek & Worthen, 1868, Am. Jour. Sci. and Arts, 2d ser., vol. 46, p. 26, and Geo. Sur. Ill., vol. 3, p. 556, Coal Meas.

ARCHIULUS, Scudder, 1868, Mem. Bost. Soc. Nat. Hist., vol. 2, p. 231, and Acad. Geol., p. 496. [Ety. *archaios*, ancient; *ioulos*, wood-louse.] Segments entire, varying much in

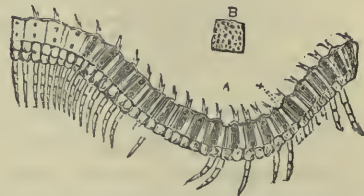


FIG. 1072.—*Euphoberia armigera*. A, part of an individual; B, enlarged surface pitting.

carri, Scudder, 1880, Mem. Bost. Soc. Nat. Hist., vol. 3, p. 171, Coal Meas.
flabellata, Scudder, 1880, Mem. Bost. Soc. Nat. Hist., vol. 3, p. 174, Coal Meas.
granosa, Scudder, 1880, Mem. Bost. Soc. Nat. Hist., vol. 3, p. 168, Coal Meas.
horrida, Scudder, 1880, Mem. Bost. Soc. Nat. Hist., vol. 3, p. 158, Coal Meas.
major, see *Acantherpestes major*.

PALÆOCAMPA, Meek & Worthen, 1865, Proc. Acad. Nat. Sci. Phil., p. 52. [Ety. *palaos*, ancient; *kampe*, a caterpillar.] Head small; segments ten, similar, subequal, and each bearing a pair of stout clumsy legs, and four bunches of cylindrical needles or spines; bunches seated on mammillæ, and arranged in dorso-pleural and lateral rows, needles or spines, exceedingly slender, scarcely tapering, blunt at tip, and longitudinally serrated. Type *P. anthrax*.

anthrax, Meek & Worthen, 1865, Proc. Acad. Nat. Sci. Phil., p. 52, and Geo. Sur. Ill., vol. 2, p. 410, Coal Meas.

TRICHOULUS, Scudder, 1884, Mem. Bost. Soc. Nat. Hist., vol. 3, p. 290. [Ety. *trichos*, hair; *ioulos*, wood-louse.] Segments entire, from three to five times broader than long, closely covered with papillæ, arranged in definite series longitudinally, and transversely supporting long, sweeping hairs. Type *T. villosus*.
ammonitiformis, Scudder, 1884, Mem. Bost. Soc. Nat. Hist., vol. 3, p. 292, Coal Meas.

nodulosus, Scudder, 1884, Mem. Bost. Soc. Nat. Hist., vol. 3, p. 292, Coal Meas.

villosus, Scudder, 1884, Mem. Bost. Soc. Nat. Hist., vol. 3, p. 291, Coal Meas.
 XYLOBIUS, Dawson, 1860, Quar. Jour. Geo. Soc., vol. 16, p. 268. [Ety. *xylobius*, living in wood.] Body crustaceous, cylindrical, elongate, rolling spirally; segments thirty or more, anterior ones smooth, posterior ones furrowed; legs small, numerous; labrum quadrilateral, divided by notches or joints into three portions; mandibles two-jointed, last ovate and pointed; eyes ten or more on each side. Type *X. sigillariae*.
 dawsoni, Scudder, 1868, Mem. Bost. Soc. Nat. Hist., vol. 2, p. 236, and Acad. Geol., p. 496, Coal Meas.

fractus, Scudder, 1868, Mem. Bost. Soc. Nat. Hist., vol. 2, p. 234, and Acad. Geol., p. 496, Coal Meas.
 mazonius, Zittel, 1885, Handbuch der Pal., p. 730, Coal Meas.
 sigillariae, Dawson, 1860, Quar. Jour. Geo. Soc., vol. 16, p. 271, Coal Meas.
 similis, Scudder, 1868, Mem. Bost. Soc. Nat. Hist., vol. 2, p. 234, and Acad. Geol., p. 496, Coal Meas.



FIG. 1073. — *Xylobius sigillariae*. *a*, Organ with palpus, pertaining to the mouth, enlarged.

CLASS INSECTA.

INSECTS are possessed of head, thorax, and abdomen. Three pairs of legs and one pair of antennæ belong to them in their perfect state. They are the highest and most complicated class of articulated animals, and abound almost everywhere. No living order, in this class, is known from the Palæozoic rocks. Indeed, the fossils consist almost wholly of fragments of wings showing little else than neuration; but they have been studied by Scudder, until he has classified them into an Order and Families, to the general satisfaction of entomologists, and all must concede he has accomplished a very difficult task. The Order Palæodictyoptera, which includes the Orthopteroid and Hemipteroid Palæodictyoptera, has been defined as follows: Body generally elongated; mouth parts variously developed; antennæ filiform; thoracic joints subequally developed; legs moderately large; meso and metathoracic wings closely similar, equally membranous; the six principal veins always developed; the marginal simple, and forming the costal border; the mediastinal generally simple or with superior branches only; the other veins usually dichotomize; stout and well defined cross veins rare; membrane generally reticulate; wings in repose lying on the abdomen; the anal area of hind wings, though usually of great distal extension, never plaited, though sometimes broadly folded; abdomen usually long and slender, the last joint often furnished with simple articulated appendages.

ORDER PALÆODICTYOPTERA.

FAMILY GERARIIDÆ.—*Adiphlebia*, *Gerarus*, *Megathentomum*, *Polyernus*.

FAMILY HEMERISTIDÆ.—*Chrestotes*, *Hemeristia*, *Lithentomum*.

FAMILY HOMOTHETIDÆ.—*Anthracothremma*, *Cheliphlebia*, *Didymophleps*, *Encænus*, *Genentomum*, *Genopteryx*, *Gerapompus*, *Homothetus*.

FAMILY MYLACRIDÆ.—*Lithomylacris*, *Mylacris*, *Necymylacris*, *Paromylacris*, *Promylacris*.

FAMILY PALÆOBLATTINIDÆ.—*Archymylacris*, *Etoblattina*, *Gerablattina*, *Oryctoblattina*, *Petrablattina*.

FAMILY PALÆOPTERINIDÆ.—*Aethophlebia*, *Dieconeura*, *Miamia*, *Propteticus*.

FAMILY PALÆEPHEMERIDÆ.—*Ephemerites*, *Geraphemera*, *Platephemera*.

FAMILY PITHANOCORIDÆ.—Phthanocoris.

FAMILY PROTOPHASMIDÆ.—Haplophlebium, Paolia, Titanophasma.

FAMILY XENONEURIDÆ.—Geroneura, Xenoneura.

FAMILY UNCERTAIN.—Archegogryllus, Dyscritus.

SUPPOSED INSECT TRAILS.—Haplotichnus, Plangtichnus, Treptichnus.

ADIPHLEBIA, Scudder, 1884, Mem. Bost. Soc. Nat. Hist., vol. 3, p. 345. [Ety. *a*, privative; *dis*, double; *phlebion*, vein.] Body rather stout; wings rather broad; all the nervules simple, arising from their stems near the base of the wings; subparallel and longitudinal. Type A. laacoana.

laacoana, Scudder, 1884, Mem. Bost. Soc. Nat. Hist., vol. 3, p. 345, Coal Meas.

ATHOPHLEBIA, Scudder, 1884, Mem. Bost. Soc. Nat. Hist., vol. 3, p. 338. [Ety. *aethes*, strange; *phleps*, a vein.] Inter-no-median vein terminating before the middle of lower border, emitting a single main branch, beyond its middle which is superior, and which, with median fork of externo-median and larger part of main scapular branch, form a continuous adventitious vein crossing principal nervules of the wing; ultimate offshoots of externo-median vein arise indifferently from the main vein and the principal branch, and are parallel and similar to the offshoots of the veins above. Type A. singularis.

singularis, Scudder, 1884, Mem. Bost. Soc. Nat. Hist., vol. 3, p. 338, Coal Meas.

ANTHRACOTHREMMMA, Scudder, 1884, Mem. Bost. Soc. Nat. Hist., vol. 3, p. 327. [Ety. *anthrax*, coal; *thremma*, reared.] Body stout; prothorax several times broader than long; wings subequal and elongated; scapular vein arcuate and nearly reaching the tip; externo-median vein with numerous parallel branches, mostly simple. Type A. robusta.

robusta, Scudder, 1884, Mem. Bost. Soc. Nat. Hist., vol. 3, p. 327, Coal Meas.

ARCHEGOGRYLLUS, Scudder, 1868, Proc. Bost. Soc. Nat. Hist., vol. xi, p. 401. [Ety. *archegos*, first in time; *gryllus*, a cricket.] Relations not clearly understood. Type A. prisceus.

prisceus, Scudder, 1868, Proc. Bost. Soc. Nat. Hist., vol. 11, p. 401, and Mem. Bost. Soc. Nat. Hist., vol. 3, p. 323, Coal Meas.

ARCHIMYLACRIS, Scudder, 1868, Acad. Geol., p. 388. [Ety. *arche*, beginning; *Mylacris*, cockroach.] Mediastinal area comparatively short; scapular terminating below the tip, and with the externo-median, which is comparatively small, occupying less than half the wing; internomedian vein comparatively long. Type A. acadicum.



FIG. 1074.—Archimylacris acadicum.

acadicum, Scudder, 1868, Acad. Geol., p. 388, Coal Meas.

parallelum, Scudder, 1879, Mem. Bost. Soc. Nat. Hist., vol. 3, p. 85, Coal Meas.

BLATTINA, Burmeister, 1838, Handbuch der Entomologie. [Ety. *Blatta*, a cockroach.] A living genus of cockroaches, raised to the rank of a family, and by some naturalists to the rank of an order, to which the name Dictyoptera has been applied. It is not a Palæozoic genus.

bretonensis, see Petrablattina bretonensis.

fascigera, see Gerablattina fascigera.

heeri, see Mylacris heeri.

sepulta, see Petrablattina sepulta.

venusta, see Etoblattina venusta.

CHELIPHLEBIA, Scudder, 1884, Mem. Bost. Soc. Nat. Hist., vol. 3, p. 328. [Ety. *chela*, forked; *phlebion*, vein.] Body rather slender, but wings large and coarse, without cross veins, interno-median vein extending far toward the tip of the wing with many oblique branches.

Type C. elongata.

carbonaria, Scudder, 1884, Mem. Bost. Soc. Nat. Hist., vol. 3, p. 328, Coal Meas.



FIG. 1075.—Cheliphlebia carbonaria.

elongata, Scudder, 1884, Mem. Bost. Soc. Nat. Hist., vol. 3, p. 328, Coal Meas.

CHRESTOTES, Scudder, 1868, Geo. Sur. Ill., vol. 3, p. 567. [Ety. *chrestotes*, good of its kind.] Wings short, broad, well



FIG. 1076.—Chrestotes lapidea.

rounded; vena scapularis throws several branches downward, commencing before the middle of the wing, and with its branches occupies the upper two-

fifths of the upper wing, and perhaps more of the lower; remainder of wing occupied by the longitudinally divaricating branches of the next two veins; anal area in upper wing distinctly set off at the basal portion of the wing. Type *C. lapidea*.

lapidea, Scudder, 1868, *Geo. Sur. Ill.*, vol. 3, p. 567, *Coal Meas.*

DIDYMOPILEPS, Scudder, 1878, *Proc.*

Bost. Soc. Nat. Hist., vol. 19, p. 300. [Ety. *didymos*, double;

pileps, vein.] All the veins and branches above the interno-median longitudinal and nearly parallel; nearly all the lower half of the wing being occupied by the oblique branches of the interno-median vein. Type *D. contusa*.

contusa, Scudder, 1878, (*Termes contusus*.) *Bost. Soc. Nat. Hist.*, vol. 19, p. 300, and *Mem. Bost. Soc. Nat. Hist.*, vol. 3, p. 330, *Coal Meas.*

DIECONEURA, Scudder, 1884, *Mem. Bost. Soc.*

Nat. Hist., vol. 3, p. 336. [Ety. *dieko*, to extend through; *neuron*, a vein.] Externo-median vein simple; interno-median vein important, arcuate, extending far toward the extremity of the lower margin. Type *D. rigida*.

arcuata, Scudder, 1884, *Mem. Bost. Soc. Nat. Hist.*, vol. 3, p. 336, *Coal Meas.*

rigida, Scudder, 1884, *Mem. Bost. Soc. Nat. Hist.*, vol. 3, p. 336, *Coal Meas.*

DYSCRITOS, Scudder, 1868, *Lond. Geo. Mag.*, vol. 5, p. 176. [Ety. *dyscritos*, hard to determine.] Founded on a fragment of the middle part of a wing without proper definition. Type *D. vetustus*.

vetustus, Scudder, 1868, *Lond. Geo. Mag.*, vol. 5, p. 176, *Devonian*.

ENCÆNUS, Scudder, 1884, *Mem. Bost. Soc.*

Nat. Hist., vol. 3, p. 325. [Ety. *en*, very; *kainos*, new, strange.] Body stout, thoracic segments twice as broad as long; abdomen ovate; fore wings with the mediastinal vein straight, terminating before the apical third of the wing with numerous straight branches; scapular with similar branches ending half way between the mediastinal and the tip; externo-median important with distant branches. Type *E. ovalis*.

ovalis, Scudder, 1884, *Mem. Bost. Soc. Nat. Hist.*, vol. 3, p. 325, *Coal Meas.*

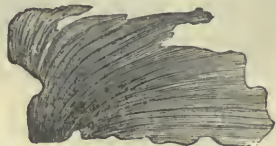


FIG. 1077.—*Ephemerites affinis*.

EPHEMERITES, Scudder, 1868, *Geo. Sur. Ill.*, vol. 3, p. 571. [Ety. *Ephemeris*, a

living genus.] The genus was not defined. It is probably a neuropteroid Palæodictyoptera. Type *E. simplex*. *affinis*, Scudder, 1868, *Geo. Sur. Ill.*, vol. 3, p. 572, *Coal Meas.*

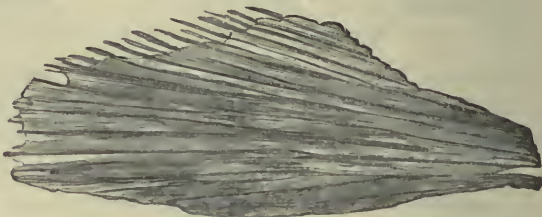


FIG. 1078.—*Ephemerites gigas*.

gigas, Scudder, 1868, *Geo. Sur. Ill.*, vol. 3, p. 571, *Coal Meas.*

primordialis, Scudder, 1878, *Proc. Bost. Soc. Nat. Hist.*, vol. 19, p. 248, *Coal Meas.*

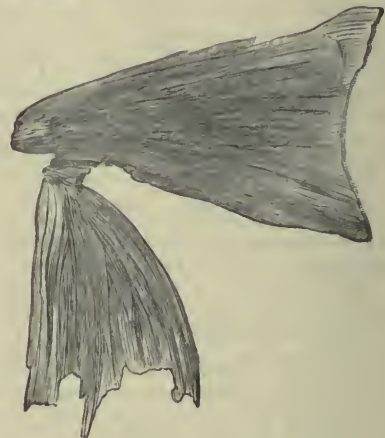


FIG. 1079.—*Ephemerites simplex*.

simplex, Scudder, 1868, *Geo. Sur. Ill.*, vol. 3, p. 571, *Coal Meas.*

ETOBLATTINA, Scudder, 1882, *Proc. Bost. Soc. Nat. Hist.*, vol. 21, p. 391. [Ety.

etos, true; *Blattina*, a genus.] Mediastinal area comparatively short; scapular not reaching tip of wing and with the externo-median, which is comparatively large, occupying less than half the wing; interno-median vein comparatively long. Type *E. mazonana*.



FIG. 1080.—*Etoblattina primaeva*. From Saarbruck in Europe for comparison.

lesquereuxi, Scudder, 1879, *Mem. Bost. Soc. Nat. Hist.*, vol. 3, p. 67, *Coal Meas.*

mazonana, Scudder, 1882, Proc. Bost. Soc. Nat. Hist., vol. 21, p. 391, Coal Meas.



FIG. 1081.—*Etoblattina venusta*.

GENENTOMUM, Scudder, 1884, Mem. Bost. Soc. Nat. Hist., vol. 3, p. 329. [Ety. *genos*, race, kind; *entomon*, insect.] Wings large, elongated with coarse venation and abundant cross veins; mediastinal vein very long, with numerous branches to the costa; other branches very distant and stout; the externo-median separated more widely than usual from the scapular, especially in the hind wing. Type *G. validum*.

validum, Scudder, 1884, Mem. Bost. Soc. Nat. Hist., vol. 3, p. 329, Coal Meas.

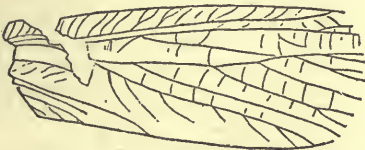


FIG. 1082.—*Genentomum validum*.

GENOPTERYX, Scudder, 1884, Mem. Bost. Soc. Nat. Hist., vol. 3, p. 327. [Ety. *genos*, kind, race; *pteryx*, a wing.] Interno-median vein with branches very similar to those of the externo-median vein, the outermost in close proximity to the innermost branches of the latter. Type *G. constricta*.

constricta, Scudder, 1884, Mem. Bost. Soc. Nat. Hist., vol. 3, p. 327, Coal Meas.

GERABLATTINA, Scudder, 1879, Mem. Bost. Soc. Nat. Hist., vol. 3, p. 110. [Ety. *geras*, old; *Blattina*, a genus of insects.] Mediastinal area comparatively long; scapular and externo-median area together occupy less than half the wing, the branches of both superior; interno-median vein comparatively long. Type *G. balteata*.

balteata, Scudder, 1879, Mem. Bost. Soc. Nat. Hist., vol. 3, p. 110, and Perm. or Up. Carb. Flora of Pa., p. 104, Up. Coal Meas. or Permian.



FIG. 1083.—*Gerablattina balteata*.

fascigera, Scudder, 1879, (*Blattina fascigera*.) Mem. Bost. Soc. Nat. Hist., vol. 3, p. 113, Coal Meas.

GEREPHEMERA, Scudder, 1868, Lond. Geo. Mag., vol. 5, p. 175. [Ety. *geras*, old; *Ephemera*, a genus of insects.] Founded on the fragment of a tip of the wing. Definition incomplete. Type *G. simplex*.

simplex, Scudder, 1868, Lond. Geo. Mag., vol. 5, p. 175, Upper Devonian.

GERAPOMPUS, Scudder, 1884, Mem. Bost. Soc. Nat. Hist., vol. 3, p. 326. [Ety. *geras*, old; *pompus*, an escort.] Body slender, the prothorax as long as broad; fore wings well rounded, the mediastinal arcuate like the costa, with infrequent simple branches; scapular ending near the tip. Type *G. blattinoides*.

blattinoides, Scudder, 1884, Mem. Bost. Soc. Nat. Hist., vol. 3, p. 326, Coal Meas.

extensus, Scudder, 1884, Mem. Bost. Soc. Nat. Hist., vol. 3, p. 326, Coal Meas.

GERARUS, Scudder, 1868, Mem. Bost. Soc. Nat. Hist., vol. 3, p. 344. [Ety. *geraros*, of stately bearing.] Body slender, tapering anteriorly; wings slender; mediastinal vein variable; branches of scapular vein numerous, more or less longitudinal, simple or forked, occupying much more space than the branches of any other vein. Type *G. danæ*.

danæ, Scudder, 1868, (*Miamia danæ*.) Geo. Sur. Ill., vol. 3, p. 566, Coal Meas.

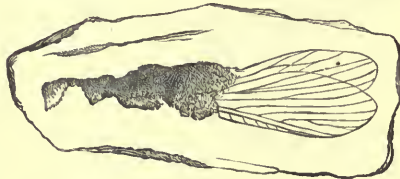


FIG. 1084.—*Gerarus danæ*.

mazonus, Scudder, 1884, Mem. Bost. Soc. Nat. Hist., vol. 3, p. 344, Coal Meas.

vetus, Scudder, 1884, Mem. Bost. Soc. Nat. Hist., vol. 3, p. 344, Coal Meas.

GERONEURA, Matthew, 1888, Trans. Roy. Soc. Can., p. 57. [Ety. *geros*, old; *neura*, a vein.] Anterior wing of the body elliptical elongate, venation strongly marked, scapular ridge conspicuous; mediastinal vein close to the scapular, but curves outward at the extremity; scapular vein and its branches cover a triangular area terminating at the apical end of the wing; main scapular terminates near the end of the costal edge; externo-median vein throws off two branches, the first one stronger than the main vein, and the second one goes with a sinuosity toward the base of the apical margin; nerves regular and simple. Type *G. wilsoni*.

wilsoni, Matthew, 1888, Trans. Roy. Soc. Can., p. 57, Lower Devonian.

HAPLOPHLEBIUM, Scudder, 1867, Can. Nat. and Geo., 2d ser., vol. 3, p. 202, and Proc. Bost. Soc. Nat. Hist., vol. 11, p. 150. [Ety. *haplos*, simple; *phlebian*, a vein.] Wing with simple neurulation and intercostal spaces filled with minute reticulations without any cross veins; wing long and slender. Type *H. barnesi*.

barnesi, Scudder, 1867, Can. Nat. and Geol. 2d ser., vol. 3, p. 202, and Acad. Geol., p. 386, Coal Meas.

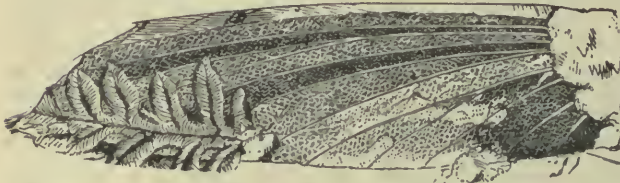


FIG. 1085.—Haplophleblum barnesi. A fern covers part of the wing.

longipennis, Scudder, 1884, Proc. Amer. Acad., vol. 20, p. 172, Coal Meas.

HAPLOTICHNUS, n. gen. [Ety. *haplotes*, plainness, simplicity; *ichnos*, track.] Simple, small, half-cylindrical trails running in any direction. Supposed to have been made by the larva or pupa of some palæodictyopterous insect. Type H. indianensis.

indianensis, n. sp. A simple half-cylindrical trail, needle-like in size, running in straight or crooked lines, or crossing itself. Found in the upper part of the Kaskaskia Group, at the Whetstone quarries in Orange County, Indiana.



FIG. 1086.—Haplotichnus indianensis.

The remains of insects found in the Palæozoic rocks occur under such circumstances as to induce the belief they were more or less aquatic in their habits, and frequented swamps and shores of bays and inlets. The Whetstone quarries of Orange County, Indiana, are yellowish white, slaty mud-rocks resembling, in appearance, the Solenhofen slates, but coarser in texture. They are limited in extent, and may be fairly presumed to represent the muddy shore of some bay or internal sea of Subcarboniferous age. The slaty layers are covered more or less upon the upper surface with trail-furrows, and on the under surface with elevated lines, showing the trails were made in mud, which afterward hardened, and was then covered with a thin deposit of mud which was tracked and hardened and covered, and so on in one series after another throughout the whole thickness of the slaty deposit. Many of the living Dictyoptera are

aquatic in their habits in the larva and pupa state, and it is not until the perfect insect is about to emerge from the

skin of the pupa that it creeps out of the water on the muddy shore or stones, or climbs the stems and leaves of aquatic plants, and from this position the imago springs into an aerial habitat. The trails on the Whetstone slates were evidently made by animals, and

all the evidence seems to indicate they were made by insects, though the evidence may not be either clear or conclusive in the latter respect. Under these circumstances the author has selected three common but distinct trails, and given them generic names; viz., Haplotichnus, Plangtichnus, and Treptichnus.

HEMERISTIA, Dana, 1864, Am. Jour. Sci. and Arts, 2d ser., vol. 37, p. 34. [Ety. *hemera*, day; *istia*, house.] Scapular branch strongly arcuate, at its base distant from the main stem, and at first taking the course of its basal offshoot. Type H. occidentalis.

occidentalis, Dana, 1864, Am. Jour. Sci. and Arts, 2d ser., vol. 37, p. 34, Coal Meas.

HOMOTHETUS, Scudder, 1867, Can. Nat. and Geol., 2d ser., vol. 3, p. 202.

[Ety. *homos*, similar; *thetos*, placed.]

Mediastinal vein extremely long, scarcely surpassed by the scapular, and with scarcely any branches to the costa; externo-median vein with only a few branches in the outer fourth of the wing; interno-median vein similar to the last. Type H. fossilis.

fossilis, Scudder, 1867, Can. Nat. and Geol., 2d ser., vol. 3, p. 202, and Acad. Geol., p. 525, Upper Devonian.

Libellula, Linnæus. Not a Palæozoic genus. *carbonaria*, see *Cheliphlebia carbonaria*.

LITHENTOMUM, Scudder, 1867, Can. Nat. and Geol., 2d ser., vol. 3, p. 202. [Ety. *lithos*, stone; *entomon*, an insect.] Main



FIG. 1088.—Lithentomum hartti.

scapular branch with a single, or at most two branches, which are almost wholly longitudinal. Type L. hartti.



FIG. 1087.—Homothetus fossilis.

hartti, Scudder, 1867, Can. Nat. and Geol., 2d ser., vol. 3, p. 202, and Acad. Geol., p. 525, Upper Devonian.

LITHOMYLACRIS, Scudder, 1879, Mem. Bost. Soc. Nat. Hist., vol. 3, p. 48. [Ety. litho, stone; *Mylakris*, a kind of roach.] Mediastinal and scapular areas together occupying more than half the wing; externo-median area small, compressed, scarcely expanding apically. Type *L. angustum*.



FIG. 1089.—*Lithomyiacris angustum*.
Mem. Bost. Soc. Nat. Hist., vol. 3, p. 50, Coal Meas.

simplex, Scudder, 1879, Mem. Bost. Soc. Nat. Hist., vol. 3, p. 51, Coal Meas.

MEGATHENTOMUM, Scudder, 1868, Geo. Sur. Ill., vol. 3, p. 570. [Ety. *megathos*, largeness; *entomon*, an insect.] Wings of great size, remarkably broad and rounded; veins distant; simple, infrequent divarications, and cross neuration of delicate, irregular veinlets; the wing is also dotted with larger and smaller spots. Type *M. pustulatum*.

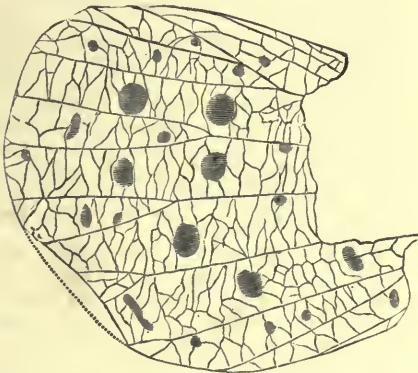


FIG. 1090.—*Megathentomum pustulatum*.

pustulatum, Scudder, 1868, Geo. Sur. Ill., vol. 3, p. 570, Coal Meas.

MIAMIA, Dana, 1864, Am. Jour. Sci. and Arts, 2d ser., vol. 37, p. 34. [Ety. proper name.] Scapular vein close to the mediastinal; straight, main branch arising near the middle of the wing, and nowhere distant from the main stem. Type *M. bronsoni*.

bronsoni, Dana, 1864, Am. Jour. Sci. and Arts, 2d ser., vol. 37, p. 34, Coal Meas. *danzæ*, see *Gerarus danæ*.

MYLACRIS, Scudder, 1868, Geo. Sur. Ill., vol. 3, p. 568. [Ety. *Mylakris*, a kind of cockroach.] Wings broad, mediastinal and scapular areas together occupying

less than half the wing; scapular area larger than the mediastinal. Type *M. anthracophilum*.

anthracophilum, Scudder, 1868, Geo. Sur. Ill., vol. 3, p. 568, Coal Meas.

antiquum, Scudder, 1884, Mem. Bost. Soc. Nat. Hist., vol. 3, p. 300, Coal Meas.

bretonense, Scudder, 1874, (*Blattina bretonensis*), Can. Nat., vol. 7, p. 271, Coal Meas.

carbonum, Scudder, 1884, Mem. Bost. Soc. Nat. Hist., vol. 3, p. 304, Coal Meas.

heeri, Scudder, 1874, (*Blattina heeri*), Can. Nat., vol. 7, p. 272, Coal Meas.

lucifugum, Scudder, 1884, Mem. Bost. Soc. Nat. Hist., vol. 3, p. 301, Coal Meas.

mansfieldi, Scudder, 1880, Mem. Bost. Soc. Nat. Hist., vol. 3, p. 47, Coal Meas.

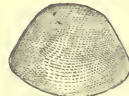


FIG. 1092.—*Mylacris anthracophilum* Pronotal shield.

ovale, Scudder, 1884, Mem. Bost. Soc. Nat. Hist., vol. 3, p. 308, Coal Meas.

pennsylvanicum, Scudder, 1880, Mem. Bost. Soc. Nat. Hist., vol. 3, p. 44, Coal Meas.

priscovolans, Scudder, 1884, Mem. Bost. Soc. Nat. Hist., vol. 3, p. 307, Coal Meas.

NECYMYLACRIS, Scudder, 1880, Mem. Bost. Soc. Nat. Hist., vol. 3, p. 53. [Ety. *nekus*, dead; *Mylakris*, a roach.] Some of the apical branches of the mediastinal vein arise beyond the base of the wing, and scarcely partake in the radiate arrangement of the others. Type *N. laeoanum*.

heros, Scudder, 1880, Mem. Bost. Soc. Nat. Hist., vol. 3, p. 54, Coal Meas.

laoanum, 1880, Mem. Bost. Soc. Nat. Hist., vol. 3, p. 53, Coal Meas.

ORYCTOBLATTINA, Scudder, 1885, Proc. Acad. Nat. Sci. Phil., p. 37. [Ety. *orkutos*, quarried; *Blattina*, a genus.] Principal veins widely separated at base; scapular area surpassing apex, and with externo-median occupying more than half the wing, the branches of latter inferior; interno-median vein comparatively short. Type *O. occidua*.

occidua, Scudder, 1885, Proc. Acad. Nat. Sci. Phil., p. 37, Coal Meas.

PAOLIA, Smith, 1871, Am. Jour. Sci. and Arts, 3d ser., vol. 1, p. 44. [Ety. proper name.] Wings long, slender, branches of veins dichotomizing strongly, and running in a longitudinal direction, so that the externo-median branches oc-



FIG. 1091.—*Mylacris anthracophilum*.

cupy only a slight portion of the lower margin. Type *P. vetusta*.

gurleyi, Scudder, 1884, Proc. Amer. Acad. vol. 20, p. 173, Coal Meas.

lacoana, Scudder, 1884, Proc. Amer. Acad., vol. 20, p. 173, Coal Meas.

superba, Scudder, 1884, Proc. Amer. Acad., vol. 20, p. 173, Coal Meas.

vetusta, Smith, 1871, Am. Jour. Sci. and Arts, 3d ser., vol. 1, p. 44, Coal Meas.

PAROMYLACRIS, Scudder, 1885, Proc. Acad. Nat. Sci. Phil., p. 35. [Ety. *paros*, before, or forefather; *Myiakris*, a kind of roach.]

Body much arched; pronotal shield more than twice as broad as long; wings extremely broad; mediastinal area large and extended, and with the scapular occupying half the wing; externo-median area expanding apically. Type *P. rotundum*.

rotundum, Scudder, 1885, Proc. Acad. Nat. Sci. Phil., p. 35, Coal Meas.

PETRABLATTINA, Scudder, 1876, Can. Geol., vol. 8, p. 88. [Ety. *petra*, stone; *Blattina*, a genus.]

Scapular and externo-median areas together covering more than half the wing; the externo-median vein directed toward and terminating near the middle of the inner border of the wing, branches superior; interno-median vein very short. Type *P. sepulta*.

sepulta, Scudder, 1876, (*Blattina sepulta*), Can. Nat. and Geol., vol. 8, p. 88, Coal Meas.

PHTHANOCORIS, Scudder, 1884, Proc. Bost. Soc. Nat. Hist., vol. 22, p. 58. [Ety. *phthano*, first; *kore*, pupa.]

Front wing differentiated from the hind wing; corium distinct from the membrane,



FIG. 1093.—*Plangtichnus erraticus*.

narrow clavus; no embolium or cuneus; mediastinal and scapular veins widely separated at base. Type *P. occidentalis*.

occidentalis, Scudder, 1884, Proc. Bost. Soc. Nat. Hist., vol. 22, p. 58, and Mem.

Bost. Soc. Nat. Hist., vol. 3, p. 348, Coal Meas.

PLANGTICHNUS, n. gen. [Ety. *Plagktos*, wandering; *ichnos*, track.] A zigzag, half-cylindrical, broken trail, running in any and every direction; sometimes dotted or sunk deeper at the angles than at other places, or most depressed between the angles in some cases. Supposed to have been made by the larva or pupa of some Palæodictyopterous insect. See remarks under *Haplotichnus*. Type *P. erraticus*.

erraticus, n. sp. A simple, irregularly zigzag, half-cylindrical, broken trail, running in any and every direction, depressed in spots deeper than the general trail. Collected in the upper part of the Kaskaskia Group at the Whetstone quarries, in Orange County, Indiana.

PLATEPHEMERA, Scudder, 1867, Can. Nat.

and Geol., 2d ser., vol. 3, p. 202. [Ety. *platys*, flat; *ephemera*, an insect.]

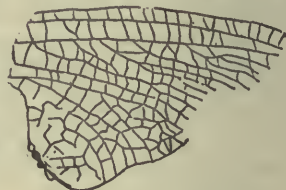


FIG. 1094.—*Platyphemera antiqua*.

showing nervation and a heavy cross vein near the base between two middle veins, from which new prominent veins arise; ancient May-flies, in which the lower externo-median stem seems to be formed on the same plan as the upper stem. Type *P. antiqua*.

antiqua, Scudder, 1867, Can. Nat. and Geol., 2d ser., vol. 3, p. 202, and Acad. Geol., p. 524, Devonian.

POLYERNUS, Scudder, 1884, Mem. Bost. Soc. Nat. Hist., vol. 3, p. 343. [Ety. *polys*, many; *ernos*, a scion.]

Body moderately stout; wings rather broad; mediastinal vein extending nearly to the tip of wing; branches of scapular vein inequidistant at origin, longitudinal, closely crowded and ramose, yet hardly more important than the externo-median vein. Type *P. complanatus*.

complanatus, Scudder, 1884, Mem. Bost. Soc. Nat. Hist., vol. 3, p. 343, Coal Meas.

laminarum, Scudder, 1884, Mem. Bost. Soc. Nat. Hist., vol. 3, p. 343, Coal Meas.

PROMYLACRIS, Scudder, 1885, Proc. Acad. Nat. Sci. Phil., p. 34. [Ety. *pro*, before; *myiakris*, a kind of roach.]

Body much arched; wing broad; mediastinal and scapular areas together not occupying more than a third of the wing; scapular area smaller than the mediastinal, the vein running obliquely to the costal margin. Type *P. ovale*.

ovale, Scudder, 1885, Proc. Acad. Nat. Sci. Phil., p. 34, Coal Meas.

PROPTETICUS, Scudder, 1884, Mem. Bost. Soc. Nat. Hist., vol. 3, p. 334. [Ety. *proi*, early; *ptetikos*, winged.] Scapular vein widely separated from the mediastinal, arcuate, main branch arising near the base of the wing, parting widely from the main stem. Type *P. infernus*.

infernus, Scudder, 1884, Mem. Bost. Soc. Nat. Hist., vol. 3, p. 334, Coal Meas.

TERMES, Linnaeus, 1748, Systema Naturæ, p. 610. Not a Palæozoic genus.

contusus, see *Didymophleps contusa*.

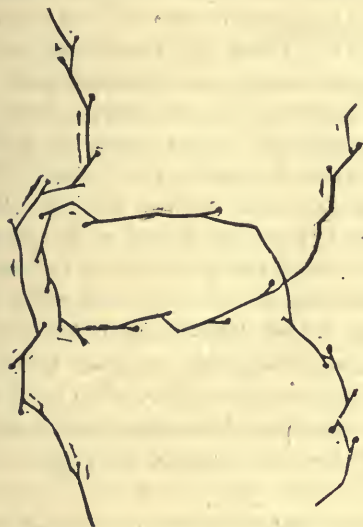


FIG. 1095.—*Treptichnus bifurcus*. The trails are larger than shown by the figure.

TITANOPHAMA, Brongniart, as recognized by Scudder. Wing very large, moderately slender; neuration moderately

abundant; scapular vein beginning to branch in the middle of the basal half of the wing.

jucunda, Scudder, 1884, Proc. Amer. Acad., vol. 20, p. 169, Coal Meas.

TREPTICHNUS, n. gen. [Ety. *treptos*, to be turned about; *ichnos*, track.] A zigzag, half-cylindrical, continuous trail, forked at each angle, and running in any direction; each line is prolonged in the direction in which the animal moved, at the angle, so as to form a short fork or projection. Supposed to have been made by the larva or pupa of some Palæopterous insect. See remarks under *Haplotichnus*. Type *T. bifurcus*.

bifurcus, n. sp. A zigzag, half-cylindrical, continuous trail, quite evenly depressed, and forked at each angle; the bifurcation takes place in the direction in which the animal moved, but generally is less sunken than the trail, and sometimes shows simply a dot disconnected with the angle. Collected in the upper part of the Kaskaskia Group at the Whetstone quarries in Orange County, Indiana.

XENONEURA, Scudder, 1867, Can. Nat. and Geo., 2d ser., vol. 3, p. 202. [Ety. *xenos*, new, strange; *neura*, a vein.] Mediastinal and scapular veins as in Palæopterina; externo-median vein amalgamated at base with the scapular, branching beyond the middle, interno-median divided at base in two branches. Type *X. antiquorum*.



FIG. 1096. *Xenoneura antiquorum*

antiquorum, Scudder, 1867, Can. Nat. and Geol., 2d ser., vol. 3, p. 202, and Acad. Geol., p. 525, Upper Devonian.

SUBKINGDOM VERTEBRATA.

THIS is the highest division of the Animal Kingdom, and, until within the last twenty years, the essential character upon which the subkingdom was based was the possession of a bony or cartilaginous internal skeleton, having a spine or vertebral column. Since that time the class known as Tunicates, or Ascidians, which have no bony skeleton, has been referred to it; and the *Amphioxus lanceolatus*, a little, slender, transparent creature, having only a gelatinous cord, no brain cavity, and colorless blood, which was regarded as the lowest type of fishes, and had been elevated into an order called *Leptocardia*, is now taken out of the Class Pisces and referred to a separate class called *Acrania*. The Classes *Tunicata* and *Acrania* are not, however, known in Palæozoic rocks. Another class, called *Cyclostomata*, consisting of long, cylindrical, worm-like bodies, with a tough skin, destitute of scales, pectoral and ventral fins, but having a fin at the extremity of the body without any rays, and having a cartilaginous skeleton, and which includes the various species of lampreys that inhabit fresh water, and are also found in the ocean, and which have generally been regarded as an order of fishes, is unknown in Palæozoic rocks. Some authors would, however, place the *Conodonts* in this class; but if they do not belong to the *Annelida*, then there are stronger reasons for believing they belong to *Crustacea* than for thinking they should be referred to the *Cyclostomata*.

No Palæozoic fossil from an animal as highly organized as the lowest mammal or a bird has ever been found. The fossils are confined to the lowest organizations of fishes, batrachians, and reptiles. The lower forms of fishes have only a cartilaginous cord, resembling the embryonic state of fishes having an osseous skeleton. In higher forms the spine consists of bony vertebræ, united in such manner as to allow flexibility and strength by reason of attaching muscles, and also to protect a spinal nerve that passes through it.

CLASS PISCES, OR FISHES.

The Class Pisces has been divided into four subclasses—*Ganoidea*, *Selachia*, *Dipnoa*, and *Teleostia*. The *Teleostia* have been divided into eleven orders, and these into twenty suborders. This subclass embraces a very large majority of the living fishes. All of them have a complete bony vertebral column and skull. Nearly all edible fishes belong to this subclass. Many have a naked skin, but the majority are covered with horny scales of various forms. When the scales are smooth the fish are said to belong to the *Cycloidea*; when the hinder margins of the scales are denticulated they belong to the *Ctenoidea*. Fishes have pectoral fins, which are called the representatives of anterior limbs; and ventral fins, representatives of posterior limbs; and also dorsal, caudal, and anal fins. This subclass is unknown in Palæozoic rocks. Agassiz divided the fish into four groups—*Cycloids*, *Ctenoids*, *Placoids*, and *Ganoids*—based on the character of the scales; but as a single fish has been found bearing two of these types of scales, and as it is now

known that the whole structure of animals must be taken into consideration in classification, his system, like that of every other based on a single character, has given way to more perfect knowledge of animal life and physical structure. And it is quite probable, if the characters of Devonian fishes could be completely ascertained, as we know the living forms, they would all be found to belong to extinct subclasses. They are judged, however, only from meager fragments of the ossified parts, and arranged by homologies with the existing species, and classed in orders where the affinities seem most strongly to arrange them.

SUBCLASS GANOIDEA.

The Ganoidea (from *ganos*, brightness, in allusion to the enameled armor with which some of them are covered) commences in the Devonian strata, where the fossil remains soon become abundant, and continue to occur from that time forward to the present, though very few families now exist. Agassiz included as Ganoids all fish covered, in whole or in part, with bony plates; but some of the living genera were found to belong to the Teleostia, and later classification has been held to include all fossil species falling within the original definition of Agassiz and part of the living forms. The dermal skeleton consists of smooth, bony plates, covered with enamel. In some cases they are rhomboidal, arranged edge to edge in oblique transverse rows; in other cases the scales are rounded; and in a few species the skin is naked. There is much diversity in the skeletons, and all shades of ossification in the vertebral column and skull from cartilaginous to perfect bone. The subclass has been divided into seven orders, viz.: Chondrostea, Halecomorpha, Ginglymoda, Pycnodonta, Crossopterygia, Acanthodea, and Placodermata.

The Order Chondrostea includes the sturgeons of fresh and salt water, and the paddle-fish or spoon-bill cat of the Mississippi River and its tributaries.

The Order Halecomorpha (shad-like) is generally united with the Ginglymoda, under the name of the Holosteia; but is distinguished by having large, round scales, no shingle-like fulera on the fins, and in having the vertebræ concave at both ends, as in the Teleostia. The only living genus is the *Amia*, called bow-fin, mud-fish, dog-fish, etc. It is common to the lakes and sluggish rivers. The order is not certainly known in Palæozoic rocks.

The Order Pycnodonta has a short, vertically-flattened body, covered with rhomboid scales and peculiar dermal ribs. Tail either heterocercal or homocercal.

The Order Ginglymoda has a bony skeleton, rhomboid scales, and shingle-like fulera on the fins. The vertebræ are convex in front and concave behind, forming ball and socket joints; tail heterocercal, and ventral fins between the pectorals and anals. This order is represented by the gar-pikes, which are common in American rivers.

The Order Crossopterygia is represented by two genera in the African waters, and fossils are referred to it back in geological time as far as the Devonian. The scales may be cycloid or rhomboid; the throat is protected by two or more plates; the caudal fin is diphyocercal; dorsal fin is divided in two or more divisions; pectorals and ventrals have a scaly axis; no fulera.

The Order Acanthodea had cartilaginous skulls, heterocercal tails, rhomboidal scales, and were armed with a spine before each fin, and are said to occupy a place between the Ganoidea and Selachia. They are all Palæozoic.

The Order Placodermata had the head and thoracic region inclosed in sculptured, bony plates. In some the tail was naked, in others it was covered with ganoid scales; in some the fins were inclosed in plates, but the vertebræ were not ossified. This order includes the oldest fish remains known to the geologist.

SUBCLASS SELACHIA.

The word Selachia is derived from *selachos*, the Greek word for shark. This subclass is also called Elasmobranchia and Chondropterygia, and it includes the living sharks, rays, and skates. The skeleton is cartilaginous, and the plates of the skull are united without sutures. There are pectoral and ventral fins, and the caudal fin is usually heterocercal. The surface of the body is naked or covered with calcified papillæ, comparable with teeth, and even spinous. The placoid scales sometimes form a sculptured armor. The dermal spines found fossil are collectively known as Ichthyodorulites. The teeth are never inserted into the jaws, but are sustained in their position by the strong skin of the gums. They sometimes have obtuse crowns, and form a pavement for both jaws; in other cases the teeth are conical, sharp, arranged in rows, with the apices pointed backward. The subclass is divided into the Holocephala and Plagiostomata. The Holocephala is represented in the existing seas by the Family Chimæridæ, and, it is said, combines some of the characters of the Selachia, Ganoidea, and Batrachia. The Plagiostomata is divided into two orders, the Squalina and Raiina. The vertebræ are well developed, and the skin is covered with plates, shields, or spines. The Order Squalina includes the ocean sharks and dog-fishes. The Order Raiina includes the skates and rays of the present seas; one of them is called the saw-fish, and another produces dangerous electrical discharges.

SUBCLASS DIPNOA.

This subclass is said to furnish a connecting link from the Ganoidea to the Batrachia. In external appearance the fish are ganoid-like. The body is long, eel-like, covered with scales, and terminates in a compressed caudal fin with weak fin-rays. The head is broad and flat. There are two orders, Monopneumonia and Dipneumonia. The Monopneumonia includes the Ceratodidæ, some of which are living in Australia, and they are common in the Mesozoic rocks, but the existence of them in the Palæozoic rocks is very doubtful.

The Order Dipneumonia contains the living Family Sirenidæ, which contains two genera, the Lepidosiren, from the rivers of Brazil, and the Protopterus, from tropical Africa. There is little reason to believe this order is represented in Palæozoic rocks, though *Ctenodus* and *Dipterus* have been referred to it.

SUBCLASS GANOIDEA.

ORDER ACANTHODEA.

FAMILY ACANTHODIDÆ.—*Acanthodes*.

ORDER CHONDROSTEA.

FAMILY CHONDROSTEIDÆ.—*Asterosteus*, *Macropetalichthys*.

FAMILY PALÆONISCIDÆ.—*Chirolepis*, *Mecolepis*, *Palæoniscus*, *Rhadinichthys*.

ORDER CROSSOPTERYGIA.

FAMILY CÆLACANTHIDÆ.—Cœlacanthus.

FAMILY CROSSOPTERYGIDÆ.—Ceratodus, Conchodus, Ctenodus, Heliodus, Onychodus, Peplorhina.

FAMILY DIPTERIDÆ.—Dipterus, Gnathorhiza, Ptyonodus.

FAMILY HOLOPTYCHIDÆ.—Glyptolepis, Holoptychius.

FAMILY PHANEROPLEURONIDÆ.—Phaneropleuron.

FAMILY RHIZODONTIDÆ.—Eusthenopterou, Rhizodus.

ORDER GINGLYMODA.

FAMILY LEPIDOSTEIDÆ.—Acrolepis, Amblypterus, Eurylepis.

ORDER PLACODERMATA.

FAMILY CEPHALASPIDÆ.—Acanthaspis, Acantholepis, Cephalaspis.

FAMILY COCCOSTEIDÆ.—Coccosteus, Dinichthys, Liognathus.

FAMILY PTERASPIDÆ.—Diplaspis, Palæaspis.

FAMILY PTERICHTHYIDÆ.—Aspidichthys, Bothriolepis, Pterichthys.

FAMILY UNCERTAIN.—Mycterops.

ORDER PYCNODONTA..

FAMILY PYCNODONTIDÆ.—Platysomus.

FAMILY UNCERTAIN.—Ectosteorachis.

SUBCLASS SELACHIA.

DIVISION HOLOCEPHALA.

ORDER CHIMEROIDIDEA.

FAMILY CHIMEROIDIDÆ.—Cyrtacanthus, Liognathus, Machæracanthus, Ptyctodus, Rhinodus, Rhynchodus.

DIVISION PLAGIOSTOMATA.

ORDER SQUALINA.

FAMILY COCHLIODONTIDÆ.—Chitonodus, Cochliodus, Cymatodus, Deltodopsis, Deltodus, Deltoptychius, Helodus, Orodus, Orthopleurodus, Petrodus, Platyodus, Pœcilodus, Psephodus, Sandalodus, Stenopterodus, Tæniodus, Tomodus, Trigonodus, Vaticinodus, Xystrodus. The Cochliodontidæ commenced at the base of the Subcarboniferous, reached their greatest development in the same geological system, and only one genus, Orthopleurodus, is found as high as the Coal Measures.

FAMILY HYBODONTIDÆ.—Agassizodus, Apedodus, Bathychilodus, Carcharopsis, Cladodus, Diplodus, Hybocladodus, Janassa, Lambdodus, Liodus, Mesodmodus, Orodus, Peripleptrodus, Phœbodus, Pristiclادodus, Stematodus, Thrinacodus, Polyrhizodus.

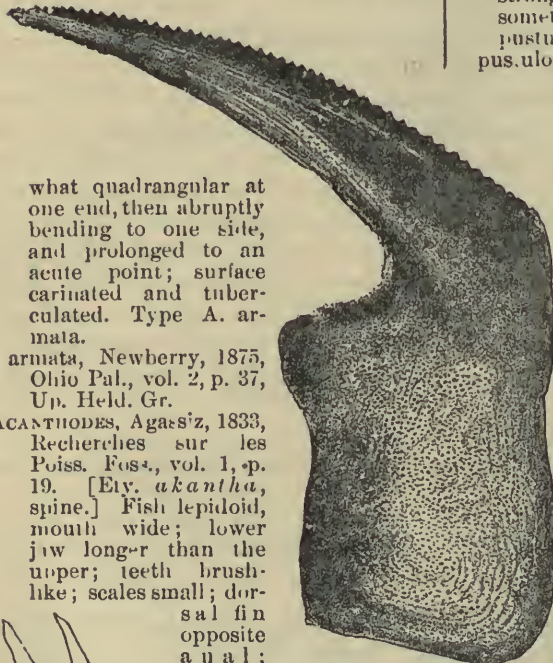
FAMILY PETALODONTIDÆ.—Antliodus, Calapodus, Cholodus, Chomatodus, Ctenopetalus, Ctenoptychius, Dactyloдus, Desmiodus, Fissodus, Harpacodus, Lisgodus, Peltodus, Peripristis, Petalodus, Petalorhynchus, Polyrhizodus, Pristodus, Tanaodus, Venustodus.

FAMILY ICITHYODORULITES.—Acondylacanthus, Amacanthus, Anaclitacanthus, Asteroptychius, Batacanthus, Bythiacanthus, Compsacanthus, Ctenacanthus, Cyrtacanthus, Drepanacanthus, Edlestus, Erismacanthus, Euneacanthus, Gampsacanthus, Gisacanthus, Glymmatacanthus, Gyraacanthus, Homacanthus, Leeracanthus, Listracanthus, Macheracanthus, Marracanthus, Oracanthus, Orthacanthus, Physonemius, Puigecanthus, Stenacanthus, Xystracanthus.

ORDER RAIINA.

FAMILY PSAMMODONTIDÆ.—Copodus, Psammodus.

ACANTHASPIS, Newberry, 1875, Ohio Pal., vol. 2, p. 36. [Ety. *akantha*, spine; *aspis*, shield.] Cranium plates some-



what quadrangular at one end, then abruptly bending to one side, and prolonged to an acute point; surface carinated and tuberculated. Type *A. armata*.

armata, Newberry, 1875, Ohio Pal., vol. 2, p. 37, Up. Held. Gr.

ACANTHODES, Agassiz, 1833, Recherches sur les Poiss. Foss., vol. 1, p. 19. [Ety. *akantha*, spine.] Fish lepidoid, mouth wide; lower jaw longer than the upper; teeth brush-like; scales small; dorsal fin opposite anal;

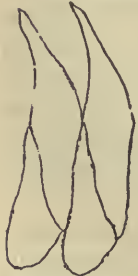


FIG. 1098.—*Acantholepis pustulosus*. Reduced outlines of four plates, probably in their relative positions.

pectoral large; first ray of each fin strong, large, stiff; rays of caudal fin close. Type *A. bronvi*. *affinis*, Whiteaves, 1839, Trans. Roy. Soc. Can., vol. 6, p. 77, Low. Devonian. *concinus*, Whiteaves, 1839, Trans. Roy. Soc. Can., vol. 6, p. 77, Low. Devonian.

ACANTHOLEPIS, Newberry, 1875, Ohio Pal., vol. 2, p. 38. [Ety. *akantha*, spine; *lepis*, scale.] Tuberculated cranial or dermal plates, having a prevailing

spatulate outline; some are thin and have the appearance of large, elongated, unsymmetrical scales; others are stronger and produced into points that sometimes become spines. Type *A. pustulosa*.

pustulosa, Newberry, 1875, Ohio Pal., vol. 2, p. 38, Up. Held. Gr.

ACONDYLACANTHUS, St. John & Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 432. [Ety. *akondylos*, without bony knobs; *akantha*, spine.] Fin rays long, gradually tapering, laterally compressed, moderately curved posteriorly; lateral faces longitudinally fluted; costæ smooth, enamel'd, increasing by bifurcation and implantation; posterior face excavated longitudinally, without median keel; postero-lateral angles bearing a row of downward hooked denticles; pulp cavity occupying the posterior half of the spine. Type *A. gracilis*.

æquicostatus, St. John & Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 434, Kookuk Gr.

gracilis, St. John & Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 433, Waverly or Kinderhook Gr. *mudgianus*, St. John & Worthen, 1883, Geo. Sur. Ill., vol. 7, p. 244, Up. Coal Meas.

nuperus, St. John & Worthen, 1883, Geo. Sur. Ill., vol. 7, p. 242, Up. Coal Meas.

occidentalis, Newberry & Worthen, 1866, (*Leptacanthus occidentalis*,)



FIG. 1099.—*Acondylacanthus gracilis*. Side view of spine mag. 1/2 diameter.

Geo. Sur. Ill. vol. 2, p. 116, St. Louis Gr.
 rectus, St. John & Worthen, 1833, Geo. Sur. Ill., vol. 7, p. 241, Up. Coal Meas.
 xiphias, St. John & Worthen, 1833, Geo. Sur. Ill., vol. 7, p. 244, Keokuk Gr.

ACROLEPIS, Agassiz, 1846, Recherches sur les Poiss. Foss., vol. 2, p. 79. [Ety.

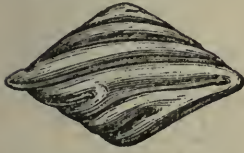


FIG. 100.—Acrolepis sedgwicki. Magnified scale.

akros, sharp.] *lepis*, scale; Distinguished from *Pygopterus* in the shorter anal fin, the dorsal being a little more anterior in position and the scales more

strongly keeled and sulcated diagonally. Type *A. sedgwicki*.

hortonensis, Dawson, 1838, Acad. Geol., p. 254, Subcarboniferous.

Agassichthys, Newberry, syn. for *Macropetalichthys*.

manni, see *Macropetalichthys manni*.

sullivanii, see *Macropetalichthys sullivanii*.

AGASSIZODUS, St. John & Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 311. [Ety. proper name; *olous*, tooth.] Teeth variable, transversely elongated, base usually produced; crown traversed by a crest, raised into several summits, the central one often large. Type *A. variabilis*.

corrugatus, Newberry & Worthen, 1870, (*Orodus corrugatus*.) Geo. Sur. Ill., vol. 4, p. 358, Coal Meas.

scitulus, St. John & Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 322, Coal Meas.

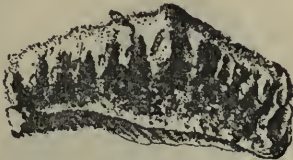


FIG. 101.—Agassizodus variabilis.

variabilis, Newberry & Worthen, 1870, (*Lophodus variabilis*.) Geo. Sur. Ill., vol. 4, p. 361, Coal Meas.

virginianus, St. John & Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 321, Coal Meas.

AMACANTHUS, St. John & Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 461. [Ety. *ama*, backward; *akantha*, spine.] Dorsal spine firmly implanted, curved forward, laterally compressed, posterior face truncated and longitudinally keeled or denticulate along the median line; rounded and tuberculated in the concave anterior face; lateral surface covered with tuberculate costæ. Type *A. gibbosus*.

gibbosus, Newberry & Worthen, 1866, (*Homonanthus gibbosus*.) Geo. Sur. Ill., vol. 2, p. 113, St. Louis Gr.

AMBLYPTERUS, Agassiz, 1833, Recherches sur les Poissons Fossils, t. 1, p. 28. [Ety. *amblys*, blunt; *pteron*, fin.] All fins large and composed of numerous rays; pectoral very large; anal broad; dorsal opposite the anal point of the ventral, which is far back; little rays on the superior lobe of the heterocercal tail; head blunt; scales medium, rhomboid. Type *A. macropterus*.

macropterus, Agassiz, 1836, Recherches Poiss. Foss., vol. 2, p. 28, Coal Meas.

ANACANTHUS, St. John & Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 412. [Ety. *anakis*, leant upon; *akantha*, spine.] Fin spine recumbent or imbedded along its inferior extent, laterally compressed, subovate in transverse section; exposed part constricted along the line of union with the base. Type *A. semicostatus*. *semicostatus*, St. John & Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 443, Burlington Gr.

ANTLIDUS, Newberry & Worthen, 1866, Geo. Sur. Ill., vol. 2, p. 33. [Ety. *anti*, a depression; *olous*, a tooth.] Teeth transversely elliptical, compressed, concavo-convex; crown similar to that of *Petalodus*; root short or obsolete. Type *A. mucronatus*.

cucullus, Newberry & Worthen, 1866, Geo. Sur. Ill., vol. 2, p. 41, Keokuk Gr.

gracilis, St. John & Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 393, Warsaw Gr.

minutus, Newberry & Worthen, 1866, Geo. Sur. Ill., vol. 2, p. 43, Keokuk Gr.

mucronatus, Newberry & Worthen, 1866, Geo. Sur. Ill., vol. 2, p. 38, St. Louis Gr.
parvulus, Newberry & Worthen, 1866, Geo. Sur. Ill., vol. 2, p. 38, Burlington Gr.

perovalis, St. John & Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 393, Warsaw Gr.

politus, Newberry & Worthen, 1866, Geo. Sur. Ill., vol. 2, p. 42, Keokuk Gr.

robustus, Newberry & Worthen, 1866, Geo. Sur. Ill., vol. 2, p. 39, Kaskaskia Gr.

sarcullulus, Newberry & Worthen, 1870, Geo. Sur. Ill., vol. 4, p. 356, Burlington Gr.

similis, Newberry & Worthen, 1866, Geo. Sur. Ill., vol. 2, p. 41, Keokuk Gr.

simplex, Newberry & Worthen, 1866, Geo. Sur. Ill., vol. 2, p. 44, Burlington Gr.

sulcatus, Newberry & Worthen, 1866, Geo. Sur. Ill., vol. 2, p. 45, Keokuk Gr.

APEDODUS, Leidy, 1856, Jour. Acad. Nat. Sci., 2d ser., vol. 3, p. 162. [Ety. *apedos*, level, smooth; *olous*, tooth.] Flatten-d lancet-shaped teeth. Type *A. priscus*.

priscus, Leidy, 1856, Jour. Acad. Nat. Sci., 2d ser., vol. 3, p. 162, Chemung Gr.

ASPIDICHTHYS, Newberry, 1873, Ohio Pal., vol. 1, p. 322. [Ety. *aspis*, shield; *ichthys*, fish.] Dorsal-plate of the carapace similar to that of *Pte-*

richthys, but many times larger and covered with large, hemispherical, smooth, enameled tubercles. Type A. clavatus.
clavatus, Newberry, 1873, Ohio Pal. vol. 1, p. 323, Portage Gr.

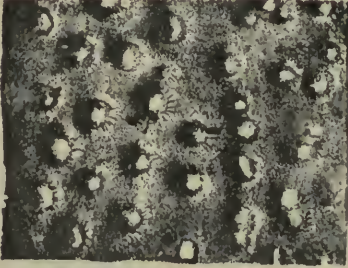


FIG. 1102.—*Aspidichthys clavatus*.

Aspidodus, Newberry & Worthen, 1866, Geo. Sur. Ill., vol. 2, p. 92, syn. for *Psephodus*.

convolutus, see *Psephodus convolutus*.

crenulatus, see *Psephodus crenulatus*.

Asteracanthus siderius, see *Bythiacanthus siderius*.

ASTEROPTERYGIUS, McCoy, 1854, British Pal. Rocks, p. 615. [Ety. *aster*, star; *ptyx*, wrinkle.] Bony fin-ray compressed, long, slender, gradually tapering to a point at the distal end, and abruptly tapering at the striated proximate end or base of insertion; sides moderately convex, converging to the anterior edge, which is strongly, keeled; posterior face with a moderate cavity, each lateral edge having a row of small, pointed teeth, directed upward; sides with smooth, thread-like ridges, separated by broader, flat, longitudinally striated spaces on which are irregularly scattered, smooth, spinous tubercles. Type A. ornatus.

bellulus, St. John & Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 439, Coal Meas.

keokuk, St. John & Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 436, Keokuk Gr.

stulodovici, St. John & Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 437, St. Louis Gr.

tenellus, St. John & Worthen, 1883, Geo. Sur. Ill., vol. 7, p. 248, Up. Coal Meas.

tenuis, St. John & Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 438, Kaskaskia Gr.

triangularis, Newberry & Worthen, 1870, Geo. Sur. Ill., vol. 4, p. 370, Burlington Gr.

vetustus, St. John and Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 435, Waverly or Kinderhook Gr.

ASTEROSTEUS, Newberry, 1875, Ohio Pal., vol. 2, p. 35. [Ety. *aster*, star; *osteon*, bone.] Head long, narrow, broadening in the occipital region; surface covered by a sheet of tuberculated enamel;

nasal pits strongly marked; condyle-like posterior projections. Type A. stenocephalus.

stenocephalus, Newberry, 1875, Ohio Pal., vol. 2, p. 36, Corniferous Gr.

BATACANTHUS, St. John & Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 468. [Ety. *batos*, prickly bush; *akantha*, spine.] Spines long, tapering, curved forward; apex obtuse; transverse section sub-circular or oval, with anterior angle and posterior face; lateral surfaces rounded, covered with stellate tubercles with intercostal sulci; base moderately inserted; pulp cavity subcentral. Type B. baculiformis.

baculiformis, St. John & Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 469, Keokuk Gr.

neis, St. John & Worthen, 1883, Geo. Sur. Ill., vol. 7, p. 253, Keokuk Gr.

stellatus, Newberry & Worthen, 1866, (*Drepanacanthus* (?) *stellatus*.) Geo. Sur. Ill., vol. 2, p. 125, Keokuk Gr.

BATHYCHILODUS, St. John & Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 252. [Ety. *bathys*, deep; *cheilos*, lip; *odus*, tooth.] Teeth minute, laterally elongated, sub-elliptical, sinuous in front; median cusp with cutting edges flanked by a pair of diverging denticles of similar shape, with a minute denticle between the lateral and median cusps. Type B. macisaacsi.

macisaacsi, St. John & Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 252, Middle Devonian.

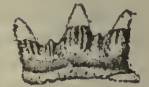


FIG. 1103.—*Bathychilodus macisaacsi*.

BOTHRIOLEPIS, Eichwald, 1840, Bull. Soc. St. Petersburg. [Ety. *bothrion*, a furrow;

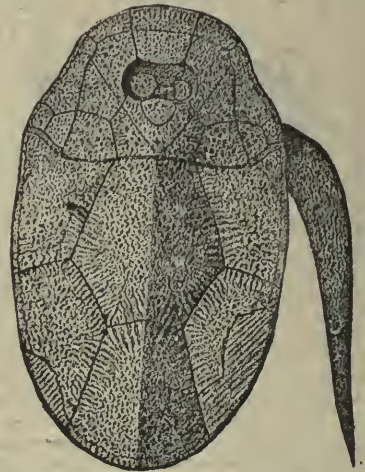


FIG. 1104.—*Bothriolepis canadensis*.

lepis, a scale.] Cephalic shield somewhat semielliptical in outline and covered with plates, as in *Pterichthys* and

Asterolepis, but distinguished by the course of the furrows and shape of the plates; it has longer articulating plates in the limb or arm, and has been otherwise distinguished, though closely related to both genera. Type B. ornatus.

canadensis, Whiteaves, 1880, (Pterichthys canadensis,) Am. Jour. Sci. and Arts, 3d. ser., vol. 20, p. 135, Up. Devonian.

BYTHIACANTHUS, St. John & Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 444. [Ety. bythios, deep; akantha, spine.] Fin deeply imbedded, laterally compressed, exposed part recumbent, tuberculated; posterior face low, keeled; pulp cavity forming a deep channel in the posterior side of the base. Type B. vanhornii.

siderius, Leidy, 1873, (Asteracanthus siderius,) Ext. Vert. Fauna, p. 313, St. Louis Gr.

vanhornii, St. John & Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 445, St. Louis Gr.

CALOPONUS, St. John & Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 403. [Ety. kalos, beautiful; odous, tooth.]

Teeth in general form like Petalodus, but distinguished by the turgid, subconical, unsymmetrical crown. Type C. apicalis.

apicalis, St. John & Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 403, Middle Coal Meas.



FIG. 1105.—Calopodus apicalis. Mag. 2 diam.

CARCHAROPSIS, Agassiz, 1843, Recherches sur les Poissons Fossiles, vol. 3, p. 313.

[Ety. carcharopsis, shark-like.] Principal cusps very strong, erect, compressed in front, rounded behind, broadly expanded at base; lateral angles sharp, crenulated; extremities occupied by isolated, conical, lateral denticles; coronal faces smooth or faintly striated vertically; base in outline like Cladodus, moderately produced and broadly rounded posteriorly; anterior face sinuous, terminating below in a ridge; inferior surface excavated. Type C. prototypus.

wortheni, Newberry, 1866, Geo. Sur. Ill., vol. 2, p. 69, Subcarboniferous.

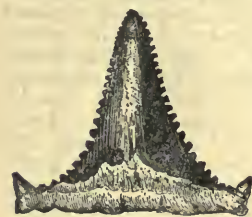


FIG. 1106.—Carcharopsis wortheni.

CEPHALASPIS, Agassiz, 1836, Recherch. Pois. Foss., t. 2, p. 135. [Ety. kephale, head; aspis, shield.] Entire skeleton external; head shield very large, subcrescent-

iform when depressed but in better condition showing an arching over the top of the head, covered with discoidal, sculptured, bony plates, with the crescent horns directed backward; eyes large, elliptical, on each side of the upper central part of the head; head shield depressed, and showing the jointed angular outline of part of the body.

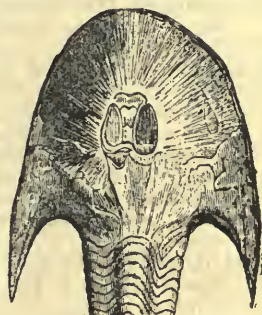


FIG. 1107.—Cephalaspis lyelli. Head shield depressed, and showing the jointed angular outline of part of the body.

and presenting a jointed appearance somewhat like a trilobite; dorsal, anal, and caudal fin, the latter like a paddle or oar. Type C. lyelli.

campbeltonensis, Whiteaves, 1881, Can. Nat., vol. 10, Devonian.

dawsoni, Lankester, 1870, London Geo. Mag., Devonian.

CERATODUS, Agassiz, 1833, Recherches sur les Poissons Fossiles, t. 1, p. 129. [Ety. keras, horn; odous, tooth.] Teeth large, thick, longer than wide, very porous; crown transversely sulcated. Type C. latissimus.

favosus, Cope, 1884, Pal. Bull., No. 39, p. 28, Permian.

paucieristatus, Cope, 1877, Proc. Am. Phil. Soc., p. 54, Permian.

vinslovii, Cope, 1876, Proc. Am. Phil. Soc., p. 410, Permian.

Chirodus, McCoy, 1848, Ann. and Mag. Nat. Hist., vol. 2, p. 130. [Ety. cheir, the hand; odous, tooth.] Tooth fan-shaped, thick, flattened; anterior broad, margin deeply divided into lobes; inner nearly straight margin has a small, recurved, thumb-like lobe projecting nearly at right angles from the middle of its length, preventing the mesial junction of the tritons of each side of the jaw; inner marginal lobe the longer; surface minutely punctured. Type C. pesranæ. Not definitely known in America.

acutus, Newberry, 1857, Proc. Acad. Nat. Sci., vol. 8, p. 99, Coal Meas. Too poorly defined to warrant recognition.

CHIROLEPIS, Agassiz, 1833, Recherches sur les Poissons Fossiles, t. 1, p. 128. [Ety. cheir, hand; lepis, scale.] Bones of the head sculptured; shoulder-bone and fins osseous; pectorals large, reaching near the ventral fin, and ventral reaching near the anal fin; dorsal fin small and opposite the posterior part of the anal fin; tail well-developed, principally on the lower side; scales small, sculp-

tured, and ranged diagonally in wavy lines. Type C. traillii.
canadensis, Whiteaves, 1881, Am. Jour. Sci. and Arts., 3d ser., vol. 21, p. 496, Up. Devonian.

Chitonodus, St. John & Worthen, 1883, Geo. Sur. Ill., vol. 7, p. 109. [Ety. *chiton*, a snook or cat; *odus*, tooth.] Mandibular posterior teeth trapezoidal, arched in the direction of inrollment; median teeth narrow, inrolled longitudinally; maxillary posterior teeth subquadrilateral, arched, and inrolled along the outer margin. Type C. spingeri.

antiquus, St. John & Worthen, 1883, Geo. Sur. Ill., vol. 7, p. 116, Low. Burlington Gr.

latus, Leidy, 1856, (Cochliodus latus,) Trans. Am. Phil. Soc., vol. 11, p. 87, pl. 5, fig. 17, Keokuk Gr.

liratus, St. John & Worthen, 1883, Geo. Sur. Ill., vol. 7, p. 119, St. Louis Gr.

rugosus, Newberry & Worthen, 1866, (Pocliodus rugosus, P. ornatus, and P. convolutus,) Geo. Sur. Ill., vol. 2, pp. 94, 95; vol. 4, p. 366, Keokuk Gr.

spingeri, St. John & Worthen, 1883, Geo. Sur. Ill., vol. 7, p. 112, Up. Burlington Gr.

tribulis, St. John & Worthen, 1883, Geo. Sur. Ill., vol. 7, p. 117, Keokuk Gr.

Chonolodus, St. John & Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 415. [Ety. *cholos*, defective; *odus*, tooth.] Distinguished from *Peltodus* and *Fissodus*, by the eccentrically lobed crest and extreme downward prolongation of the lateral extremities of the coronal fold in the convex



FIG. 1108.—*Chonolodus inaequalis*. Convex face.

face. Type C. *inaequalis*.
inaequalis, St. John & Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 416, Coal Meas.

Chomatodus, Agassiz, 1843, Recherches sur les Poissons Fossiles, t. 3, p. 107. [Ety. *choma*, a pile or heap; *odus*, tooth.] Teeth transversely much elongated, compressed, and depressed; crown having the homologous parts of *Petalodus*, and the form and structure of *Polyrhizodus*; root short, sometimes obsolete, undivided. Type C. *linearis*.

affinis, Newberry & Worthen, 1866, Geo. Sur. Ill., vol. 2, p. 54, Keokuk Gr.

angularis, see *Tanaodus angularis*.

arcuatus, St. John, 1870, Proc. Am. Phil. Soc., vol. 2, p. 435, and Pal. E. Neb., p. 243, Coal Meas.

chesterensis, St. John & Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 363, Kaskaskia Gr.

comptus, St. John & Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 356, Burlington Gr.

costatus, Newberry & Worthen, 1866, Geo. Sur. Ill., vol. 2, p. 85, Keokuk Gr.

cultellus, Newberry & Worthen, 1866, Geo. Sur. Ill., vol. 2, p. 52, Kaskaskia Gr.

elegans, Newberry & Worthen, 1866, Geo. Sur. Ill., vol. 2, p. 86, Keokuk Gr.

gracillimus, see *Tanaodus gracillimus*.

inconstans, St. John & Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 360, St. Louis Gr.

incrassatus, St. John & Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 359, St. Louis Gr.



FIG. 1109.—*Chomatodus incrassatus*.

insignis, Leidy, 1856, Trans. Am. Phil. Soc., vol. 11, p. 87, St. Louis Gr.

linearis, Agassiz, 1843, (Psammodus linearis,) Recherches Pois. Foss., t. 3, p. 108, Subcarb.

loriformis, Newberry & Worthen, 1866, Geo. Sur. Ill., vol. 2, p. 58, Keokuk Gr.

molaris, Newberry & Worthen, 1866, Geo. Sur. Ill., vol. 2, p. 56, Keokuk Gr.

multiplicatus, see *Tanaodus multiplicatus*.

obscurus, see *Tanaodus obscurus*.

parallelus, St. John & Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 358, Warsaw Gr.

pusillus, Newberry & Worthen, 1866, Geo. Sur. Ill., vol. 2, p. 53, Keokuk Gr.

varsoviensis, St. John & Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 393, Warsaw Gr.

venustus, Leidy, see *Venustodus leidyi*, where the specific name is made to designate the genus, and the author the specific name, contrary to the rules of nomenclature; also see *Venustodus venustus*.

Cladodus, Agassiz, 1843, Recherches sur les Poissons Fossiles, t. 3, p. 196. [Ety. *klados*, twig; *odus*, tooth.] Teeth with broad, horizontal, semicircular, thick, bony, coarsely fibrous base, rounded behind, truncated in front; crown divided into long, sharp, subulate, conical points, arranged along the straight truncated edge of the base; medial cone much larger than the secondary ones, of which latter the external cones are the larger; all the cones striated longitudinally, and either circular in section or with simple cutting edges, slightly compressed. Type C. *mirabilis*.

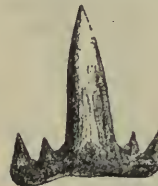


FIG. 1110.—*Cladodus acuminatus*.

acuminatus, Newberry, 1857, Proc. Acad. Nat. Sci. Phil., vol. 8, p. 99, and Ohio Pal., vol. 2, p. 45, Subcarboniferous.

alternatus, St. John & Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 265, Waverly or Kinderhook Gr.

angulatus, Newberry & Worthen, 1866, Geo. Sur. Ill., vol. 2, p. 24, Keokuk Gr.

- bellifer, St. John & Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 270, Burlington Gr.
- carinatus, St. John & Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 279, Coal Meas.
- concinuus, Newberry, 1875, Ohio Pal., vol. 2, p. 48, Portage Gr.
- costatus, Newberry & Worthen, 1866, Geo. Sur. Ill., vol. 2, p. 27, Kaskaskia Gr.
- deflexus, Newberry & Worthen, 1870, Geo. Sur. Ill., vol. 4, p. 355, Burlington Gr.
- eccentricus, St. John & Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 272, St. Louis Gr.
- elegans, Newberry & Worthen, 1870, Geo. Sur. Ill., vol. 6, p. 354, St. Louis Gr.
- euglypheus, St. John & Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 274, St. Louis Gr.
- exiguus, St. John & Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 261, Waverly or Kinderhook Gr.
- exilis, St. John & Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 258, Waverly or Kinderhook Gr.
- ferox, Newberry & Worthen, 1866, Geo. Sur. Ill., vol. 2, p. 26, St. Louis Gr.
- fulleri, St. John & Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 276, Coal Meas.
- gomphoides, St. John & Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 269, Burlington Gr.
- gracilis, Newberry & Worthen, 1866, Geo. Sur. Ill., vol. 2, p. 30, Coal Meas.
- grandis, Newberry & Worthen, 1866, Geo. Sur. Ill., vol. 2, p. 29, Kaskaskia Gr.
- herzeri, Newberry, 1875, Ohio Pal., vol. 2, p. 46, Portage Gr.
- intercostatus, St. John & Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 267, Burlington Gr.
- ischyphus, Newberry & Worthen, 1870, Geo. Sur. Ill., vol. 4, p. 354, St. Louis Gr.
- lammoides, Newberry & Worthen, 1866, Geo. Sur. Ill., vol. 2, p. 30, Keokuk Gr.
- magnificus, Tuomey, 1858, 2d Rep. Geo. Ala., p. 39, Kaskaskia Gr.
- micropus, Newberry & Worthen, 1866, Geo. Sur. Ill., vol. 2, p. 21, Keokuk Gr.
- mortifer, Newberry & Worthen, 1866, Geo. Sur. Ill., vol. 2, p. 22, Coal Meas.
- newmanti, Tuomey, 1858, Geo. Ala., p. 39, Kaskaskia Gr.
- occidentalis, Leidy, 1859, Proc. Acad. Nat. Sci. Phil., Up. Coal Meas.
- pandatus, St. John & Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 278, Coal Meas.
- parvulus, Newberry, 1875, Ohio Pal., vol. 2, p. 48, Portage Gr.
- pattersoni, Newberry, 1875, Ohio Pal., vol. 2, p. 47, Waverly Gr.
- politus, Newberry & Worthen, 1875, Geo. Sur. Ill., vol. 2, p. 27, Kaskaskia Gr.
- præautius, St. John & Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 270, Burlington Gr.
- rarestatus, St. John & Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 271, Keokuk Gr.
- robustus, Newberry & Worthen, 1866, Geo. Sur. Ill., vol. 2, p. 20, Keokuk Gr.
- romingeri, Newberry, 1875, Ohio Pal., vol. 2, p. 49, Waverly Gr.
- spinosus, Newberry & Worthen, 1866, Geo. Sur., Ill., vol. 2, p. 22, St. Louis Gr.
- springeri, St. John & Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 259, Waverly or Kinderhook Gr.
- stenopus, Newberry & Worthen, 1866, Geo. Sur. Ill., vol. 2, p. 23, St. Louis Gr.
- subulatus, Newberry, 1875, Ohio Pal., vol. 2, p. 47, Cuyahoga shale over the Berea grit.
- succinctus, St. John & Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 265, Waverly or Kinderhook Gr.
- turritus, Newberry & Worthen, 1866, Geo. Sur. Ill., vol. 2, p. 28, Keokuk Gr.
- vanhornii, St. John & Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 273, St. Louis Gr.
- wachsmuthi, St. John & Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 263, Waverly or Kinderhook Gr.
- zygopus, Newberry & Worthen, 1866, Geo. Sur. Ill., vol. 2, p. 25, Kaskaskia Gr.
- Climacodus*, McCoy, 1848, Ann. and Mag. Nat. Hist., 2d ser., vol. 2. [Ety. *klimax*, ladder; *odus*, tooth.] Tooth longer than wide, gradually narrowing toward the front, with nearly straight sides; anterior part of the crown crossed by broad, imbricating transverse ridges, at right angles to its length; surface minutely punctured. Type *C. imbricatus*. Not definitely known in America.
- brevis*, Newberry, 1837, Proc. Acad. Nat. Sci., vol. 8, p. 100, Coal Meas. Too poorly defined to warrant recognition.
- COCCOSTEUS**, Agassiz, 1836, Rech. reh. Poiss. Foss., vol. 2, p. 302. [Ety. *kokkos*, berry; *osteon*, bone.] Head rounded; body triangular, with long vertebrate tail, like a rudder, the whole compared in form, by Hugh Miller, to a boy's kite; head and body covered with tuberculated bony plates; central front plate like the keystone of an arch; the posterior body plate is large, saddle-wise toward the center, pointed behind; on the ridge there is a longitudinal groove ending in a perforation, a little behind the apex. It is this plate which has been described as *C. occidentalis*, but it does not show groove or perforation. Type *C. decipiens*.
- acaciensis*, Whiteaves, 1881, Can. Nat., vol. 10, Upper Devonian.
- occidentalis*, Newberry, 1875, Ohio Pal., vol. 2, p. 32, Up. H-Hl. Gr.
- COCHLIODUS**, Agassiz, 1843, Recherches sur les Poissons Fossiles, t. 3, p. 113. [Ety. *echlias*, anything spiral; *odus*, tooth.] Lower jaw thick, short, bony, V-shaped, bearing on each ramus two obliquely twisted and obtusely ridged semi-cylindrical teeth, strongly inrolled on

the outer margin, convex above, concave below, with porous grinding surfaces, as in *Psammodus*, from the termination of the vertical medullary canals. Type *C. contortus*.

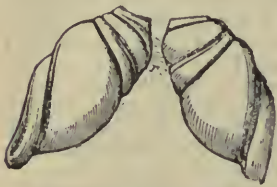


FIG. 111.—*Cochllodus contortus*.

costatus, Newberry & Worthen, 1870, *Geo. Sur. Ill.*, vol. 4, p. 364, Burlington Gr. *crassus*, Newberry & Worthen, 1866, syn.

for *Sandalodus lævissimus*. *latus*, see *Chitonodus latus*. *leidyi*, St. John & Worthen, 1883, *Geo. Sur. Ill.*, vol. 7, p. 127, Kaskaskia Gr. *nitidus*, see *Deltoptychius nitidus*. *nobilis*, Newberry & Worthen, syn. for *Chitonodus latus*. *obliquus*, St. John & Worthen, 1883, *Geo. Sur. Ill.*, vol. 7, p. 126, St. Louis Gr. *occidentalis*, see *Deltodus occidentalis*. *vanhornii*, St. John & Worthen, 1883, *Geo. Sur. Ill.*, vol. 7, p. 120, St. Louis Gr.

CÆLACANTHUS, Agassiz, 1836, *Recherches sur les Poissons Fossiles*, t. 2, p. 170. [Ety. *koiros*, hollow; *akantha*, spine.] Head plates sculptured; scales large, imbricated, sculptured, arranged diagonally; two small dorsal fins supported on interspinous bones, the anterior one a little forward of the ventral fin, and the posterior one nearly opposite the anal fin; caudal fin equi-lobate, and near its extremity a minute supple-



FIG. 112.—*Coelacanthus elegans*.

mental caudal; vertebral column cartilaginous, but neural arches and fin-rays bony; teeth small, numerous, conical. Type *C. granulatus*.

elegans, Newberry, 1856, *Proc. Acad. Nat. Sci. Phil.*, vol. 8, p. 98, and Ohio Pal., vol. 1, p. 339, Coal Meas.



ornatus, Newberry, 1856, *Proc. Acad. Nat. Sci. Phil.*, vol. 8, p. 98, and Ohio Pal., vol. 1, p. 340, Coal Meas. *robustus*, Newberry, 1856, *Proc. Acad. Nat. Sci. Phil.*, vol. 8, p. 98, and Ohio Pal., vol. 1, p. 341, Coal Meas.

FIG. 113.—*Coelacanthus granulatus*. Magnified scale.

COMPSACANTHUS, Newberry, 1857, *Proc. Acad. Nat. Sci.*, vol. 8, p. 99, and Ohio Pal., vol. 1, p. 331. [Ety. *composos*, elegant; *akantha*, a spine.] Spines small, gently curved backward; exposed part smooth, polished; section circular; single row of remote, depressed hooks on the posterior median line. Type *C. lævis*.

lævis, Newberry, 1857, *Proc. Acad. Nat. Sci. Phil.*, vol. 8, p. 99, and Ohio Pal., vol. 1, p. 332, Coal Meas.



FIG. 114.—*Compsacanthus lævis*.

Conchiopsis, syn. for *Cœlacanthus*. *anguliferus*, syn. for *Cœlacanthus elegans*. *exanthematicus*, syn. for *Peplorhina an-thracina*. *filiferus*, syn. for *Cœlacanthus elegans*.

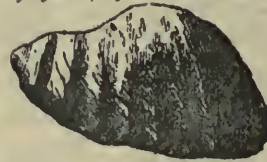


FIG. 115.—*Conchodus plicatus*.

CONCHODUS, McCoy, 1848, *Ann. and Mag. Nat. Hist.*, 2d. ser., vol. 2. [Ety. *conchus*, shell; *odous*, tooth.] Teeth large,

somewhat semicircular, pointed in front, subtruncate behind, deeply concave on the grinding surface; internal margin straight, thickened, edge abruptly deflected; external border convex, much raised, undulato-plicate, ridges larger in front, smaller posterior; under surface polished, minutely porous. Type *C. ostreiformis*.

plicatus, Dawson, 1868, *Acad. Geol.*, p. 209, Coal Meas.

COPODUS, Agassiz, MSS., 1859, St. John & Worthen, 1883, *Geo. Sur. Ill.*, vol. 7, p. 227. [Ety. *kopis*, broad, curved knife; *odous*, tooth.] Teeth bilaterally symmetrical, spanning the jaw without mesial suture, arranged in single, longitudinal series from behind backward; lateral borders converging anteriorly; coronal region arched; rim at base; anterior and posterior walls vertical, channeled; inferior surface concave; porous beneath the enamel-

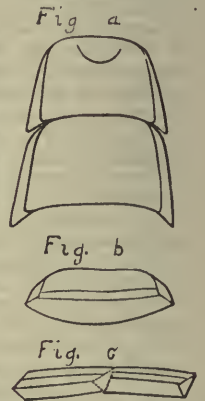


FIG. 116.—*Copodus cornutus*. Maxillary form. *a*, Triturating surface; *b*, transverse profile; *c*, longitudinal profile.

ed coronal surface. Type *C. cornutus*.

pusillus, St. John & Worthen, 1883, Geo. Sur. Ill., vol. 7, p. 231, Kaskaskia Gr.

Fig. a



Fig. b



Fig. c



FIG. 117.—*Copodus cornutus*. Mandibular form. *a*, Trituration surface; *b*, transverse profile; *c*, longitudinal profile.

transverse scales or tubercles; concealed base rapidly tapering, finely striated. Type *C. tenuistriatus*.

angulatus, Newberry & Worthen, 1866, Geo. Sur. Ill., vol. 2, p. 118, Kaskaskia Gr.

burlingtonensis, St. John & Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 426, Burlington Gr.

buttersi, St. John & Worthen, 1883, Geo. Sur. Ill., vol. 7, p. 240, Lower Coal Meas.

cannaliratus, St. John & Worthen, 1883, Geo. Sur. Ill., vol. 7, p. 239, Kaskaskia Gr.

costatus, see *Eunemacanthus costatus*.

coxanus, St. John & Worthen, 1883, Geo. Sur. Ill., vol. 7, p. 233, Keokuk Gr.

deflexus, St. John & Worthen, 1883, Geo. Sur. Ill., vol. 7, p. 234, St. Louis Gr.

elegans, Tuomey, 1858, Geo. Ala., p. 38, Kaskaskia Gr.

excavatus, St. John & Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 428, Keokuk Gr.

formosus, Newberry, 1873, Ohio Pal., vol. 1, p. 328, Waverly Gr.

furcicarinatus, Newberry, 1875, Ohio Pal., vol. 2, p. 54, Waverly Gr.

gemmatus, St. John & Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 429, St. Louis Gr.

gracillimus, Newberry & Worthen, 1866, Geo. Sur. Ill., vol. 2, p. 126, St. Louis Gr.

grado-costatus, St. John & Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 425, Burlington Gr.

vanhornii, St. John & Worthen, 1883, Geo. Sur. Ill., vol. 7, p. 229, St. Louis Gr.

CTENACANTHUS, Agassiz, 1843, Recherches sur les Poissons Fossiles, t. 3, p. 11.

[Ety. *ktenos*, comb; *akantha*, spine.] Fin spine compressed, gradually tapering, arched backward; anterior face narrow, rounded; posterior face concave, lateral edges bordered by two rows of curved denticles inclined downward; surface ridges furrowed, pectinated by

harrisoni, St. John & Worthen, 1883, Geo. Sur. Ill., vol. 7, p. 236, St. Louis Gr.

keokuk, St. John & Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 427, Keokuk Gr.

latispinosus, Whiteaves, 1881, Can. Nat. and Geol., vol. 10, Upper Devonian.

marshi, Newberry, 1873, Ohio Pal., vol. 1, p. 326, Coal Meas.

mayi, Newberry & Worthen, 1870, Geo. Sur. Ill., vol. 4, p. 372, Burlington Gr.

parvulus, Newberry, 1875, Ohio Pal., vol. 2, p. 55, Cleveland shale.

pellensis, St. John & Worthen, 1883, Geo. Sur. Ill., vol. 7, p. 237, St. Louis Gr.

pugiunculus, St. John & Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 430, St. Louis Gr.

sculptus, St. John & Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 421, Waverly or Kinderhook Gr.

similis, St. John & Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 431, Kaskaskia Gr.

speciosus, St. John & Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 424, Waverly or Kinderhook Gr.

spectabilis, St. John & Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 420, Waverly or Kinderhook Gr.

triangularis, Newberry, 1873, Ohio Pal., vol. 1, p. 329, Waverly Gr.

varians, St. John & Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 422, Waverly or Kinderhook Gr.

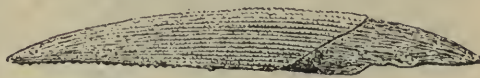


FIG. 118.—*Ctenacanthus triangularis*.

vetustus, Newberry, 1873, Ohio Pal., vol. 1, p. 326, Waverly Gr.

wrighti, Newberry, 1884, 35th Rep. N. Y. Mus. Nat. Hist., p. 206, Ham. Gr.

CTENODUS, Agassiz, 1843, Recherches sur les Poissons Fossiles, t. 3, p. 137. [Ety. *ktenos*, comb; *odus*, tooth.] Tooth somewhat fan-like, with closely serrated edges, very porous and sulcated; position in the jaw unknown. Type *C. cristatus*.

dialophilus, Cope, 1878, Proc. Am. Phil. Soc., vol. 17, p. 528, in Pal. Bull. No. 29, Permian.

fossatus, Cope, 1877, Proc. Am. Phil. Soc., p. 54, Permian.

gurleianus, Cope, 1877, Proc. Am. Phil. Soc., p. 55, Permian.

ohioensis, Cope, 1874, Proc. Acad. Nat. Sci. Phil., p. 91, and Ohio Pal., vol. 1, p. 410, Coal Meas.

periprion, Cope, 1878, Pal. Bull. No. 29, in Proc. Am. Phil. Soc., vol. 17, p. 527, Permian.



FIG. 119.—*Ctenodus serratus*.

porrectus, Cope, 1878, Pal. Bull. No. 29, in Proc. Am. Phil. Soc., vol. 17, p. 527, Permian.

pu-illus, Cope, 1878, Pal. Bull. No. 26, in Proc. Am. Phil. Soc., vol. 17, p. 191, Permian.

reticulatus, Newberry, 1875, Ohio Pal., vol. 2, p. 60, Coal Meas.

serratus, Newberry, 1875, Ohio Pal., vol. 2, p. 59, Coal Meas.

CTENOPETALUS, Agassiz, 1869, Catal. Foss. Fish, Collection of Earl of Eoniskillen, in Geo. Mag., vol. 6. [Ety. *ktenos*, comb; *petals*, broad, full-grown.] The serrated or denticulated crest distinguishes it from *Petalodus*, which it much resembles, and to which it bears about the same relation as *Petalodus* does to *Antiodus*. Type *C. serratus*.

bellulus, St. John & Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 398, St. Louis Gr.

limbatus, St. John & Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 399, Kaskaskia Gr.

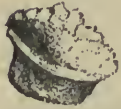


FIG. 1120.—*Ctenopetalus occidentalis*. Concave face.

medius, St. John & Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 400, Kaskaskia Gr.

occidentalis, St. John & Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 401, Coal Meas.

vinosus, St. John & Worthen, 1875, Geo.

Sur. Ill., vol. 6, p. 396, Keokuk Gr.

CTENOPTYCHUS, Agassiz, 1843, Recherches sur les Poissons Fossiles, t. 3, p. 99. [Ety. *ktenos*, comb; *ptyche*, wrinkle.] Teeth small, highly polished, strongly compressed, rounded or obtusely pointed; edge divided into several strong denticulations; base of crown with a few imbricating folds of ganoine; bony root, oblong, flattened in the same direction as the crown. Type *C. apicalis*.

cristatus, Dawson, 1868, Acad. Geol., p. 209, Coal Meas.



FIG. 1121.—*Ctenoptychus cristatus*. Natural size and magnified.

digitatus, Leidy, 1856, Trans. Am. Phil. Soc., vol. 11, St. Louis Gr.

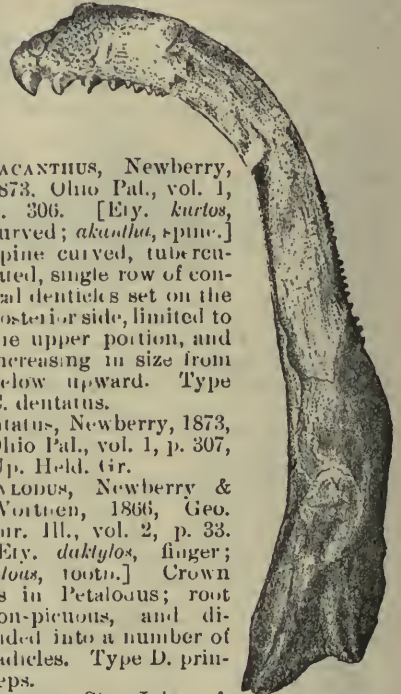
perrenius, St. John & Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 382, Kaskaskia Gr.

semicircularis, see *Peripristis semicircularis*.

stevensoni, St. John & Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 383, Coal Meas.

CYMATODUS, Newberry & Worthen, 1870, Geo. Sur. Ill., vol. 4, p. 363. [Ety. *cymatos*, wavy; *odous*, tooth.] Teeth small, oblong, or elliptical, thin, forming a flat or arched plate, of which the crown surface is transversely undulated and uniformly punctate; under surface flat, smooth, at the posterior end bearing a narrow, strap-shaped, oblique root. Type *C. oblongus*.

oblongus, Newberry & Worthen, 1870, Geo. Sur. Ill., vol. 4, p. 364, Up. Coal Meas.



CYRTACANTHUS, Newberry, 1873, Ohio Pal., vol. 1, p. 306. [Ety. *kyrtos*, curved; *akantha*, spine.] Spine curved, tuberculated, single row of conical denticles set on the posterior side, limited to the upper portion, and increasing in size from below upward. Type *C. dentatus*.

dentatus, Newberry, 1873, Ohio Pal., vol. 1, p. 307, Up. Held. Gr.

DACTYLODUS, Newberry & Worthen, 1866, Geo. Sur. Ill., vol. 2, p. 33. [Ety. *daktylos*, finger; *odous*, tooth.] Crown as in *Petalodus*; root conspicuous, and divided into a number of radicles. Type *D. princeps*.

concevus, St. John & Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 390, St. Louis Gr.

FIG. 1122.—*Cyrtacanthus dentatus*.

excavatus, St. John & Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 392, Kaskaskia Gr.

inflexus, Newberry & Worthen, 1866, Geo. Sur. Ill., vol. 2, p. 48, Kaskaskia Gr.

lobatus, Newberry & Worthen, 1866, Geo. Sur. Ill., vol. 2, p. 47, St. Louis Gr.

nimmus, St. John & Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 391, St. Louis Gr.

princeps, Newberry & Worthen, 1866, Geo. Sur. Ill., vol. 2, p. 45, St. Louis Gr.



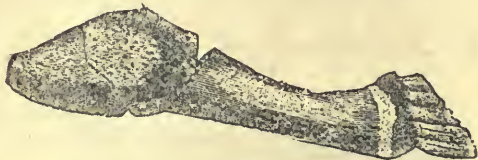
FIG. 1123.—*Dactylopus concevus*. Concave face.

DELTOPOPSIS, St. John & Worthen, 1883, Geo. Sur. Ill., vol. 7, p. 158. [Ety. from resemblance to *Deltodus*.] Coronal contour and general aspect near *Deltodus*, distinguished by the differentiation of the median ridge of the anterior coronal prominence, which approaches *Cochliodus* or *Chitonodus*. Type *D. angusta*.
affinis, St. John & Worthen, 1883, Geo. Sur. Ill., vol. 7, p. 160, Warsaw Gr.
angusta, Newberry & Worthen 1870. (*Deltodus angustus*.) Geo. Sur. Ill., vol. 4, p. 368, Kaskaskia Gr.
bialveata, St. John & Worthen, 1883, Geo. Sur. Ill., vol. 7, p. 169, Burlington Gr.
convexa, St. John & Worthen, 1883, Geo. Sur. Ill., vol. 7, p. 169, Up. Burlington Gr.
convoluta, St. John & Worthen, 1883, Geo. Sur. Ill., vol. 7, p. 165, Up. Burlington Gr.
exornata, St. John & Worthen, 1883, Geo. Sur. Ill., vol. 7, p. 168, Warsaw Gr.
inflexa, St. John & Worthen, 1883, Geo. Sur. Ill., vol. 7, p. 167, Keokuk Gr.
keokuk, St. John & Worthen. Geo. Sur. Ill., vol. 7, p. 169, Keokuk Gr.
stulovicici, St. John & Worthen, 1883, Geo. Sur. Ill., vol. 7, p. 161, St. Louis Gr.

DELTODUS, Agassiz, 1859, MSS., and Newberry & Worthen, 1866, Geo. Sur. Ill., vol. 2, p. 95. [Ety. *delta*, triangle; *odus*, tooth.] Teeth large, thick, strong, triangular, more or less arched, sometimes inrolled from the longer and more acute angle to the opposite margin; crown surface arched or marked by 1-3 prominent ridges from the basal margin toward the longer angle. Type *D. sublaevis*.
alvus, Newberry & Worthen, syn. for *Chitonodus laevis*.
angularis, Newberry & Worthen, syn. for *Orthopleurodus carbonarius*.
angustus, see *Deltodus angusta*.
ciuctus, St. John & Worthen, 1883, Geo. Sur. Ill., vol. 7, p. 146, Warsaw Gr.
cingulatus, Newberry & Worthen, 1866, Geo. Sur. Ill., vol. 2, p. 99, Kaskaskia Gr.
complanatus, see *Sandalodus complanatus*.
fasciatus, see *Tænidus fasciatus*.
grandis, Newberry & Worthen, 1866, Geo. Sur. Ill., vol. 2, p. 101, Keokuk Gr. Probably syn. for *Sandalodus lævisimus*.
intramedius, St. John & Worthen, 1883, Geo. Sur. Ill., vol. 7, p. 153, St. Louis Gr.
laticus, St. John & Worthen, 1883, Geo. Sur. Ill., vol. 7, p. 145, Keokuk Gr.
litoni, Newberry & Worthen, 1870, Geo. Sur. Ill., vol. 4, p. 367, Subcarboniferous.
occidentalis, Leidy, 1856, (*Cochliodus occidentalis*.) Trans. Am. Phil. Soc., vol. 11, p. 87, Warsaw and St. Louis Grs.
parvus, St. John & Worthen, 1883, Geo. Sur. Ill., vol. 7, p. 151, St. Louis Gr.
powelli, St. John & Worthen, 1883, Geo. Sur. Ill., vol. 7, p. 154, Carboniferous.

propinquus, St. John & Worthen, 1883, Geo. Sur. Ill., vol. 7, p. 56, Coal Meas.
rhomboides, Newberry & Worthen, syn. for *Sandalodus spatulatus*.
spatulatus, Newberry & Worthen, 1866, Geo. Sur. Ill., vol. 2, p. 100, Burlington Gr.
stellatus, Newberry & Worthen, 1866, Geo. Sur. Ill., vol. 2, p. 97, Keokuk Gr.
trilobus, St. John & Worthen, 1883, Geo. Sur. Ill., vol. 7, p. 148, Warsaw Gr.
undulatus, Newberry & Worthen, 1866, Geo. Sur. Ill., vol. 2, p. 98, Keokuk Gr.

DELTOPTYCHIUS, Agassiz, 1859, MSS., and St. John & Worthen, 1883, Geo. Sur. Ill., vol. 7, p. 89. [Ety. *delta*, triangle; *ptyx*, a wrinkle.] Posterior teeth of lower jaw trigonal, strongly built, and arched in the direction of inrollment; coronal contour in three divisions, narrowing toward the outer extremity; those of the upper jaw subspatulate, inrolled on the outer margin, acute posteriorly. Type *D. acutus*.
expansus, St. John & Worthen, 1883, Geo. Sur. Ill., vol. 7, p. 98, St. Louis Gr.
nitidus, Leidy, 1856, (*Cochliodus nitidus*.) Trans. Am. Phil. Soc., vol. 11, p. 87, Kaskaskia Gr.
primus, St. John & Worthen, 1883, Geo. Sur. Ill., vol. 7, p. 93, Up. Burlington Gr.
varsoviensis, St. John & Worthen, 1883, Geo. Sur. Ill., vol. 7, p. 96, Warsaw Gr.
wachsmuthi, St. John & Worthen, 1883, Geo. Sur. Ill., vol. 7, p. 93, Keokuk Gr.

FIG. 1124.—*Deltoptychius wachsmuthi*.

DESMIODUS, St. John & Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 337. [Ety. *desmos*, a ligament; *odus*, a tooth.] This name was applied to a genus of bats, in 1826, by Pflüger, Neu. Wied. in Beitrage zur Naturg. Brasiliens. Teeth occurring in rows, small, robust; crown laterally elongated, arched vertically, median cusp with lateral crests; base constricted and produced. Type *D. tumidus*.
costelliferus, St. John & Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 341, St. Louis Gr.
flabellum, St. John & Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 343, Keokuk Gr.
ligoniformis, St. John & Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 342, Keokuk Gr.
minusculus, Newberry & Worthen, 1866, (*Oodus minusculus*.) Geo. Rep. Ill., vol. 2, p. 67, Keokuk Gr.

FIG. 1125.—*Desmidodus costelliferus*. Convex aspect.

tumidus, St. John & Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 339, St. Louis Gr.

DINICHTHYS, Newberry, 1873, Ohio Pal., vol. 1, p. 313, and vol. 2, p. 3. [Ety. *deinos*, terrible; *ichthys*, a fish.] Cranium composed of thick bony plates, strengthened with internal arches ankylosed together, occipital bone in the type species three inches in thickness; relatively small maxillaries bearing a number of acute, conical, ankylosed teeth, which interlocked with a similar series on the mandibles; premaxillaries large, strong, triangular plates or teeth; mandibles of great length, flattened and spatulate behind, turning up anteriorly to form a strong triangular tooth, with its fellow of the opposite mandible, interlocked with the great, divergent, premaxillary teeth; vital parts of the body covered with large, thick plates which formed a carapace. Type *D. terrelli*.

hertzeri, Newberry, 1873, Ohio Pal., vol. 1, p. 316, Portage Gr.

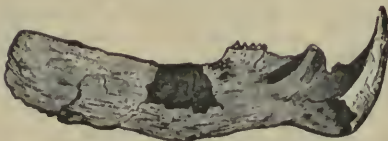


FIG. 1126.—*Dinichthys hertzeri*.

terrelli, Newberry, 1873-75, Ohio Pal., vol. 1, p. 313, and vol. 2, p. 3, Portage Gr.

DIPLASPIS, Matthew, 1888, Can. Rec. Sci., vol. 2, p. 251. [Ety. *diplos*, double; *aspis*, shield.] Small, having plates on the head, back, and sides, and one ventral plate; plates bearing very fine ridges. Type *D. acadica*.

acadica, Matthew, 1888, Can. Rec. Sci., vol. 2, p. 251, Up. Silurian or Low. Devonian.

DIPLODUS, Agassiz, 1843, Recherches sur les Poissons Fossiles, t. 3, p. 204. [Ety. *diploos*, double; *odous*, a tooth.] This name was used by Rafinesque for a genus of Sparidae in 1810, Indice d'Litologia Siciliana. Teeth having a flattened or rounded base, from which spring two lateral and sometimes a small central denticle; each jaw bore several hundred teeth in radiating rows, the points projecting inward. They belong to sharks possessed of spines, described under the names of *Oracanthus* and *Xenacanthus*. Type *D. gibbosus*.

acinacis, Dawson, 1860, Acad. Geol., p. 211, and Can. Nat. Geol., vol. 5, Coal Meas.

compressus, Newberry, 1857, Proc. Acad. Nat. Sci., Phil., vol. 8, p. 99, and Ohio Pal., vol. 1, p. 335, Coal Meas.

duplicatus, see *Thrinacodus duplicatus*.

gracilis, Newberry, 1857, Proc. Acad. Nat. Sci., Phil., vol. 8, p. 99, and Ohio Pal., vol. 1, p. 335, Coal Meas.

incurvus, see *Thrinacodus incurvus*.

latus, Newberry, 1857, Proc. Acad. Nat. Sci., Phil., vol. 8, p. 99, and Ohio Pal., vol. 1, p. 336, Coal Meas.

penetrans, Dawson, 1860, Acad. Geol., p. 211, and Can. Nat. and Geol., vol. 5, Coal Meas.



FIG. 1127.—*Diplodus latus*.

DIPTERUS, Sedgwick & Murchison, 1835, Geo. Trans., 2d ser., vol. 3. [Ety. *dipteros*, two-winged.] Diptera is an order of insects established by Linnaeus. Small fusiform fishes; heads compressed, tails heterocercal; two dorsal fins opposite two similar anal fins, the second of each the larger; a strongly marked lateral line; scales circular, thickest in the middle, variously curved with concentric lines or longitudinal ridges. Type *D. brachypterygopterus*.

sherwoodi, Newberry, 1875, Ohio Pal. vol. 2, p. 61, Catskill Gr.



FIG. 1128.—*Dipterus sherwoodi*.

DREPANACANTHUS, Newberry & Worthen, 1866, Geo. Sur. Ill., vol. 2, p. 120. [Ety. *drepane*, a sickle; *akantha*, spine.] Fin spines compressed laterally, gradually tapering to an acute point, curved forward; anterior margin with a row of flattened or conical tubercles; lateral surfaces with tubercles in longitudinal rows; posterior margin without hooks, sometimes with tubercles. Type *D. gemmatus*.

anceps, see *Xystracanthus anceps*.

gemmaus, Newberry & Worthen, 1866, Geo. Sur. Ill., vol. 2, p. 123, Keokuk Gr.

reversus, St. John & Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 456, St. Louis Gr.

stellatus, see *Batacanthus stellatus*.

ECTOSTEORACHIS, Cope, 1880, Pal. Bull. No. 32, p. 19. [Ety. *ektos*, without; *osteon*, bone; *rachis*, a ridge, backbone.]

Base of the skull consists of ossified parachordals, which embrace the chorda dorsalis posteriorly, and are continued for a short distance posteriorly as a tube; anteriorly the chordal groove is open; trabeculae not ossified; cranial structure embryonic; above and in front of the opening for the chorda the neural canal enters the groove; parachordals subtriangular. Type *E. nitidus*.

ciceronius, Cope, 1883, Pal. Bull. No. 36, in Proc. Am. Phil. Soc., p. 628, Permian.

nitidus, Cope, 1880, Pal. Bull. No. 32, p. 19, Permian.

EDESTUS, Leidy, 1856, Jour. Acad. Nat. Sci., 2d ser., vol. 3, p. 159. [Ety. *edestes*, a devourer.] Maxillary bonesegmented; segments beveled anteriorly and excavated posteriorly for co-adaptation; teeth resembling those of *Carcharodon*, one co-ossified with each maxillary segment. Type *E. vorax*.

giganteus, Newberry, 1888, Ann. N. Y. Acad. Sci., vol. 4, p. 1, Coal Meas.

heinrichsi, Newberry & Worthen, 1870, Geo. Sur. Ill., vol. 4, p. 350, Coal Meas.

minor, Newberry, 1866, Geo. Sur. Ill., vol. 2, p. 84, Coal Meas.

vorax, Leidy, 1856, Jour. Acad. Nat. Sci. Phil., vol. 3, 2d series, p. 159, Coal Meas.



FIG. 1129.—*Edestus vorax*.

Elonichthys peltigerus, see *Palæoniscus peltigerus*.

ERISMACANTHUS, McCoy, 1848, Ann. and Mag. Nat. Hist., 2d series, vol. 2, p. 119. [Ety. *ereisma*, a prop or stay; *akantha*, spine.] Spine of three parts; one compressed, finely striated, which entered the flesh; the second short, compressed, rapidly tapering, curved backward, sides with longitudinal ridges, and two rows of downward curved teeth on the posterior concave margin; the third, a prop-like part extending forward nearly at right angles with the base, arched, compressed at the basal half, depressed distally, and covered with tubercles and some spines on the under side. Type *E. jonesi*.

maccoyanus, St. John & Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 461, St. Louis Gr.

EUNEMACANTHUS, St. John & Worthen, 1883, Geo. Sur. Ill., vol. 7, p. 120. [Ety. *eu*, beautiful; *nema*, a line; *akantha*, spine.] Distinguished from *Ctenacanthus* by the plain dorsal ridge, tuberculated intercostal sulci, and upward direction of the denticles on the angles of the posterior face. Type *E. costatus*.

costatus, Newberry & Worthen, 1866, (*Ctenacanthus costatus*.) Geo. Sur. Ill., vol. 2, p. 120, St. Louis Gr.

EURYLEPIS, Newberry, 1856, Proc. Acad. Nat. Sci. Phil. [Ety. *eurys*, broad; *lepis*,

scale.] Small; body fusiform; head obtuse; tail elongated, lobes unequal; fins small, with delicate fulcra; dorsal and anal fins opposite, and far back on the body; ventrals near middle of abdomen; cranial surface tubercular; maxillary, mandibular, and jugular plates corrugated; scales smooth, ornamented, or serrated; teeth numerous, conical, short. Type *E. tuberculata*.

corrugata, Newberry, 1856, Proc. Acad. Nat. Sci. Phil., and Ohio Pal., vol. 1, p. 350, Coal Meas.

granulata, Newberry, 1856, Proc. Acad. Nat. Sci. Phil., and Ohio Pal., vol. 1, p. 352, Coal Meas.

insculpta, Newberry, 1856, Proc. Acad. Nat. Sci. Phil., and Ohio Pal., vol. 1, p. 351, Coal Meas.

lineata, Newberry, 1856, Proc. Acad. Nat. Sci. Phil., and Ohio Pal., vol. 1, p. 353, Coal Meas.

minima, Newberry, 1873, Ohio Pal., vol. 1, p. 353, Coal Meas.

ornatissima, Newberry, 1856, Proc. Acad. Nat. Sci. Phil., and Ohio Pal., vol. 1, p. 352, Coal Meas.

ovoidea, Newberry, 1856, Proc. Acad. Nat. Sci. Phil., and Ohio Pal., vol. 1, p. 351, Coal Meas.

striolata, Newberry, 1873, Ohio Pal., vol. 1, p. 355, Coal Meas.

tuberculata, Newberry, 1856, Proc. Acad. Nat. Sci., and Ohio Pal., vol. 1, p. 350, Coal Meas.



FIG. 1130.—*Eurylepis tuberculata*.

EUSTHENOPTERON, Whiteaves, 1881, Am. Jour. Sci. and Arts, 3d ser., vol. 21, p. 495. [Ety. *eu*, very; *sthenes*, stout; *pteron*, a fin.] Fin rays of anal and second dorsal fins supported by three osselets articulated to a broad interspinous apophysis; vertebral centers not ossified; caudal osselets articulated to modified hæmal spines. Type *E. foordi*.

foordi, Whiteaves, 1881, Am. Jour. Sci. and Arts, 3d ser., vol. 21, p. 495, Upper Devonian.

FISSODUS, St. John & Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 413. [Ety. *fissus*, split; *odous*, tooth.] Teeth small, in the form of root and general contour

like *Peltodus*, but distinguished by the cleft condition of the crest. Type *F. bifidus*.

bifidus, St. John & Worthen, 1875, *Geo. Sur. Ill.*, vol. 6, p. 414, Kaskaskia Gr.



FIG. 1131.—*Fis-sodus bifidus*.

tricuspidatus, St. John & Worthen, 1875, *Geo. Sur. Ill.*, vol. 6, p. 415, Kaskaskia Gr.

GAMPSACANTHUS, St. John & Worthen, 1875, *Geo. Sur. Ill.*, vol. 6, p. 471. [Ety. *gampsos*, curved; *akantha*, spine.] Spines long, laterally compressed, tapering, costate, with larger and smaller tubercles; posterior margin denticulate; base expanded; pulp cavity large. Type *G. typus*.

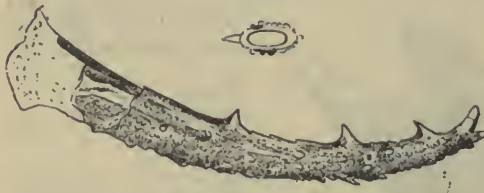


FIG. 1132.—*Gampsacanthus typus*. Side view of a spine magnified 2 diam., and transverse section.

latus, St. John & Worthen, 1875, *Geo. Sur. Ill.*, vol. 6, p. 474, Keokuk Gr.

squamosus, St. John & Worthen, 1875, *Geo. Sur. Ill.*, vol. 6, p. 473, St. Louis Gr.

typus, St. John & Worthen, 1875, *Geo. Sur. Ill.*, vol. 6, p. 472, St. Louis Gr.

GISACANTHUS, St. John & Worthen, 1875, *Geo. Sur. Ill.*, vol. 6, p. 440. [Ety. *geison*, a border; *akantha*, a spine.] Spine curved posteriorly, anterior angle a simple raised keel; lateral faces bearing longitudinal rows of tubercles; posterior face longitudinally keeled. Type *G. stellatus*.

bullatus, St. John & Worthen, 1875, *Geo. Sur. Ill.*, vol. 6, p. 441, Kaskaskia Gr.

stellatus, St. John & Worthen, 1875, *Geo. Sur. Ill.*, vol. 6, p. 440, St. Louis Gr.



FIG. 1133.—*Glymmatacanthus irishi*. Fragment of spine.

GLYMMATACANTHUS, St. John & Worthen, 1875, *Geo. Sur. Ill.*, vol. 6, p. 446. [Ety. *glymmatos*, engraved; *akantha*, spine.] Fin ray vertically elongated, posteriorly arched, laterally compressed; lateral faces covered with stellate or striated tubercles. Type *G. irishi*.

irishi, St. John & Worthen, 1875, *Geo. Sur. Ill.*, vol. 6, p. 447, Kinderhook or Waverly Gr.

petrodoides, St. John & Worthen, 1883, *Geo. Sur. Ill.*, vol. 7, p. 250, Kaskaskia Gr.

rudis, St. John & Worthen, 1883, *Geo. Sur. Ill.*, vol. 7, p. 249, Keokuk Gr.

GLYPTOLEPIS, Agassiz, 1836, *Poiss. Foss.*, vol. 2, p. 179. [Ety. *glyptos*, sculptured; *lepis*, scale.] Fins long, sometimes pendulous; anterior dorsal opposite ventral, and posterior dorsal opposite anal; tail fin long, spreading below; shoulder bones huge; teeth minute; scales of great size in proportion to the animal, and deeply sculptured. Type *G. elegans*.

microlepidotus, Agassiz, 1836, *Poiss. Foss.*, vol. 2, p. 179, Devonian.

quebecensis, Whiteaves, 1889, *Trans. Roy. Soc. Can.*, vol. 6, p. 77, Low. Devonian.

GNATHIORHIZA, Cope, 1883, *Proc. Am. Phil. Soc.*, vol. 20, p. 629. [Ety. *gnathos*, jaw; *rhiza*, root.] Founded upon some ganoine teeth. The definition is too meager for identification, and the genus may never again be recognized. Type *G. serrata*.

serrata, Cope, 1883, *Proc. Am. Phil. Soc.*, vol. 20, p. 629, Permian.

GYRACANTHUS, Agassiz, 1833, *Recherches sur les Poissons Fossiles*, t. 1, p. 87.

[Ety. *gyros*, a circle; *akantha*, spine.] Fin spines very large, gradually tapering to the apex, and slightly arched backward; inserted base small, rapidly tapering; posterior margin feebly armed with two rows of small denticles; surface of the sides covered with very oblique ridges, which meet at an angle on the anterior face. Type *G. formosus*.

alleni, Newberry, 1873, *Ohio Pal.*, vol. 1, p. 331, Cuyahoga shale.

compressus, Newberry, 1873, *Ohio Pal.*, vol. 1, p. 230, Cuyahoga shale.

cordatus, St. John & Worthen, 1883, *Geo. Sur. Ill.*, vol. 7, p. 251, Keokuk Gr.

duplicatus, Dawson, 1868, *Acad. Geol.*, p. 210, Coal Meas.

magnificus, Dawson, 1868, *Acad. Geol.*, p. 210, Sub-carboniferous.

HARPACODUS, Agassiz, 1869, *Catal. Foss. Fish.* Collection of Earl of Enniskillen, and St. John & Worthen, in *Geo. Sur. Ill.*, vol. 6, p. 354. [Ety. *harpe*, a



FIG. 1134.—*Gyracanthus alleni*. Anterior face.

hook; *odous*, tooth.] Teeth laterally elongated, vertically arched, gently curved outward in the concave face; margins nearly parallel; crown compressed along the crest; serrated, expanded below; convex face low, opposite face concave; coronal borders produced in beveled; base strong, obliquely produced; lateral angles well defined. Type *H. dentatus*, or, more properly, *H. occidentalis*.



FIG. 1135.—*Harpacodus occidentalis*.

compactus, St. John & Worthen, 1875, *Geo. Sur. Ill.*, vol. 6, p. 355, Kaskaskia Gr.
occidentalis, St. John & Worthen, 1875, *Geo. Sur. Ill.*, vol. 6, p. 355, St. Louis Gr.

HELIODUS, Newberry, 1875, *Ohio Pal.*, vol. 2, p. 62. [*Ety. helios*, sun; *odous*, tooth.] Distinguished from *Dipterus* by having the upper palate teeth united, forming a rounded, semicircular, trituration plate, bearing radiating tuberculated ridges. Type *H. lesleyi*. Dr. Traquair, of England, regards *Heliodus* as a synonym for *Palædaphus*, Van Beneden & DeKoninck, 1864, *Bull. Acad. Belg.*, vol. 17, p. 143.



FIG. 1136.—*Heliodus lesleyi*.

lesleyi, Newberry, 1875, *Ohio Pal.*, vol. 2, p. 64, Chemung Gr.

HELODUS, Agassiz, 1843, *Recherches sur les Poissons Fossiles*, t. 3, p. 104. [*Ety. helos*, a nail or rudder; *odous*, tooth.] Transversely elongate, crown convex, elevated along the middle into an obtuse, circular ridge, sometimes divided into a line of several compressed cones diminishing from the center; surface porous as in *Psammodus*; margin of the crown raised in the middle on both the inner and outer sides, and it and the root vertically plicated. Type *H. simplex*.

angulatus, Newberry & Worthen, 1866, *Geo. Sur. Ill.*, vol. 2, p. 83, Burlington Gr.
biformis, Newberry & Worthen, 1866, *Geo. Sur. Ill.*, vol. 2, p. 77, Waverly or Kinderhook Gr.
carbonarius, Newberry & Worthen, 1866, *Geo. Sur. Ill.*, vol. 2, p. 75, Coal Meas.

compressus, Newberry & Worthen, 1870, *Geo. Sur. Ill.*, vol. 4, p. 360, Burlington Gr.
compressus, see *Hybocladodus compressus*.
coniculus, Newberry & Worthen, 1866, *Geo. Sur. Ill.*, vol. 2, p. 75, Burlington Gr.
consolidatus, Newberry & Worthen, 1866, *Geo. Sur. Ill.*, vol. 2, syn. for *Chitonodus latus*.

crenulatus, Newberry & Worthen, 1866, *Geo. Sur. Ill.*, vol. 2, p. 82, Keokuk Gr.
denshumani, Newberry & Worthen, 1866, *Geo. Sur. Ill.*, vol. 2, p. 76, Keokuk Gr.
denticulatus, Newberry & Worthen, 1866, *Geo. Sur. Ill.*, vol. 2, p. 81, Keokuk Gr.
elytra, Newberry & Worthen, 1866, *Geo. Sur. Ill.*, vol. 2, p. 78, Keokuk Gr.

gibbosus, Newberry & Worthen, 1866, *Geo. Sur. Ill.*, vol. 2, p. 79, Keokuk Gr.



gibbus, Leidy, 1856, *Trans. Am. Phil. Soc.*, vol. 11, p. 87, Keokuk Gr.

FIG. 1137.—*Helodus gibbosus*.

limax, Newberry & Worthen, 1866, *Geo. Sur. Ill.*, vol. 2, p. 80, Burlington Gr.
nobilis, Newberry & Worthen, 1866, *Geo. Sur. Ill.*, vol. 2, same as *Chitonodus latus*.

placenta, see *Psephodus placenta*.

politus, Newberry & Worthen, 1866, *Geo. Sur. Ill.*, vol. 2, p. 79, Keokuk Gr.
rugosus, Newberry & Worthen, 1866, *Geo. Sur. Ill.*, vol. 4, p. 359, Coal Meas.
sulcatus, Newberry & Worthen, 1866, *Geo. Sur. Ill.*, vol. 2, p. 82, Keokuk Gr.
undulatus, Newberry & Worthen, 1866, *Geo. Sur.*, *Ill.*, vol. 2, p. 82, Keokuk Gr.

HOLOPTYCHIUS, Agassiz, 1836, *Recherches sur les Poissons Fossiles*, t. 2, p. 179. [*Ety. holos*, entire; *ptyx*, wrinkle.] Body thick, short, rounded, bones of the head granulated; scales large, very thick, subrhomboidal, rounded, imbricating, composed of numerous bony layers, exposed surface marked with large, longitudinal, flexuous wrinkles and tubercles; teeth small, numerous, conical, longitudinally sulcated at base; tail heterocercal, caudal fin triangular, obliquely truncated; dorsal fin opposite a similar anal one close to the base of the caudal; ventral behind the middle of the body. Type *H. giganteus*.



FIG. 1138.—*Holoptychius americanus*. Single tooth.

americanus, Leidy, 1856, *Jour. Acad. Nat. Sci.*, 2d series, vol. 3, p. 159, Catskill Gr.

nobilissimus, Agassiz, as identified by Hall, 1843, *Geo. Rep. 4th Dist. N. Y.*, is described as *H. americanus*.

taylori, Hall, 1843, (*Sauripteris taylori*), *Geo. Rep. 4th Dist. N. Y.*, p. 282, Catskill Gr.

Homacanthus, Agassiz, 1845, Poiss. Foss. [Ety. *homos*, similar; *akantha*, spine.] *gibbosus*, see *Amacanthus gibbosus*. *gracilis*, Whiteaves, 1889, Trans. Roy. Soc., Can., vol. 6, p. 77, Low. Devonian. *rectus*, see *Marracanthus rectus*.

HYBODODUS, St. John & Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 284. [Ety. *hybos*, hump; *Cladodus*, a genus.] Teeth small, strongly cuspidate, base resembling that of a *Cladodus*, being elliptical and broadly expanded, with a more or less prominent antero-posteriorly compressed median cone, both surfaces of which are plicated and resemble the crown of a *Hybodus*; anterior face nearly straight, curved laterally, terminating below in a well defined marginal border or ridge, posterior margin broadly rounded, inferior surface excavated immediately behind the marginal border, with a beveled space extending along the posterior margin, superior face more or less convex and beveled to the posterior edge; both coronal surfaces vertically marked with plicæ. Type *H. plicatilis*.

compressus, Newberry & Worthen, 1866, (*Helodus compressus*.) Geo. Sur. Ill., vol. 2, p. 78, Burlington Gr.

intermedius, St. John & Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 287, Keokuk Gr.



FIG. 1139.—*Hybodus plicatilis*.

nitidus, St. John & Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 288, Kaskaskia Gr.

plicatilis, St. John & Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 286, Burlington Gr.

tenuicostatus, St. John & Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 286, Keokuk Gr.

JANASSA, Munster, 1839, Beitrage Petrefaktenkunde, vol. 1, and Agassiz in Poiss. Foss., t. 3, p. 375. [Ety. mythological name.] Teeth have a tabulated structure and enameled, wavy crown; small in front and larger toward the posterior part of the jaw; jaw-bone rough and granular. Type *J. angulata*.

gurlieana, Cope, 1877, (*Strigillina gurlieana*.) Proc. Am. Phil. Soc., p. 191, Permian.

linguiformis, Cope, 1877, (*Strigillina linguiformis*.) Proc. Am. Phil. Soc., p. 53, Permian.

LAMBODUS, St. John & Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 280. [Ety. *Lambda*, a Greek letter; *odous*, tooth.] Teeth small, base posteriorly produced and laterally expanded, broadest behind the cornua; a single strong, slightly sigmoidally curved, recurved, eccentric cornua arises from the anterior angle of the base, terminates in a sharp apex, compressed in front, broadly rounded behind, with more or less distinct cutting edges and vertical costæ. It is distinguished from *Cladodus* by the

single coronal cornua, and the absence of lateral denticles; the basal portion bears some resemblance to *Thrinacodus*.

Type *L. costatus*.

calceolus, St. John & Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 281, Burlington Gr. *calceolus* var. *robustus*, St. John & Worthen, 1866, Geo. Sur. Ill., vol. 6, p. 282, Keokuk Gr.

costatus, St. John & Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 280, Burlington Gr.



FIG. 1140.—*Lambodus costatus*.

hamulus, St. John & Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 283, Kaskaskia Gr.

reflexus, St. John & Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 284, Kaskaskia Gr.

transversus, St. John & Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 282, St. Louis Gr.

LECRACANTHUS, St. John & Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 475. [Ety. *lekroi*, the antlers of a stag; *akantha*, spine.] Spines long, tapering, curved, laterally compressed, stellate tubercles irregularly disposed; base thin, expanded; pulp cavity large; apex transversely expanded and armed with strong denticles. Type *L. unguiculus*.

unguiculus, St. John & Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 476, St. Louis Gr.

Leptacanthus, Agassiz, 1837, Poiss. Foss., vol. 3. [Ety. *leptos*, slender; *akantha*, spine.] *occidentalis*, see *Acondylacanthus occidentalis*.

LIODUS, St. John & Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 335. [Ety. *leios*, smooth; *odous*, tooth.] Teeth resembling *Orodus*; crown arched, laterally and vertically; basal margins constructed and sharply defined from the base; apex with obscurely defined lateral crests; convex in either face; anterior face produced beneath the median cone, and both faces occupied with faint vertical sulci, producing obscure secondary prominences; surface smooth, punctate, or verrucose; base as in *Orodus*, relatively deep. Type *L. calcaratus*.

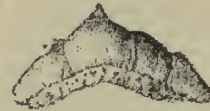


FIG. 1141.—*Liodus calcaratus*.

calcaratus, St. John & Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 336, Burlington Gr.

calcaratus var. *gros-sipunctatus*, St. John & Worthen,

1875, Geo. Sur. Ill., vol. 6, p. 337, Keokuk Gr.

LIOGNATHUS, Newberry, 1873, Ohio Pal., vol. 1, p. 306. [Ety. *lis*, smooth; *gnathos*, the jaw.] Jaw the only part yet known; spatulate, dentate only at and near the anterior extremity; resembles *Coccosteus*. Type *L. spatulatus*.

spatulatus, Newberry, 1873, Ohio Pal., vol. 1, p. 306, Up. Held. Gr.

LISGODUS, St. John & Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 363. [Ety. *lisgos*, a spade; *odous*, tooth.] Teeth laterally



FIG. 1142.—*Liograthus spatulatus*.

abbreviated strong; crown thick, sharp-crested, and sometimes obscurely serrated; basal margins well defined; base



FIG. 1145.—*Machæracanthus peracutus*.

vertical to the crown, rectangular, prolonged, equal to the elevation of the crown; inferior surface well defined from either face above; and generally slightly beveled from the concave to the opposite border; coronal surface enameled, worn crest striato-punctate. Type *L. curtus*.



FIG. 1143.—*Lisgodus curtus*.

curtus, St. John & Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 364, Burlington Gr.

selluliformis, St. John & Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 366, St.

Louis Gr. serratus, St. John & Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 365, Burlington Gr.

LISTRACANTHUS, Newberry & Worthen, 1870, Geo. Sur. Ill., vol. 4, p. 371. [Ety. *listron*, shovel; *akantha*, spine.] Spines small, gently arched, flattened, thin; sides marked by numerous sharp, longitudinal carinæ, edges set with divergent, slender, acute teeth; most numerous on the convex margin; and largest base expanded and obliquely truncated. Type *L. hystrix*.



FIG. 1144.—*Listracanthus hystrix*.

hildrethi, Newberry, 1875, Ohio Pal., vol. 2, p. 56, Coal Meas.

Lophodus, Newberry & Worthen, 1870, Geo. Sur. Ill., vol. 4. This name was preoccupied by Romanowsky in 1864.

variabilis, see *Agassizodus variabilis*.

MACILÆRACANTHUS, Newberry, 1857, Bull. Nat. Inst., p. 6, and Ohio Pal., vol. 1,

p. 302. [Ety. *machaira*, a saber; *akantha*, a spine.] Spines large, flattened, curved, ancipital, unsymmetrical; edges and point acute; base narrowed, with a rough and irregular extremity; central cavity reaching nearly to the apex; external surface enameled, smooth or punctate, and striate microscopic structure dense. Type *M. major*.

major Newberry, 1857, Bull. Nat. Inst., p. 6, and Ohio Pal., vol. 1, p. 304, Up. Held. Gr.

peracutus, Newberry, 1857, Bull. Nat. Inst., p. 6, and Ohio Pal., vol. 1, p. 305, Up. Held. Gr.

sulcatus, Newberry, 1857, Bull. Nat. Inst., p. 6, and Ohio Pal., vol. 1, p. 305, Up. Held. Gr.

MACROPETALICHTHYS, Norwood & Owen, 1846, Am. Jour. Sci., 2d ser., vol. 1, p. 367. [Ety. *makros*, large; *petalos*, expanded or spread out; *ichthys*, fish.] Cranium composed of large polygonal plates, united by double sutures; sur-



FIG. 1146.—*Macropetalichthys sullivanti*. One-fifth natural size.

face enameled, tubercled, ornamented; eye orbits conspicuous; nasal plate wedge-shaped; occipital plate oblong, emarginate behind, and prolonged anteriorly, where it meets the nasal plate. Type *M. rapheidolabis*.

manni, Newberry, (*Agassichthys manni*) 1857, Bull. Nat. Inst., p. 3, Up. Held. Gr.

rapheidolabis, Norwood & Owen, 1846, Am. Jour. Sci., 2d ser., vol. 1, p. 367, Up. Held. Gr.

sullivanti, Newberry, 1857, (*Agassichthys sullivanti*.) Bull. Nat. Inst., p. 3, and Ohio Pal., vol. 1, p. 294, Up. Held. Gr.

MARRACANTHUS, St. John & Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 465. [Ety. *marron*, a spade; *akantha*, spine.] Dorsal spine nearly straight, or with a forward curvature, obtusely terminated, rounded in front, truncated behind, or rounded into the posterior face, which is longitudinally ridged in apparent continuity with the lateral costæ; lateral face and anterior margin longitudinally ridged, the costæ being tuberculated, those in front more or less strongly

developed, with their apices directed upward, and especially in their upper part, where they gradually increase in size, forming strong, more or less deflected hooks, transversely carinated; intercostal spaces minutely ridged and striato-punctate; base moderately inserted, forming a comparatively thin plate, more or less laterally expanded posteriorly from the angular ridge in front, with more or less prominent marginal angles behind; pulp-cavity moderately large, similar in section to the body, and occupying the posterior two-thirds of the spine. In costation and the expanded base it is like *Amacanthus*, but distinguished in all other respects. Type *M. rectus*.

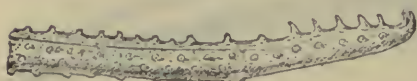


FIG. 1147.—*Marracanthus rectus*. Anterior part of spine.

rectus, Newberry & Worthen, 1866, (*Homacanthus* (?) *rectus*), *Geo. Sur. Ill.*, vol. 2, p. 115, St. Louis Gr.

MECOCERIS, Newberry, 1857, *Proc. Acad. Nat. Sci.*, vol. 8, p. 96. [Ety. *mekos*, large; *lepis*, a scale.] Heteroecercal lepidoids of small size; body fusiform; head obtuse; tail elongated; lobes unequal; fins small, provided with delicate fulcra; dorsal opposite anal, both far back on the body; crania corrugated or tuberculated; opercular maxillary and hyoid plates ornamented; scales smooth or ornamented; posterior margin serrated; scales of median line crenulated; two rows of scales extending back to near anal fin; teeth conical, short, brush-like. Distinguished from *Palæoniscus* by small size, posterior position of dorsal fin, and the high lateral scales. Type *M. corrugata*. Probably a syn. for *Palæoniscus*, but not figured, and species poorly defined.

corrugata, Newberry, 1856, *Proc. Acad. Nat. Sci.*, vol. 8, p. 96, Coal Meas.

granulata, Newberry, 1856, *Proc. Acad. Nat. Sci.*, vol. 8, p. 97, Coal Meas.

insculpta, Newberry, 1856, *Proc. Acad. Nat. Sci.*, vol. 8, p. 97, Coal Meas.

lineata, Newberry, 1856, *Proc. Acad. Nat. Sci.*, vol. 8, p. 97, Coal Meas.

ornatissima, Newberry, 1856, *Proc. Acad. Nat. Sci.*, vol. 8, p. 97, Coal Meas.

ovoidea, Newberry, 1856, *Proc. Acad. Nat. Sci.*, vol. 8, p. 97, Coal Meas.

serrata, Newberry, 1856, *Proc. Acad. Nat. Sci.*, vol. 8, p. 97, Coal Meas.

tuberculata, Newberry, 1856, *Proc. Acad. Nat. Sci.*, vol. 8, p. 96, Coal Meas.

MESODMODUS, St. John & Worthen, 1875, *Geo. Sur. Ill.*, vol. 6, p. 290. [Ety. *mesodme*, something between; *odous*, tooth.] Teeth laterally elongated; base

consisting of one inferior flattened; posterior obliquely produced, massive plate, of which the posterior face slopes downward and slightly backward, at an obtuse angle, to the posterior crown face; anterior face slightly produced along the shoulder, which extends parallel with the base of the crown, vertical or beveled, and occupied by a more or less prominent median protuberance, which extends to the edge of the inferior surfaces; both faces are more or less roughened or pitted, lateral angles truncated or rounded, and more or less constricted above, equaling the lateral diameter of the crown; crown rising along the anterior border, sharply constricted in front and laterally, and well defined, sometimes constricted from the posterior basal face, nearly equaling the base in antero-posterior diameter; but more or less compressed along the crest, which rises into a more or less prominent median or submedian cusp, vertical or laterally deflected and recurved, usually compressed, with distinct, sometimes sharp, cutting edges; the lateral portions of the crown denticulated, extremities bearing slightly more prominent cusps than intermediate spaces; both faces ridged vertically; outer face of median cone often strongly buttressed; coronal surface enameled. Type *M. exculptus*.

explanatus, St. John & Worthen, 1875, *Geo. Sur. Ill.*, vol. 6, p. 293, Waverly or Kinderhook Gr.

exculptus, St. John

& Worthen, 1875,

Geo. Sur. Ill., vol.

6, p. 291, Wa-

verly or Kinder-

hook Gr.

ornatus, St. John & Worthen, 1875, *Geo. Sur. Ill.*, vol. 6, p. 294, Burlington Gr.

MYCTEROPS, Cope, 1888, *Am. Nat.*, p. 876.

[Ety. *mukter*, nose; *ops*, eye.] Founded upon the cast of the cranial and nuchal buckler of a placoderm fish; the eye-holes resemble those of *Cephalaspis*, and they are separated by a nose-hole, which is divided by a narrow bridge. Type *M. ordinata*.

ordinata, Cope, 1888, *Am. Nat.*, p. 876, Coal Meas.

Onchus, Agassiz, 1837, *Recherches sur les Poissons Fossiles*. [Ety. *onchos*, bent, or hooked like a talon or arrow-barb.]

deweyi, see *Ceratiocaris deweyi*.

ONYCHODUS, Newberry, 1857, *Bull. Nat. Inst.*, p. 5, and *Ohio Pal.*, vol. 1, p. 296. [Ety. *onyx*, a claw; *odous*, tooth.]

Cranium composed of a great number of plates covered with an enameled and tuberculated surface; jaws set with numerous conical, acute, recurved teeth; maxillary forming a low trian-



FIG. 1148.—*Mesodmodus exculptus*.

gle; dentary bones posteriorly acute, where they are overlapped by the articular portions of the mandibles, long and narrow, curving upward to the

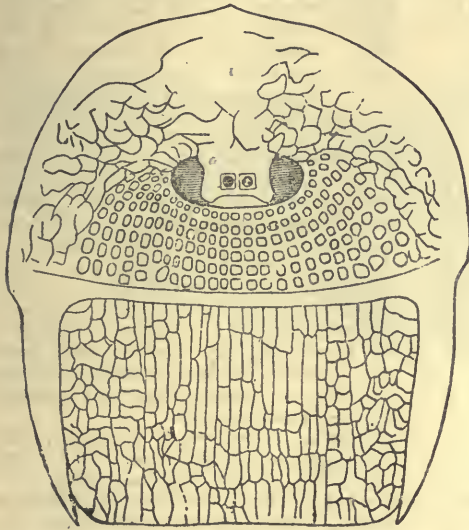


FIG. 1149.—*Mycterops ordinata*.

symphysis, where they support an inter-mandibular arch of bone, to which is attached a series of large, curved, conical teeth; body covered with imbricated circular scales. Type *O. sigmoides*.



FIG. 1150.—*Onychodus sigmoides*. One-half nat. size of inter-mandibular crest with 6 teeth.

hopkinsi, Newberry, 1857, Bull. Nat. Inst., p. 5, Chemung Gr.

sigmoides, Newberry, 1857, Bull. Nat. Inst.,

p. 5, and Ohio Pal., vol. 1, p. 299, Up. Held. Gr.



FIG. 1151.—*Onychodus sigmoides*. Fragment of the right mandible.

ORACANTHUS, Agassiz, 1843, Recherches sur les Poissons Fossiles, t. 3, p. 13. [Ety. *oraios*, beautiful; *akantha*, spine.] Dorsal rays large, conical, without solid base, hollow, walls thin, surface tuberculated; no posterior rows of denticles. Type *O. milleri*.

abbreviatus, Newberry, 1857, Bull. Nat. Inst., p. 5, Up. Held. Gr.

consimilis, St. John & Worthen, 1875, Geo. Sur. Ill., vol. 6, syn. for *O. vetustus*.

fragilis, Newberry, 1857, Bull. Nat. Inst., p. 5, Up. Held. Gr.

granulatus, Newberry, 1857, Bull. Nat. Inst., p. 5, Up. Held. Gr.

multiseriatus, Newberry, 1857, Bull. Nat. Inst., p. 5, Up. Held. Gr.

(?) *obliquus*, St. John & Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 477, Keokuk Gr.

pnigeus. This species is made the type of the genus *Pnigeacanthus*. See *P. deltoides*.

rectus, St. John & Worthen, 1883, Geo. Sur. Ill., vol. 7, p. 257, Kaskaskia Gr.

vetustus, Leidy, 1856, Jour. Acad. Nat. Sci. Phil., 2d ser., vol. 3, p. 162, St. Louis Gr.

ORODUS, Agassiz, 1843, Recherches sur les Poissons Fossiles, t. 3, p. 97. [Ety. *oraios*, beautiful; *odous*, tooth.] Teeth laterally elongated, middle more elevated than extremities, forming an obtuse transverse cone; longitudinal diameter greatest and marked by a medial ridge with oblique secondary ridges. Type *O. cinctus*.

alleni, St. John & Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 310, Coal Meas.

carinatus, St. John & Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 307, Keokuk Gr.

corrugatus, see *Agassizodus corrugatus*.

daedaleus, St. John & Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 301, Waverly or Kinderhook Gr.

decussatus, St. John & Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 300, Waverly or Kinderhook Gr.

elegantulus, Newberry & Worthen, 1866, Geo. Sur. Ill., vol. 2, p. 64, Burlington Gr.

fastigiatus, St. John & Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 306, Burlington Gr.

major, St. John & Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 302, Burlington Gr.

mammillaris, Newberry & Worthen, 1866, Geo. Sur. Ill., vol. 2, p. 66, Keokuk Gr.

minusculus, see *Desmiodus minusculus*.

minusculus, see *Desmiodus minusculus*.

minutus, Newberry & Worthen, 1866, Geo. Sur. Ill., vol. 2, p. 68, Keokuk Gr.

multicarinatus, Newberry & Worthen, 1866, Geo. Sur. Ill., vol. 2, p. 62, Waverly or Kinderhook Gr.

neglectus, St. John & Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 308, St. Louis Gr.

ornatus, Newberry & Worthen, 1866, Geo. Sur. Ill., vol. 2, p. 65, Keokuk Gr.

parallelus, St. John & Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 295, Waverly or Kinderhook Gr.

parvulus, St. John & Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 309, St. Louis Gr.

plicatus, Newberry & Worthen, 1866, Geo. Sur. Ill., vol. 2, p. 63, St. Louis Gr.

tuberculatus, Newberry & Worthen, 1866, Geo. Sur. Ill., vol. 2, p. 66, Burlington Gr.



FIG. 1152.—*Orodus mammillaris*.

turgidus, St. John & Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 310, Kaskaskia Gr.



FIG. 1153.—*Orodus variabilis*.

whitii, St. John & Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 297, Waverly or Kinderhook Gr.

ORTHACANTHUS, Agassiz, 1843, Poiss. Foss., t. 3, p. 330, [Ety. *orthos*, straight; *akantha*, spine.] Spines straight or gently curved; two or more rows of denticles on the posterior face. Type *O. cylindricus*.



FIG. 1154.—*Orthacanthus gracilis*.

arcuatus, Newberry, 1857, (*Pleuracanthus arcuatus*), Proc. Acad. Nat. Sci. Phil., p. —, and Ohio Pal., vol. 1, p. 332, Coal Meas.

gracilis, Newberry, 1875, Ohio Pal., vol. 2, p. 56, Coal Meas.

quadriseriatus, Cope, 1877, Pal. Bull. No. 26, in Proc. Am. Phil. Soc., vol. 17, p. 192, Permian.

ORTHOPLERODUS, St. John & Worthen, 1883, Geo. Sur. Ill., vol. 7, p. 190. [Ety. *orthos*, straight; *pleuron*, side; *odous*, tooth; in allusion to the straight postero-lateral border of the maxillary posterior tooth.] Posterior teeth of upper jaw subspatulate in outline; postero-lateral border straight, or nearly so, and probably gently curved downward and inward at the outer extremity, and gently arched in the same direction, terminating posteriorly in an acute angle or spur, whence the inner margin, which is greatly thickened or massive, is broadly rounded into and merges with the thin antero-lateral border toward the extremity; coronal surface occupied by a prominent principal fold or ridge rising nearest the straight border, and flanked on the anterior slope by an obscure secondary ridge; the punctate enamel forms a narrow fold along the thickened straight border; teeth supposed to have occupied a similar position on the mandibles, distinguished by their trigonal outline, somewhat strong and spiral inrollment of the extremity, toward which the antero and postero-lateral borders regularly converge, inner margin more or less obliquely rounded, and sigmoidally curved from front toward the posterior angle; coronal surface pre-

senting a more or less well-defined plane; anterior fold, abruptly broken down on that side, where the coronal enamel forms a wide belt sharply defined from the deep basal rim, and limited behind by the more or less deep longitudinal depression from which rises the alate posterior lobe, which is limited exteriorly by a narrow fold of enamel separating the crown from the basal portion of the tooth; mandibular median or second teeth characterized by their triangular outline, rather strong inrollment of the outer extremity; straight postero-lateral border, which is similarly enameled to the antero-lateral border of last above described posterior dental plates; antero-lateral border rapidly and irregularly converging from the subacute angle of the broad, slightly arched inner margin; coronal surface forming a broad, low arch, or nearly plane transversely. Type *O. carbonarius*.

carbonarius, Newberry & Worthen, 1866, (*Sandalodus carbonarius*), Geo. Sur. Ill., vol. 2, p. 104, Up. Coal Meas.

convexus, St. John & Worthen, 1883, Geo. Sur. Ill., vol. 7, p. 193, Coal Meas.

novomexicanus, St. John & Worthen, 1883, Geo. Sur. Ill., vol. 7, p. 195, Sub-carboniferous.

PALÆASPIS, Claypole, 1885, Quar. Jour. Geo. Soc. Lond. [Ety. *palaios*, ancient; *aspis*, shield.] Plates or scutes ornamented. Only single dorsal plates discovered. Type *P. americana*.

americana, Claypole, 1885, Quar. Jour. Geo. Soc. Lond., Up. Silurian or Low. Devonian.

truncata, Claypole, 1885, Quar. Jour. Geo. Soc. Lond., Up. Silurian or Low. Devonian.

PALÆOBATIS, Leidy, 1856, Trans. Am. Phil. Soc., vol. 11, p. 87. [Ety. *palaios*, ancient; *batis*, a prickly kind of roach or ray.] Type *P. insignis*.

insignis, Leidy, 1856, Trans. Am. Phil. Soc., vol. 11, p. 87, Keokuk Gr.

PALÆONISCUS, Agassiz, 1833, Recherches sur les Poissons Fossiles, t. 1, p. 4. [Ety. *palaios*, ancient; *oniscus*, a wood-louse.] Small, fusiform, deep between ventral and pectoral fins; tail heterocercal, forked, upper lobe longer and narrower than lower; fins small; jaws large; teeth minute; scales rhomboidal, smooth or striated. Type *P. fultus*.

alberti, see *Rhadinichthys alberti*.

brainerdi, Thomas, 1853, Bost Soc. Nat. Hist., vol. 4, Ohio Pal., vol. 1, p. 346, Berea grit.

browni, Jackson, 1851, Rep. on Albert Coal Mine, Coal Meas.

cairnesi, see *Rhadinichthys cairnesi*.

gracilis, Newberry & Worthen, 1870, Geo. Sur. Ill., vol. 4, p. 347, Coal Meas.

jacksoni, Dawson, 1877, Can. Nat. Quar. Jour. Sci., vol. 8, Carboniferous.

leidyanus, Lea, 1853, Jour. Acad. Nat. Sci., 2d ser., vol. 2, Coal Meas.
modulus, see *Rhadinichthys modulus*.
peltigerus, Newberry, 1857, (*Elonichthys peltigerus*.) Proc. Acad. Nat. Sci., vol. 8, p. 98, and Ohio Pal., vol. 1, p. 345, Coal Meas.

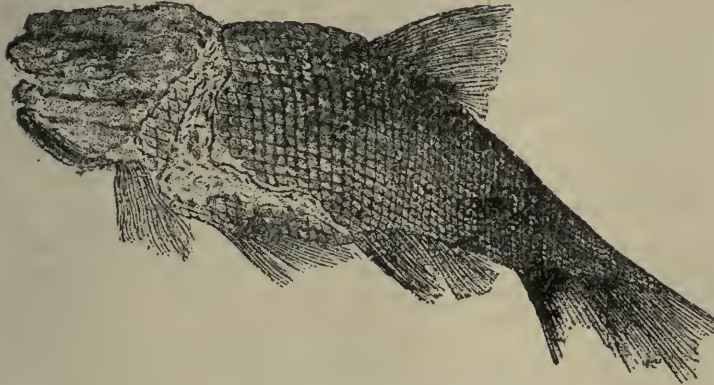


FIG. 1155.—*Palæoniscus peltigerus*.

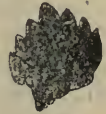
scutigera, Newberry, 1857, Proc. Acad. Nat. Sci. Phil., Coal Meas.
PETALODUS, Newberry & Worthen, 1870, Geo. Sur. Ill., vol. 4, p. 362. [Ety. *petle*, a half-moon shield; *odous*, tooth.] Teeth small and low, round oval or elliptical in outline, arched above in both directions, concave or flattened below; crown surface most strongly arched from front to rear, highest near the anterior margin; more or less evenly punctate throughout; under surface bony and rough; margins thin and irregular where the teeth are separated, thickened and even along the lines of contact when closely set. They are less flat, smooth and pavement-like than *Psammodus*, and less convoluted than *Cochliodus*. Type *P. unguiformis*.
plicomphalus, St. John & Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 411, Kaskaskia Gr.
quadratus, St. John & Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 410, St. Louis Gr.
transversus, St. John & Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 412, Coal Meas.
unguiformis, Newberry & Worthen, 1870, Geo. Sur. Ill., vol. 4, p. 363, Coal Meas.
PEPLORHINA, Cope, 1873, Proc. Acad. Nat. Sci. Phil., p. 343. [Ety. *peplos*, a robe; *Rhine*, a kind of dog-fish.] Type *P. anthracina*.
anthracina, Cope, 1873, Proc. Acad. Nat. Sci. Phil., p. 343, Coal Meas.
arctata, Cope, 1877, Proc. Am. Phil. Soc., p. 55, Permian Gr.
PERIPLECTRODUS, St. John & Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 324. [Ety. *peri*, near by; *Plectrodus*, a genus.] Base expanded laterally or compressed; symmetrically inrolled from within outward, inferior surface excavated; crown

consisting of transverse, strong, median cusps, flanked by denticles; one on either side, and then regularly increase in size from the outer to the inner extremity or with age; coronal cusps enameled, smooth or vertically striated. Type *P. warreni*.

compressus, St. John & Worthen, 1875, Geo. Sur. Ill. vol. 6, p. 326, St. Louis Gr.
expansus, St. John & Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 327, Kaskaskia Gr.
warreni, St. John & Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 325, Burlington Gr.

PERIPRISTIS, Agassiz, 1870, Proc.

Am. Phil. Soc., vol. 11, p. 434. [Ety. *peri*, around; *pristis*, saw.] Small, crown compressed, acuminate, serrate, curved laterally; coronal cavity; root as in *Petalodus*, crown and coronal cavity covered with ganoine. Type *P. semicircularis*.



semicircularis, Newberry & Worthen, 1866, (*Ctenoprychius semicircularis*.) Geo. Sur. Ill., vol. 2, p. 72, Coal Meas.

FIG. 1156.—*Peripristis semicircularis*.

PETALODUS, Owen 1840, Odontography, p. 60. [Ety. *petalos*, spread out; *odous*, tooth.] Teeth transversely elongated, compressed, thin, petal-shaped, cutting edge serrated; base of crown with imbricating folds of enamel, descending lower on the posterior than anterior face; root large, oblong, truncated below; lower edge obtuse, tumid. Type *P. hastingsi*.



FIG. 1157.—*Petalodus alleghaniensis*.

alleghaniensis, Leidy, 1856, Jour. Acad. Nat. Sci., 2d series, vol. 3, p. 161, and Geo. Sur. Ill., vol. 2, p. 35, Coal Meas.
curtus, Newberry & Worthen, 1866, Geo. Sur. Ill., vol. 6, p. 355, Keokuk Gr.
destructor, Newberry & Worthen, 1866, syn. for *P. alleghaniensis*.

hybridus, St. John & Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 394, St. Louis Gr.

linguifer, Newberry & Worthen, 1856, Geo. Sur. Ill., vol. 2, p. 37, Kaskaskia Gr. proximus, St. John & Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 395, Coal Meas.

PETALORHYNCHUS, Agassiz, 1855, in British Pal. Rocks. [Ety. *petalos*, spread out; *rhynchos*, a beak.] Teeth small, crown compressed, thin, concavo-convex, petal-shaped; higher and narrower than Petalodus; imbricating folds on posterior face forming a short transverse band, not extending to the lateral angles of the crown; root long, undivided. Type *P. sagittatum*.

distortum, St. John & Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 406, St. Louis Gr.

pseudosagittatum, St. John & Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 405, St. Louis Gr.

spatulatum, St. John & Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 408, St. Louis Gr.

striatum, Newberry & Worthen, 1866, Geo. Sur. Ill., vol. 2, p. 40, Burlington Gr.

PETRODUS, McCoy, 1848, Ann. and Mag. Nat. Hist., 2d series, vol. 2, p. 132. [Ety. *petros*, a rock; *odus*, a tooth.] Conical; base round or subtrigonal; apex rudely pointed; sides radiatingly ridged; osseous base wider than the crown. Type *P. patelliformis*.

acutus, Newberry & Worthen, 1866, Geo. Sur. Ill., vol. 2, p. 72, Coal Meas.

occidentalis, Newberry & Worthen, 1866, Geo. Sur. Ill., vol. 2, p. 70, Coal Meas.

pustulosus, Newberry & Worthen, 1870, Geo. Sur. Ill., vol. 4, p. 369, Burlington Gr.

PHANEROPLEURON, Huxley, 1871, 10th Decade Geo. Sur. of Gt. Britain. [Ety. *phaneros*, open; *pleuron*, side.]

curtum, Whiteaves, 1881, Am. Jour. Sci. and Arts, 3d ser., vol. 21, p. 495, Upper Devonian.

PHŒBODUS, St. John & Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 251. [Ety. mythological name; *odus*, a tooth.] Teeth small; base irregularly elliptical, strongly produced in front and faintly excavated at the median line; the antero-inferior angles approximate, and laterally curve to the rounded extremities; broadly though irregularly rounded behind; the angles in front are occupied by a strong, lateral, pad-like prominence, which is more or less distinctly bilobed and beveled to the deeply excavated inferior surface; posterior margin slightly beveled; postero-superior surface moderately convex, and surmounted by a laterally elongated, well-defined prominence, which is situated nearly midway between the base of the crown and the posterior border, to which the surface abruptly slopes, and extending

laterally nearly half the diameter of the base; the coronal region consists of three strong cusps, of which the exterior pair are largest, strongly diverging and moderately recurved or nearly vertical, antero-posteriorly compressed or suboval in section, apparently without distinct cutting edges; median cone similar in shape, erect, more or less produced in front and continued to the shallow median depression in the border; a rudimentary denticle between the median and lateral cusps. Type *P. sophia*.



FIG. 1158.—Phœbodus sophia.

sophia, St. John & Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 251, Devonian.

PHYSONEMUS, Agassiz, 1843, Recherches sur les Poissons Fossiles, t. 3, p. 176. [Ety. *physa*, bladder; *nema*, thread.] Dorsal spine strong, laterally compressed, deeply imbedded, curved; apex directed toward the front; lateral faces bearing costæ and tubercles; pulp cavity large; base notched. Type *P. subteres*.

altonensis, St. John & Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 454, St. Louis Gr.

carinatus, St. John & Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 452, Waverly or Kinderhook Gr.

chesterensis, St. John & Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 455, Kaskaskia Gr.

depressus, St. John & Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 452, Waverly or Kinderhook Gr.

falcatus, St. John & Worthen, 1883, Geo. Sur. Ill., vol. 7, p. 252, St. Louis Gr.

gigas, Newberry & Worthen, 1870, Geo. Sur. Ill., vol. 4, p. 373, Burlington Gr.

parvulus, St. John & Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 453, Keokuk Gr.

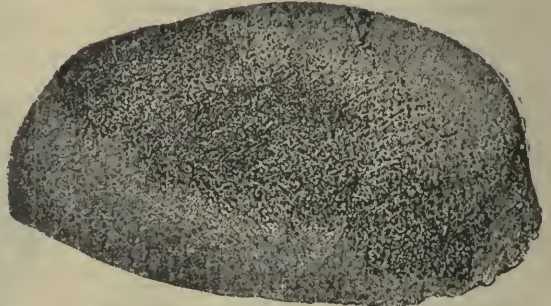


FIG. 1159.—Platydodus lineatus. Crown surface.

proclivis, St. John & Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 451, Waverly or Kinderhook Gr.

PLATYDODUS, Newberry, 1875, Ohio Pal., vol. 2, p. 58. [Ety. *platys*, broad; *odus*, tooth.] Teeth elliptical in outline; crown arched in both directions; sur-

face punctate in undulate lines, but without folds or ridges. Type *P. lineatus*.

lineatus, Newberry, 1875, Ohio Pal., vol. 2, p. 58, Waverly Gr.

PLATYSOMUS, Agassiz, 1833, Recherches sur les Poissons Fossiles, t. 1, p. 6. [Ety. *platys*, broad; *sóma*, body.] Rhomboidal, compressed; dorsal and anal fins nearly equal, opposite; pectorals small; ventrals small; teeth clavate; crown dilated, flattened; base slender, constricted at the base of the ganoiné; scales large, oblong, articular internal ridge at anterior edge; beveled spine at the upper corner received in a notch of the adjoining scale. Type *P. striatus*.

circularis, Newberry & Worthen, 1870, Geo. Sur. Ill., vol. 4, p. 347, Coal Meas.

Pleuracanthus, Agassiz, 1843, Poiss. Foss., vol. 3, p. 66. [Ety. *pleura*, side; *akantha*, spine.] The genus was founded upon a spine supposed to belong to the Order Raiina. It is serrated on one edge, curved at the base, and furrowed on the inferior side. The species named in this genus from America are too poorly defined to warrant recognition. Type *P. lævissimus*.

arcuatus, see *Orthacanthus arcuatus*.

biserialis, Newberry, 1857, Proc. Acad. Nat. Sci., vol. 8, p. 100, Coal Meas.

dilatatus, Newberry, 1857, Proc. Acad. Nat. Sci., vol. 8, p. 100, Coal Meas.

PNIGECANTHUS, St. John & Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 480. [Ety. from the specific name in *Oracanthus pnigeus*; *akantha*, spine.] Spine short, conical, laterally compressed; base broadly expanded before and behind, without insertion, rapidly tapering to the obtuse apex, which is directed posteriorly; transverse section elliptical, rounded into the slightly sigmoidally curved anterior border and concave posterior margin; pulp cavity very large, extending nearly to the tip; lateral walls very thin, slightly thickened in the margins; external surface occupied by irregularly disposed, radiatingly sculptured tubercles, sometimes arranged in obscure or interrupted longitudinal and diagonal order. The type is *Oracanthus pnigeus*, of Newberry & Worthen, which St. John named *Pnigecanthus deltoides*.

deltoides, St. John & Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 480, Keokuk Gr. But why should this species not be *Pnigecanthus pnigeus*?

trigonalis, St. John & Worthen, 1883, Geo. Sur. Ill., vol. 7, p. 259, St. Louis Gr.

PŒCILODUS, Agassiz, 1843, Recherches Poiss. Foss., vol. 3, p. 174. [Ety. *poikilos*, variegated; *odous*, tooth.] Teeth as in *Cochliodus*; terminal tooth obliquely trigonal, convoluted; median tooth nar-

row, convoluted; all teeth wrinkled at right angles to the articular edges; surface porous. Type *P. jonesi*.

carbonarius, St. John & Worthen, 1883, Geo. Sur. Ill., vol. 7, p. 139, Coal Meas.

cestriensis, St. John & Worthen, 1883, Geo. Sur. Ill., vol. 7, p. 135, Kaskaskia Gr.

ornatus, Newberry & Worthen, 1866, Geo. Sur. Ill., vol. 2, p. 95, syn. for *Chitonodus rugosus*.

rugosus, see *Chitonodus rugosus*.

springeri, St. John & Worthen, 1883, Geo. Sur. Ill., vol. 7, p. 138, Subcarboniferous.

stludovici, St. John & Worthen, 1883, Geo. Sur. Ill., vol. 7, p. 132, St. Louis Gr.

varsoviensis, St. John & Worthen, 1883, Geo. Sur. Ill., vol. 7, p. 131, Warsaw Gr.

wortheni, St. John, 1883, Geo. Sur. Ill., vol. 7, p. 136, Kaskaskia Gr.

POLYRHIZODUS, McCoy, 1848, Ann. and Mag. Nat. Hist., 2d series, vol. 2, p. 125.

[Ety. *polys*, many; *rhiza*, root; *odous*, tooth.] Crown like *Petalodus*, but more elongated, transversely lower and thicker; root divided into numerous short, robust radicles. Type *P. magnus*.

amplus, St. John & Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 387, St. Louis Gr.

carbonarius, St. John & Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 389, Coal Meas.

dentatus, Newberry & Worthen, 1866, Geo. Sur. Ill., vol. 2, p. 50, Kaskaskia Gr.

littoni, Newberry & Worthen, 1870, Geo. Sur. Ill., vol. 4, p. 357, St. Louis Gr.

modestus, Newberry, 1875, Ohio Pal., vol. 2, p. 50, Cleveland shale.

nanus, St. John & Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 386, Keokuk Gr.

piasensis, St. John & Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 386, Warsaw Gr.

ponticulus, Newberry & Worthen, 1866, Geo. Sur. Ill., vol. 2, p. 51, Kaskaskia Gr.

porosus, Newberry & Worthen, 1866, Geo. Sur. Ill., vol. 2, p. 49, Burlington Gr.

truncatus, Newberry & Worthen, 1870, Geo. Sur. Ill., vol. 4, p. 357, Burlington Gr.

williamsi, St. John & Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 384, Keokuk Gr.

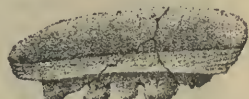


FIG. 1160.—Polyrrhizodus littoni. Concave face.



FIG. 1161.—Polyrrhizodus modestus.

PRISTICLADODUS, McCoy, 1855, British Pal. Rocks, p. 642. [Ety. from the two genera *Pristis* and *Cladodus*.] Teeth resemble *Cladodus*;

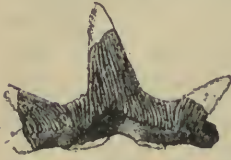


FIG. 1162.—*Pristicladodus springeri*.

1875, *Geo. Sur. Ill.*, vol. 6, p. 255, Waverly or Kinderhook Gr.

PRISTODUS, Agassiz. [Ety. *pristis*, a saw; *odous*, a tooth.] This genus has been only doubtfully identified in America.

(?) *acuminatus*, St. John & Worthen, 1875, *Geo. Sur. Ill.*, vol. 6, p. 402, Waverly or Kinderhook Gr.

PSAMMODUS, Agassiz, 1843, *Recherches sur les Poissons Fossiles*, t. 3, p. 112. [Ety. *psammos*, sand; *odous*, tooth.] Teeth quadrilateral or trapezoidal in general outline, variable, usually thick and massive; the coronal region presents a more or less plane surface, according to the position the form occupied upon the jaws, always arched, generally moderately in the longitudinal direction or from behind forward, transversely concave (maxillary teeth), or more or less convex (mandibular teeth), sometimes raised into a low ridge along the exterior lateral border, also along the articular inner border, or showing a more or less wide convexity in the latter region, and sometimes presenting a more or less well-defined transverse prominence in mature maxillary form; the marginal limits of the crown are well defined, rounded along the exterior of lateral border, and usually in-beveled, and almost always making an angulation at the articular inner border and along the anterior and posterior margins, the enamel extending well down, and more or less distinctly defined from the coarse, vermicularly pitted base which constitutes the greater part of the height of the tooth; in front and behind, the basal wall is nearly exactly vertical to the plane of the coronal surface, and moderately channelled or concave; the inner articular face is also vertical and slightly excavated, presenting generally at one or the other extremity an obliquely truncated articular facet for co-adaptation with the contiguous tooth of the opposite series, the extent and obliquity of the truncation varying greatly according to the species; the exterior lateral border, in typical forms, shows an expansion of the basal portion beyond the coronal limits, increasing in breadth and terminating in a more or

less produced spur at the postero-outer angle of the tooth; the coronal surface exhibits under an ordinary lens a distinct, vertical, prismatic structure, each of the vertical columns inclosing a medullary tube, the appearance of which at the surface produces the exceedingly minute punctation usually observed in these teeth; the exceedingly elegant vermiculose rugosity exhibited in the less worn surfaces of certain species is produced by the wrinkling of the enamel or external layer, and which apparently has no other relation to the medullary tubes than to rudely define them in irregular and transverse or longitudinal rows,

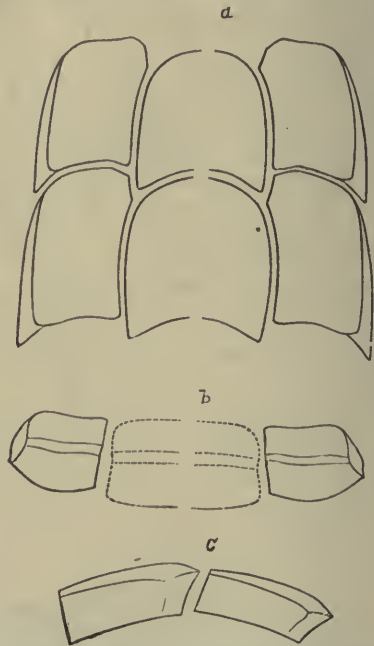


FIG. 1163.—*Psammodus crassidens*. a, Median dental plates; b, transverse profile; c, longitudinal profile.

the punctæ rarely confluent, and the rugose appearance becoming obsolete or more or less obscured over the more exposed parts of the triturating surface; the impression also prevails that the tendency to rugosity of the coronal surface increases with age, since this appearance, so far as observed, seems to be most prevalent and conspicuous in large individuals belonging to the series which have received several accessions, the innermost individuals of which have suffered little from the abrading effects of trituration while in use; but it is not an essential character, as some species evidently always remained quite smooth in their coronal areas; the

inferior surface is plane, in a general way conforming to that of the crown, and even possessing distinctive characteristics as applied to species; it shows in the perfect state a rather dense, thin layer, perhaps in degree rather than structurally differing from the more cellulose middle layer composing the bulk of the base, and usually marked by more or less distinct longitudinal grooves, or smooth and faintly keeled nearest the inner articular border.

Type *P. porosus*.

angularis, Newberry & Worthen, 1866, *Geo. Sur. Ill.*, vol. 2, p. 107, Kaskaskia Gr.

antiquus, Newberry, 1857, *Bull. Nat. Inst., Up. Held. Gr.*

bretonensis, Whiteaves, 1881, *Can. Nat.*, vol. 10, Carboniferous.



FIG. 1164.—*Psammodus porosus*.

cælatus, St. John & Worthen, 1883, *Geo. Sur. Ill.*, vol. 7, p. 217, St. Louis Gr.

crassidens, St. John & Worthen, 1883, *Geo. Sur. Ill.*, vol. 7, p. 218, St. Louis Gr.

glyptus, St. John & Worthen, 1883, *Geo. Sur. Ill.*, vol. 7, p. 209, Up. Burlington Gr.

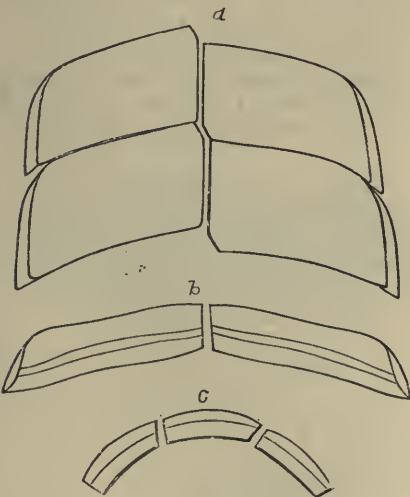


FIG. 1165.—Diagram of *Psammodus springeri*. a, Mandibular series; b, transverse profile; c, longitudinal profile.

grandis, St. John & Worthen, 1883, *Geo. Sur. Ill.*, vol. 7, p. 211, Keokuk Gr.

lovianus, St. John & Worthen, 1883, *Geo. Sur. Ill.*, vol. 7, p. 207, Burlington Gr.

plenus, St. John & Worthen, 1883, *Geo. Sur. Ill.*, vol. 7, p. 213, St. Louis Gr.

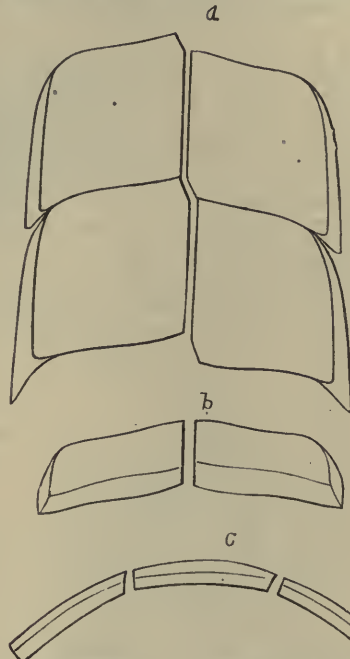


FIG. 1166.—Diagram of *Psammodus springeri*. a, Maxillary series; b, transverse profile; c, longitudinal profile.

porosus, Agassiz, 1843, *Recherch. Poiss. Foss.*, t. 3, p. 112, Kaskaskia Gr.



FIG. 1167.—Hypothetical diagram, showing median dental plates of *Psammodus springeri*.

reticulatus, Newberry & Worthen, 1866, *Geo. Sur. Ill.*, vol. 2, p. 109, Kaskaskia Gr.

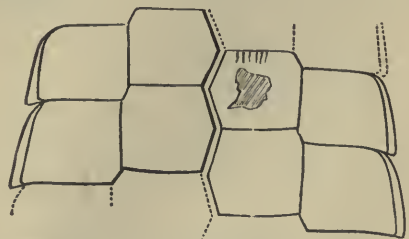


FIG. 1168.—Hypothetical diagram of *Psammodus turgidus*.

rhomboides, Newberry & Worthen, 1866, *Geo. Sur. Ill.*, vol. 2, p. 110, syn. for *Sandalodus lævissimus*.

- semicylindricus*, Newberry & Worthen, 1866, Geo. Sur. Ill., vol. 2, p. 109, syn. for *Sandalodus levissimus*.
- springeri*, St. John & Worthen, 1883, Geo. Sur. Ill., vol. 7, p. 202, Upper Burlington Gr.
- tumidus*, St. John & Worthen, 1883, Geo. Sur. Ill., vol. 7, p. 205, Up. Burlington Gr.
- turgidus*, St. John & Worthen, 1883, Geo. Sur. Ill., vol. 7, p. 206, Keokuk Gr.
- PSEPHODUS**, Agassiz, 1862, Quar. Jour. Geo. Soc., vol. 18, p. 102. [Ety. *psephos*, a pebble; *odous*, a tooth.] Heavy, more or less spirally inrolled triturating or crushing plates invest the median range of the rami of the jaws; they are trapezoidal in outline, with undulated articular surfaces. Type *P. magnus*.
- convolutus*, Newberry & Worthen, 1866, (*Aspidodus convolutus*.) Geo. Sur. Ill., vol. 2, p. 94, Kaskaskia Gr.
- crenulatus*, Newberry & Worthen, 1866, (*Aspidodus crenulatus*.) Geo. Sur. Ill., vol. 2, p. 93, Kaskaskia Gr.
- conulatus*, see *P. lunulatus*.
- latus*, St. John & Worthen, 1883, Geo. Sur. Ill., vol. 7, p. 72, St. Louis Gr.
- lunulatus*, St. John & Worthen, 1883, Geo. Sur. Ill., vol. 7, p. 74, (misprinted *conulatus*.) Kaskaskia Gr.
- obliquus*, St. John & Worthen, 1883, Geo. Sur. Ill., vol. 7, p. 66, Waverly or Kinderhook Gr.
- placenta*, Newberry & Worthen, 1866, (*Helodus placenta*.) Geo. Sur. Ill., vol. 2, p. 80, Waverly or Kinderhook Gr.
- reticulatus*, St. John & Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 417, Waverly or Kinderhook Gr.
- symmetricus*, St. John & Worthen, 1883, Geo. Sur. Ill., vol. 7, p. 71, Waverly or Kinderhook Gr.
- PTERICHTHYS**, Agassiz, 1835, Recherches sur les Poissons Fossiles, t. 1, p. 302. [Ety. *pteron*, fin; *ichthys*, fish.] The outline of this genus reminded Hugh Miller of the figure of a man rudely drawn in black on a gray ground, the head cut off at the shoulders, the arms spread at full as in the attitude of swimming, the body rather long than otherwise, and narrowing from the chest downward, one of the legs cut away at the hip-joint, and the other as if to preserve the balance, placed directly under the center of the figure, which it seems to support. The under part of the body was flat, the upper rose toward the center into a roof-like ridge, and both under and upper were covered with a strong armor of plates; the plates on the under side are divided by a longitudinal suture and a transverse suture, and they would cut at right angles were it not for a lozenge-shaped plate in the center; there are therefore five plates on the under side, all of which are

thickly tuberculated; the upper side is covered with a large, long, hexagonal plate in the central part, that is surrounded by a row of unequal and variously formed plates, all of which are strongly tuberculated; the cephalic shield is rounded in front, and truncated behind where it joins the body carapace, having a transverse median opening; nuchal region occupied by a plate somewhat like the lateral view of a



FIG. 1169.—*Pterichthys milleri*.

- coronet or crown; one post-median plate, another in front, one lateral occipital on each side, two lateral and one postero-lateral on each side, and an angular plate on each postero-lateral side articulating with the limb; the oblong carapace is covered by the large, hexagonal antero-median plate, and a smaller posterior median dorsal, and two dorso-lateral plates on each side; tail thick, conical, covered with rhomboidal scales; surface covered with granules. Type *P. milleri*.
- canadensis*, see *Bothriolepis canadensis*.
- norwoodensis*, Owen, syn. for *Macropetalichthys rapheidolabis*.
- rugosus*, Clappole, 1883, Proc. Am. Phil. Soc., p. 664, Upper Chemung Gr.
- PTYCNOBUS**, Pander Über die Ctenodipteren des Devonischens Systems, p. 48. [Ety. *ptyktos*, folded; *odous*, tooth.] Elongated; base expanded, subconical; crown flattened or furrowed; enameled; tubes in transverse furrows, with low intervening ridges. Type *P. obliquus*.
- calceolus*, Newberry & Worthen, 1866, (*Rinodus calceolus*.) Geo. Sur. Ill., vol. 2, p. 106, Ham. Gr.
- PTYONODUS**, Cope, 1877, Proc. Am. Phil. Soc., p. 192. [Ety. *ptyon*, a fan; *odous*, a tooth.]
- paucicristatus*, Cope, 1877, Proc. Am. Phil. Soc., p. 54, Permian.
- vinslovi*, Cope, 1877, Proc. Acad. Nat. Sci. Phil., p. 410, Permian.

Pygopterus, Agassiz, 1833, Poiss. Foss., t. 1, p. 10. [Ety. *pyge*, rump; *pteron*, fin.] Body large, elongate, ovate; fins large,



FIG. 1170.—*Ptyctodus caeleolus*. Side view.

with sulcal scales; anal fin long, nearly opposite dorsal; ventrals small; pectorals small, falcate; caudal large, notched; upper jaw longer than the lower; endoskeleton strong; scales small, rhomboidal. Type *P. humboldti*. Not definitely known from America.

scutellatus, Newberry, 1857, Proc. Acad. Nat. Sci., vol. 8, p. 98, Coal Meas. Too poorly defined to warrant recognition.

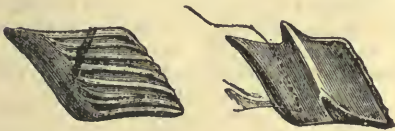


FIG. 1171.—*Pygopterus mandibularis*. Outside and under surface of scale magnified.

RHADINICHTHYS, Traquair, 1877, Quar. Jour. Geo. Soc. Lond., vol. 33, p. 548. [Ety. *rhadinios*, slender; *ichthys*, fish.] Body slender; jaws with a row of incurved lanianaries, outside of which there are smaller teeth; principal rays of pectoral fin as in *Pygopterus*; dorsal far back, nearly opposite the anal. Type *R. ornatissimus*.



FIG. 1172.—*Rhadinichthys alberti*.

alberti, Jackson, 1851, (*Palæoniscus alberti*), Rep. on the Albert Coal-mine, New Brunswick, Coal Meas.

cairnsi, Jackson, 1851, (*Palæoniscus cairnsi*), Rep. on Albert Coal-mine, New Brunswick, Coal Meas.

modulus, Dawson, 1877, (*Palæoniscus modulus*), Can. Nat. and Quar. Jour. Sci., vol. 8, Carboniferous.

RHIZODUS, Owen, 1840, Odontography. [Ety. *rhiza*, a root; *odous*, tooth.] Jaws massive, bearing large, compressed, double-edged teeth, with sulcated bases

in each dental bone, and numerous smaller ones; scales large, rotundato-quadrate, thin, inner surface concentrically lined; outer surface tuberculate. Type *R. hibernerti*.

angustus, Newberry, 1857, Proc. Acad. Nat. Sci. Phil., vol. 8, p. 99, Coal Meas. Poorly defined.

hardingi, Dawson, 1868, Acad. Geol., p. 254, Subcarboniferous.

incurvus, Newberry, 1857, Proc. Acad. Nat. Sci., vol. 8, p. 99, Coal Meas. Poorly defined.



FIG. 1173.—*Rhizodus occidentalis*. Scale.

lancifer, Newberry, 1857, Proc. Acad. Nat. Sci. Phil., vol. 8, p. 99, and Ohio Pal., vol. 1, p. 342, Coal Meas.

occidentalis, Newberry & Worthen, 1866, Geo. Sur. Ill., vol. 2, p. 19, Coal Meas.

quadratus, Newberry, 1873, Ohio Pal., vol. 1, p. 343, Coal Meas.

reticulatus, Newberry & Worthen, 1870, Geo. Sur. Ill., vol. 4, p. 349, Coal Meas.

RHYNCHODUS, Newberry, 1873, Ohio Pal., vol. 1, p. 307.

[Ety. *rhynchos*, beak; *odous*, tooth.] Teeth somewhat half-circular, compressed, exterior margins curved; one cornua produced, the

other obtuse; straight side the trituration or cutting edge. Type *R. secans*.

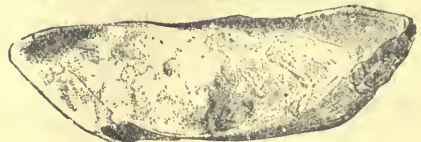


FIG. 1174.—*Rhynchodus frangens*.

crassus, Newberry, 1873, Ohio Pal., vol. 1, p. 312, Up. Held. Gr.

- excavatus, Newberry, 1877, Geo. of Wis., vol. 2, p. 397, Ham. Gr.
- frangens, Newberry, 1873, Ohio Pal., vol. 1, p. 311, Up. Held. Gr.
- secans, Newberry, 1873, Ohio Pal., vol. 1, p. 310, Up. Held. Gr.
- Rinodus, Newberry & Worthen, 1866, syn. for Ptyctodus.
- calceolus, see Ptyctodus calceolus.
- SANDALODUS, Newberry & Worthen, 1866, Geo. Sur. Ill., vol. 2, p. 102. [Ety. *sandalon*, a sandal; *odous*, tooth.] Teeth thick, strong, subtriangular or club-shaped, with one or two pointed extremities; twisted and arched; base concave, surface punctate. Type *S. parvulus*.
- angustus, Newberry & Worthen, 1866, Geo. Sur. Ill., vol. 2, p. 103, Keokuk Gr.
- carbonarius, see Orthopleurodus carbonarius.
- complanatus, Newberry & Worthen, 1866, (Deltodus complanatus,) Geo. Sur. Ill., vol. 2, p. 98, Upper Burlington Gr.
- crassus, Newberry & Worthen, 1870, Geo. Sur. Ill., vol. 4, p. 369, syn. for *S. spatulatus*.
- grandis, Newberry & Worthen, 1866, Geo. Sur. Ill., vol. 2, p. 105, syn. for *S. lævisimus*.
- lævisimus, Newberry & Worthen, 1866, Geo. Sur. Ill., vol. 2, p. 104, Keokuk Gr.
- minor, Newberry & Worthen, 1866, (Trigonodus minor,) Geo. Sur. Ill., vol. 2, p. 112, Keokuk Gr.
- parvulus, Newberry & Worthen, 1866, Geo. Sur. Ill., vol. 2, p. 102, St. Louis Gr. In part Stenopterodus parvulus.
- spatulatus, Newberry & Worthen, 1866, Geo. Sur. Ill., vol. 2, p. 103, St. Louis Gr.



FIG. 1175.—*Sandalodus spatulatus*.

- Sauripteris*, Hall, 1843, Geo. Rep. 4th Dist. N. Y. [Ety. *sauros*, lizard; *pteron*, wing.] *taylori*, see *Holoptychius taylori*.
- Sciaris extinctus*, Leidy, 1855, Proc. Acad. Nat. Sci., vol. 7. Not satisfactorily defined.
- STEMMATODUS, St. John & Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 328. [Ety. *stemma*, a wreath; *odous*, tooth.] Teeth variable, anomalous, some triangular with three or more rows of denticles, others simple with narrower base and a single row of coronal cusps. Type *S. chiriformis*.
- bicristatus, St. John & Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 331, Burlington Gr.
- bifurcatus, St. John & Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 330, Burlington Gr.

- chiriformis, St. John & Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 330, Burlington Gr.
- compactus, St. John & Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 334, Kaskaskia Gr.
- keokuk, St. John & Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 334, Keokuk Gr.
- simplex, St. John & Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 332, Burlington Gr.
- symmetricus, St. John & Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 333, Burlington Gr.
- STENACANTHUS, Leidy, 1856, Jour. Acad. Nat. Sci., 2d ser., vol. 3, p. 162. [Ety. *stenos*, narrow; *akantha*, a spine.] Narrow denticulated spine. Type *S. nitidus*.
- nitidus, Leidy, 1856, Jour. Acad. Nat. Sci., 2d ser., vol. 3, p. 162, Carboniferous.
- STENOPTERODUS, St. John & Worthen, 1883, Geo. Sur. Ill., vol. 7, p. 100. [Ety. *stenos*, narrow; *pteron*, wing; *odous*, tooth.] Teeth distinguished by their long elliptical outline, strongly arched and spiral inrollment of the outer extremity. Crown with a lobe in the direction of inrollment. Type *S. planus*.
- elongatus, St. John & Worthen, 1883, Geo. Sur. Ill., vol. 7, p. 106, Warsaw Gr.
- parvulus, Newberry & Worthen, 1866, (*Sandalodus parvulus*.) Geo. Sur. Ill., vol. 2, p. 102, St. Louis Gr.
- planus, St. John & Worthen, 1883, Geo. Sur. Ill., vol. 7, p. 102, Upper Burlington Gr.
- Strigillina*, Cope, syn. for *Janassa gurleiana*, see *Janassa gurleiana*.
- linguiformis*, see *Janassa linguiformis*.
- TÆNIODUS, De Koninck, MSS., and St. John & Worthen, 1883, Geo. Sur. Ill., vol. 7, p. 75. [Ety. *tænia*, ribbon; *odous*, tooth.] Trapezoidal, arched from within outward, inrolled obliquely outward and forward; distinguished from *Psephodus* by the differentiation of the coronal contour of the maxillary median forms. Type *T. contortus*.
- fasciatus, Newberry & Worthen, 1870, (*Deltodus fasciatus*.) Geo. Sur. Ill., vol. 4, p. 366, Keokuk Gr.
- obliquus, St. John & Worthen, 1883, Geo. Sur. Ill., vol. 7, p. 78, Kaskaskia Gr.
- regularis, St. John & Worthen, 1883, Geo. Sur. Ill., vol. 7, p. 77, Warsaw Gr.
- TANAODUS, St. John & Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 367. [Ety. *tanaos*, long; *odous*, a tooth.] In the laterally extended linear outline of the crown it resembles *Chomatodus*; in the disproportionate depth of the coronal surfaces and marginal position of the root it resembles *Antliodus* from which it is distinguished by the linear outline of the crown and the inferior surface of the root. Type *T. gracillimus*.
- angularis, Newberry & Worthen, 1866, (*Chomatodus angularis*.) Geo. Sur. Ill., vol. 2, p. 55, Coal Meas.

bellicinctus, St. John & Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 376, Kaskaskia Gr.

depressus, St. John & Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 378, Kaskaskia Gr.



FIG. 1176.—*Tanaodus gracillimus*.

gracillimus, Newberry & Worthen, 1866, (*Chomatodus gracillimus*.) Geo. Sur. Ill., vol.

2, p. 51, Burlington Gr.

grossiplicatus, St. John & Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 375, Kaskaskia Gr.

multiplicatus, Newberry & Worthen, 1866, (*Chomatodus multiplicatus*.) Geo. Sur. Ill., vol. 2, p. 57, Burlington Gr.

obscurus, Leidy, 1856, (*Chomatodus obscurus*.) Trans. Am. Phil. Soc., vol. 11, p. 87, Keokuk Gr.

polymorphus, St. John & Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 380, Kaskaskia Gr.

prænuentius, St. John & Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 371, St. Louis Gr.

pumilus, St. John & Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 369, St. Louis Gr.

sculptus, St. John & Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 373, St. Louis Gr.

sublunatus, St. John & Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 368, St. Louis Gr.

THORACODUS, Cope, 1883, Proc. Acad. Nat. Sci., p. 108. [Ety. *thoracos*, protected; *odus*, tooth.] Jaws plate-like, divided on middle line, each half with transverse grooves and ridges, and a smooth border all round. Type *T. eurydinus*.

eurydinus, Cope, 1883, Proc. Acad. Nat. Sci. Phil., p. 108, Permian Gr.

THRINACODUS, St. John & Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 289. [Ety. *thrinakos*, three-pronged; *odus*, tooth.] Teeth small; base produced posteriorly in a long sometimes twisted vertically flattened, or laterally compressed, clavate plate, longer than wide, anterior face narrow, and abruptly beveled from the basal line of the crown; posterior extremity more or less obtusely rounded; inferior surface narrow, plain or faintly excavated; superior surface gently convex, concave antero-posteriorly, or corresponding to the curvature of the inferior surface; from the antero-superior extremity of the base spring three more or less relatively stout, nearly equal, trenchant, acutely pointed, recurved cusps the exterior pair divergent, the central one more or less vertical, slightly sigmoidally curved, transverse section sublenticular, compressed in front, rounded behind, with simple cutting edges, and more or less strongly costate in either face. Allied to *Diplodus*. Type *T. nanus*.

duplicatus, Newberry & Worthen, 1866, (*Diplodus duplicatus*.) Geo. Sur. Ill., vol. 2, p. 61, Keokuk Gr.

incurvus, Newberry & Worthen, 1866, (*Diplodus incurvus*.) Geo. Sur. Ill., vol. 2, p. 62, Keokuk Gr.

nanus, St. John & Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 289, Waverly or Kinderhook Gr.

TOMODUS, Agassiz, 1859, MSS. and St. John & Worthen, 1883, Geo. Sur. Ill., vol. 7, p. 171. [Ety. *tomos*, sharp; *odus*, tooth.] Distinguished from *Xystrodus* by the great convexity of the coronal ridge, abrupt articular border, and absence of transverse punctæ on the triturating surface. Type *T. convexus*.

limitaris, St. John & Worthen, 1883, Geo. Sur. Ill., vol. 7, p. 173, Upper Burlington Gr.

TRIGONODUS, Newberry & Worthen, 1866, Geo. Sur. Ill., vol. 2, p. 111. [Ety. *trigonos*, three-cornered; *odus*, tooth.] Syn. for *sandalodus*.

major, Newberry & Worthen, 1866, Geo. Sur. Ill., vol. 2, p. 112, syn. for *Sandalodus complanatus*.

minor, see *Sandalodus minor*.

VATICINODUS, St. John & Worthen, 1883, Geo. Sur. Ill., vol. 7, p. 80. [Ety. *vaticinus*, prophetic; *odus*, tooth.] Posterior teeth distinguished from *Deltotychius* by the absence of the secondary lobe, the anterior part of the tooth forward of the posterior prominence being plain, as in *Stenopterosodus*. Type *V. vetustus*.

carbonarius, St. John & Worthen, 1883, Geo. Sur. Ill., vol. 7, p. 88, Coal Meas.

discrepans, St. John & Worthen, 1883, Geo. Sur. Ill., vol. 7, p. 83, Upper Burlington Gr.

lepis, St. John & Worthen, 1883, Geo. Sur. Ill., vol. 7, p. 88, Up. Coal Meas.

similis, St. John & Worthen, 1883, Geo. Sur. Ill., vol. 7, p. 86, Kaskaskia Gr.

simplex, St. John & Worthen, 1883, Geo. Sur. Ill., vol. 7, p. 84, St. Louis Gr.

vetustus, St. John & Worthen, 1883, Geo. Sur. Ill., vol. 7, p. 82, Waverly or Kinderhook Gr.

VENUSTODUS, St. John & Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 344. [Ety. *venustus*, beautiful; *odus*, tooth.] Teeth laterally elongated, vertically arched; crown constricted at the base, defined by imbricating folds; crest elevated, uniform, or with median prominence; denticulations lateral; base forming a shallow plate. Type *V. robustus*.

argutus, St. John & Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 352, Kaskaskia Gr.

leidyi, St. John & Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 350, St. Louis Gr. This name is a syn. for *V. venustus*.

robustus, St. John & Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 345, Burlington Gr. tenuicristatus, St. John & Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 348, Keokuk Gr.



FIG. 1177.—Venustodus robustus.

variabilis, St. John & Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 346, Burlington Gr. venustus, Leidy, 1856, (Chomatodus venustus,) Trans. Am. Phil. Soc. Phil., vol. 11, p. 87, St. Louis Gr. XYSTRACANTHUS, Leidy, 1859, Proc. Acad. Nat. Sci. Phil., p. 3. [Ety. *xystra*, a tool for scraping; *akantha*, spine.] Distinguished from *Physonemus* by the slender, straight outline, and less preponderance of the antero-inferior shoulder. Type X. arcuatus. acinaciformis, St. John & Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 459, Coal Meas. anceps, Newberry & Worthen, 1866, (Drepanacanthus anceps,) Geo. Sur. Ill., vol. 2, p. 122, Coal Meas. arcuatus, Leidy, 1859, Proc. Acad. Nat. Sci. Phil., p. 3, Up. Coal Meas. mirabilis, St. John & Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 458, Coal Meas.

XYSTRODUS, Agassiz, MSS., 1859, and St. John 1870, Proc. Am. Phil. Soc., vol. 11, p. 436. [Ety. *xystra*, an instrument for scraping; *odous*, tooth.] Mandibular posterior teeth triangular; great transverse breadth of the inner margin as compared with the longitudinal diameter; coronal surface plain, depressed, and alated posteriorly; maxillary posterior teeth cuneiform, and narrow transverse diameter at the inner margin. Type X. striatus. bellulus, St. John & Worthen, 1883, Geo. Sur. Ill., vol. 7, p. 183, Coal Meas. imitatus, St. John & Worthen, 1883, Geo. Sur. Ill., vol. 7, p. 180, St. Louis Gr. inconditus, St. John & Worthen, 1883, Geo. Sur. Ill., vol. 7, p. 179, Keokuk Gr. occidentalis, St. John, 1870, Palæontology of Eastern Nebraska, p. 244, syn. for *Orthopleurodus carbonarius*. simplex, St. John & Worthen, 1883, Geo. Sur. Ill., vol. 7, p. 178, Upper Burlington Gr. verus, St. John & Worthen, 1883, Geo. Sur. Ill., vol. 7, p. 181, Kaskaskia Gr.

CLASS BATRACHIA.

[Ety. *batrachos*, frog.]

THE Batrachia live a double life—that is, both on land and in water—and are called Amphibia. [*Amphi*, on both sides, around; *bios*, life.] They approach the fishes in their early stages of growth, and resemble the true Reptilia in their more mature development. All possess lungs, but during their young or larval condition they are always furnished with branchiæ, and in some orders these remain throughout the life of the animal. They form a distinct transition from aquatic fishes to exclusively air-breathing reptiles. They are all strictly oviparous, although in some species the eggs are retained in or upon the body of the parent until the young have attained some degree of growth. After leaving the egg, the animals undergo a series of transformations before arriving at their complete or perfect state. In their early stage they are known as tadpoles, little, fish-like animals, with broad heads, sack-like body, and long, compressed tail. The mouth is at the lower part of the front of the head, and is furnished with a pair of horny jaws, with which they feed upon the animalculæ that furnishes the food. They are vertebrated animals, with cold blood and naked skin, and undergo a metamorphosis or change of condition from an aquatic respiration by gills to an atmospheric respiration by lungs, and a consequent alteration in general structure and mode of life.

In the tadpole and the genera which retain their gills through life, the substance between the vertebræ is soft, and contained in cup-like hollows formed by the concave articular surfaces of contiguous bones, precisely as in fishes. The lower orders are fish-like in possessing permanent branchiæ, the limbs are reduced to a rudimentary condition, and the tail is flattened and surrounded by a fin. In the higher orders the limbs are more and more developed and fitted for terrestrial progression, until they are capable of active motion and the animals can take their habitual residence in trees. The spinal column in some is composed of a continuous *chorda dorsalis*, inclosed in a fibrous sheath, but furnished with bony superior and inferior arches for the protection of the spinal cord and principal blood-vessels. In others the vertebræ are articulated by a sort of ball-and-socket joint. The vertebræ are usually furnished with long, transverse processes which appear to take the place of ribs; ribs are generally deficient. In those having a *chorda dorsalis* the skull is formed of a simple cartilaginous capsule, with which the *chorda* is completely continuous, and the only indications of ossification are in the lateral portions of the occipital bone. In the higher forms the skull is completely ossified; it is always of a broad and flattened form, with enormous, large orbits, and possesses one constant character which distinguishes the skull of a Batrachia from that of a Reptile; namely, the occipital bone is always furnished with two lateral condyles that fit into corresponding sockets in the first vertebra of the neck. The bones of the upper jaw and palate form a broad arch, which is always firmly attached to the skull; the maxillary and intermaxillary bones assist in the formation of the edge of the mouth, and are much developed, transversely expanding the general form of the skull without involving any enlargement of the brain cavity, which is very small.

All Batrachia have teeth on the palate; the salamanders have them also in both the upper and lower jaws, the frogs in the upper only, and the toads in neither. The jaw teeth are always slender, sharp-pointed, and closely set. The frog has about forty on each side of the upper jaw; the salamander has about sixty above and below; the palatine teeth are generally arranged transversely parallel to the jaw teeth. The hind legs of the frog are developed for leaping, and it has no useless tail; the body is contracted into a short space, and the few vertebræ are united into a single immovable piece, unprovided with ribs. The water salamanders, or newts, have a long tail, a slender flexible body, and all their organs are fitted for aquatic life. The structure of the bones is more compact and calcareous, and less transparent and flexible, than in fishes. The bones of the skull have their margins in contact, and occasionally united, but never overlapping. The hyoid bone changes largely in those genera undergoing metamorphosis in accordance with the development of the respiratory organ.

The Batrachia are generally distinguished from the Reptilia by the absence of a scaly covering. The skin of aquatic genera is soft and smooth, and constantly moistened by the cutaneous secretions; in land genera, as frogs and toads, the glands of the skin secrete a thick, whitish fluid. The cuticle is shed frequently. A few species are covered with horny scales.

They begin life with the single heart and gills of fishes; but as their metamorphosis goes on, the heart assumes the compound character necessary for the pulmonary respiration of the reptiles. In the development of the nervous system and the organs of the senses, they exhibit a slight advance upon the fishes. In the first

stages the circulation through the branchial apparatus is exactly the same as in the fishes; but later pulmonary arteries make their appearance, lungs are developed, and aerial respiration commences.

The class has been divided into five orders, namely: Amphipneusta, Anura, Urodella, Abranchia, and Apoda. None of the Palæozoic fossil families are referred to any of these orders except the Cocytinidæ, and the correctness of that reference is exceedingly doubtful. All other Palæozoic fossils are referred to orders which have become extinct. The change, either by progression into higher classes of the vertebrate kingdom, or by retrogression to an inferior state, is strongly marked. The Urodella, to which the Cocytinidæ are referred, have long, slender bodies, four limbs, which are sometimes very small, and occasionally the toes are furnished with claws, and a long, persistent tail; no external branchiæ, but in some species there is a branchial aperture on each side of the neck, within which are the branchial arches, with their laminae; lungs well developed, skin smooth, or covered with warty prominences, and furnished with numerous glands, which secrete an acrid, viscid fluid. In general form they resemble the lizards, which belong to the Reptilia. The aquatic and land salamanders belong to this order.

The first Batrachia are found in the Coal Measures. They increase rapidly in numbers, and spread out in progressive evolution through the Permian Group, and reach their highest development and largest size in the Triassic, and since that time they have declined or retrograded, and now constitute a very inferior grade of the Vertebrata. The Animal Kingdom has been divided into classes and orders upon a basis which constitutes, as it is supposed, a natural system, and the more recent study of embryology has demonstrated that this natural system corresponds with the phases of embryonic history in all, or nearly all, its parts, and the study of Palæontology has proven beyond all peradventure that there has been a succession of organic types from the earliest geological time to the present, which is stamped upon the embryonic growth of living animals, and coincides with the grades established by the natural system of classification.

It follows that when the Palæozoic orders are distinct from the living, the class has been more comprehensive than the definition given by zoologists. Indeed, all the fossils can not be strictly embraced within the prescribed limits of the Batrachia. Many of them might be included within the Reptilia, because they combine Batrachian and Reptilian characters, and where the latter prevail probably they should be classed with the Reptilia. Some of them, however, rise a step higher in the animal system, and include Batrachian and Mammalian characteristics, and for this reason it is urged by the evolutionists that the Mammalia descended from the Batrachia, without having passed through the Reptilian stage. In other words, what is here included is a comprehensive type of animal existence not limited by the bounds which define the living Batrachia.

The arrangement of the fossils into orders and families must be regarded as provisional, and only approximating the present learning, for the following reasons, in addition to those which will be apparent to the specialist: 1. There are several synonyms of orders and families. 2. No one has published a complete classification from which the author could compile the learning. 3. The author has never had an opportunity to study the fossils of this class and have an opinion of his own to assert or defend.

ORDER ARCHEGOSAURIA.

FAMILY ARCHÆGOSAURIDÆ.—Brachydectes, Hylerpeton.

ORDER GANOCEPHALA.

FAMILY COLOSTEIDÆ.—Amphibamus, Colosteus, Sauropleura.

ORDER LABYRINTHODONTIA.

FAMILY BAPHETIDÆ.—Baphetes.

FAMILY TREMATOSAURIDÆ.—Cricotus.

ORDER MICROSAURIA.

FAMILY DIPLOCAULIDÆ.—Diplocaulus.

FAMILY EOSAURIDÆ.—Eosaurus.

FAMILY MOLGOPHIDÆ.—Molgophis, Pleuroptyx.

FAMILY PELIONIDÆ.—Hylonomus, Pelion.

FAMILY PHLEGETHONTIIDÆ.—Phlegethontia.

FAMILY PTYONIIDÆ.—Ceraterpeton, Hyphasma, Oestocephalus, Ptyonius, Thyrsideum.

FAMILY TUDITANIDÆ.—Dendrerpeton, Leptophractus, Tuditanus.

ORDER PELYCOSAURIA.

FAMILY BOLOSOURIDÆ.—Bolosaurus, Chilonyx, Lysorophus.

FAMILY DIALECTIDÆ.—Diadectes, Helodectes.

FAMILY CLEPSYDROPSIDÆ.—Archæobolus, Clepsydrops, Dimetrodon, Ectocynodon, Embolophorus, Empedias, Metarmosaurus, Pariotichus, Theropleura.

FAMILY EDAPHOSAURIDÆ.—Edaphosaurus, Pantylus.

ORDER RHACHITOMA.

FAMILY ERYOPSIDÆ.—Acheloma, Anisodexis, Eryops, Ichthyacanthus, Trimerorachis, Zatrachys.

ORDER URODELLA.

FAMILY COCYTINIDÆ.—Cocytinus.

ORDER AND FAMILY UNCERTAIN.—Chirotherium, Collettosaurus, Nothodon, Ophiacodon, Sauropus, Sphæropezium, Sphenacodon, Thenaropus.

ACHELOMA, Cope, 1882, Pal. Bull. No. 35, and Proc. Am. Phil. Soc., p. 455. [Ety. *a*, without; *cheloma*, a notch.] Mandible without angular process; teeth subequal, rather larger anteriorly; pterygoid bone ending in a free, recurved edge anterior to the quadrate bone; palatines and pterygoids nar-

row; palatal foramen wide, posterior border of cranium entire; without notch on the external side of the epiotic bone; vertebræ rhachitomous. Type *A. cumminsi*.
cumminsi, Cope, 1882, Pal. Bull. No. 35, and Proc. Am. Phil. Soc., p. 456, Permian.

ard.] Teeth fixed in shallow alveoli, with crowns expanded transversely to the jaw, swollen at the base, apex low and divided vertically; the postero-internal half in the maxillary series is low and horizontal, the antero-external portion forms a curved cusp; in the lower jaw the relative position of the ledge and cusp is reversed. Type B. striatus.



FIG. 1179.—*Baphetes planticeps*.

rapidens, see *Chilonyx rapidens*.
striatus, Cope, 1878, Pal. Bull. No. 29, and Proc. Am. Phil. Soc., vol. 17, p. 507, Permian.

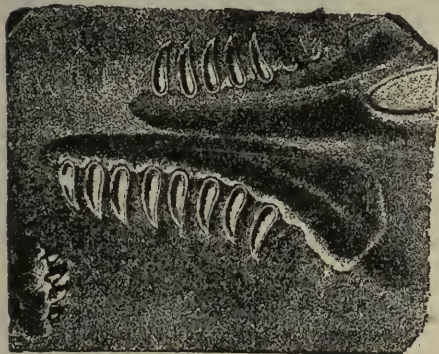


FIG. 1180.—*Brachyectes newberryi*.

BRACHYDECTES, Cope, 1868, Proc. Acad. Nat. Sci. Phil., p. 214. [Ety. *brachys*, short; *dektēs*, a biter.] Rami short, stout; teeth subequal, elongate, cylindrical cones with acute tips turned posteriorly, pulp-cavity large; skeleton unknown. Type B. *Newberryi*.
newberryi, Cope, 1868, Proc. Acad. Nat. Sci. Phil., p. 214, and Ohio Pal., vol. 2, p. 388, Coal Meas.

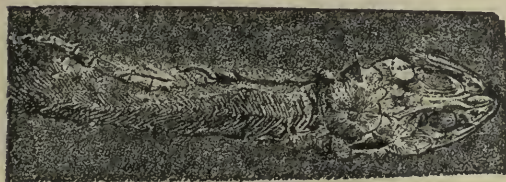


FIG. 1181.—*Ceraterpeton tenuicorne*.

CERATERPETON, Huxley. [Ety. *keras*, horn; *erpeton*, reptile.] Teeth simple, equal on outside of jaws; angles of intercalary bones produced into horn-like processes; cranial bones sculptured,

vertebræ undivided; carpus and tarsus osseous.

lineopunctatum, Cope, 1875, Ohio Pal., vol. 2, p. 372, Coal Meas.

tenuicorne, Cope, 1875, Ohio Pal., vol. 2, p. 372, Coal Meas.

CHIROTHERIUM, Kaup, 1835, in Leonhard und Bronn Neues Jahrbuch für Mineralogie. [Ety. *cheir*, the hand; *therion*, beast.] Represented by foot impressions only. Toes robust, the internal shorter and divergent from the others. Sole (or palum) short, wide. Type C. *barthi*.

reiteri, Moore, 1873, Am. Jour. Sci. and Arts, 3d ser., vol. 5, p. 292, Coal Meas.

CHILONYX, Cope, 1883, Proc. Am. Phil. Soc., vol. 20, p. 631. [Ety. *cheilos*, lip; *onyx*, claw.] Long diameter of the crowns of the teeth transverse to the jaw, and each crown contracting to a slightly incurved apex; maxillary teeth short; temporal fossæ roofed; superior surface of cranium divided in areas by grooves. Type C. *rapidens*.

rapidens, Cope, 1878, (Bolosaurus *rapidens*.) Proc. Am. Phil. Soc., vol. 17, p. 506, and vol. 20, p. 631, Permian.

CLEPSYDROPS, Cope, 1876, Proc. Acad. Nat. Sci. Phil., p. 407. [Ety. *klepsydra*, an hour-glass; *ops*, appearance.] Intercentra present; neural spines only elongate posteriorly; premaxillary teeth not especially elongate; one or two long maxillary teeth; no grinding teeth. Type C. *colletti*.

colletti, Cope, 1876, Proc. Acad. Nat. Sci. Phil., p. 407, Permian.

gigas, see *Dimetrodon gigas*.

leptocephalus, Cope, 1884, Pal. Bull. No. 39, p. 30, Permian.

limbatus, Cope, 1877, Proc. Am. Phil. Soc., p. 196, Permian or Triassic.

macrospendylus, Cope, 1884, Pal. Bull. No. 39, p. 35, Permian.

natalis, Cope, 1878, Pal. Bull., No. 29, and Proc. Am. Phil. Soc., vol. 17, p. 509, Permian.

pedunculatus, Cope, 1877, Proc. Am. Phil. Soc., p. 63, Permian.

vinslovi, Cope, 1877, Proc. Am. Phil. Soc. p. 62, Permian.

COCYTINUS, Cope, 1871, Proc. Am. Phil. Soc., p. 177, and Ohio Pal., vol. 2, p. 360. [Ety. mythological name.] Vertebræ and ribs osseous; teeth on the premaxillary bone; none on the maxillary; axial hyal with basihyal on each side united with corresponding ceratohyal at the end of which is an element in position of stylohyal; hæmal or basal branchiyls three, the anterior two each supporting one pleural branchiyl and the third supporting one; hæmal branchiyl on the inner side of the ceratohyal, approaching the me-

dian line, and with elongate pleural element. Type C. *gyrinoides*.



FIG. 1182.—*Cocyttinus gyrinoides*.

gyrinoides, Cope, 1874, Trans. Am. Phil. Soc., and Ohio Pal., vol. 2, p. 364, Coal Meas.

COLLETTOSAURUS, Cox, 1874, Geo. Sur. Ind., 5th Ann. Rep., p. 247. [Ety. proper name; *sauros*, a lizard.] Founded upon tracks having five digits, and supposed to be related to Batrachians and Salamanders. Type C. *indianensis*.

indianensis, Cox, 1873, Geo. Sur. Ind., 5th Ann. Rep., p. 247, Coal Meas.

COLOSTEUS, Cope, 1869, Trans. Am. Phil. Soc., p. 22. [Ety. *kolos*, imperfect; *osteon*, a bone.] No vertebral centra, spines, or sclerotic bones; short ribs; two pairs of short limbs; three sculptured pectoral bones; abdominal region protected by scales in chevron; ? anterior teeth longer than posterior, basal half incised sulcate, except two behind the dentary. Type C. *foveatus*.

crassiscutatus, Cope, syn. for *C. scutellatus*. *foveatus*, Cope, 1869, Trans. Am. Phil. Soc., p. 24, and Ohio Pal., vol. 2, p. 406, Coal Meas.

marshi, see *Ptyonius marshi*.

pauciradiatus, Cope, 1874, Trans. Am. Phil. Soc., p. 10, and Ohio Pal., vol. 2, p. 408, Coal Meas.

scutellatus, Newberry, 1856, (*Pygopterus scutellatus*.) Proc. Acad. Nat. Sci. Phil., p. 98, and Ohio Pal., vol. 2, p. 407, Coal Meas.

CRICOTUS, Cope, 1876, Proc. Acad. Nat. Sci. Phil., p. 405. [Ety. *krikotos*, ringed.] Centra undivided, equal to the disciform intercentra in the caudal region, intercentra a little smaller in the dorsal region; neural spines and zygapophyses; developed foramen; chordæ dorsalis persistent; teeth equal, except probably the palatines; limbs short, a facial lyra. Type C. *heteroclitus*.

crassidiscus, Cope, 1884, Pal. Bull. No. 39, p. 28, Permian.

discophorus, Cope, syn. for *C. heteroclitus*. *gibsoni*, Cope, 1877, Pal. Bull. No. 26, and Proc. Am. Phil. Soc., vol. 17, p. 185, Permian.

heteroclitus, Cope, 1876, Proc. Acad. Nat. Sci. Phil., p. 405, Permian.

hyantricus, Cope, 1884, Pal. Bull. No. 39, p. 30, Permian.

DENDRERPETON, Owen, 1853, Quar. Jour. Geo. Soc., vol. 9, p. 58. [Ety. *dendron*, a tree; *erpeton*, a lizard, from the circumstance under which the reptile was found.] Teeth in double series; outer simple, flattened, conic; inner series conical, with inflected folds of cement; teeth on the vomer; skull-bones corrugated; body protected below with ovate or rhomboidal bony scales, imbricated, horny scales above; fore-limbs the larger; tail natatory; vertebræ biconcave; neural arches and bones ossified. Type D. *acadianum*.

acadianum, Owen, 1853, Quar. Jour. Geo. Soc., vol. 9, p. 58, and Acadian Geology, p. 362, Coal Meas.



Fig. 1183—*Dendrerpeton acadianum*. (a) Cross section of tooth magnified.

obtusum, see *Tuditonus obtusum*.

oweni, Dawson, 1863, Quar. Jour. Geo. Soc., vol. 19, p. 469, and Acad. Geol., p. 368, Coal Meas.

DIADETES Cope, 1878, Pal. Bull. No. 29, and Proc. Am. Phil. Soc., vol. 17, p. 505. [Ety. *dia*, crosswise; *dektos*, a biter.] Teeth with much compressed crowns, with bracket-shaped edge, longer axis transverse to the jaws, edges of crowns obtuse, no sculpture on the face. Alveoli not separated. External alveolar border more elevated than the internal, inner alveolar border pierced by a fossa behind the inner extremity of each tooth. Type D. *sideropellicus*.

latibuccatus, see *Empedias latibuccatus*.

molaris, see *Empedias molaris*.

phaseolinus, see *Empedias phaseolinus*.

sideropellicus, Cope, 1878, Pal. Bull. No. 29, and Proc. Am. Phil. Soc., vol. 17, p. 505, Permian.

DIMETRODON, Cope, 1878, Pal. Bull. No. 29, and Proc. Am. Phil. Soc., vol. 17, p. 512. [Ety. *dimetros*, two measures; *odous*, tooth.] Dentition with enormously long incisors and two or three long maxillaries; the pubic bone not distinct from ischium; humerus with trochlear condyles and a defined proximal articular surface; neural spines of dorsal and lumbar vertebræ enormously elongate; intercentra present. Type D. *incisivus*.

cruciger, Cope, 1878, Am. Naturalist, vol. 12, p. 830, Permian.

gigas, Cope, 1878, Am. Nat., p. 327, (*Clepsydraps gigas*.) and Proc. Am. Phil. Soc., vol. 17, p. 515, Permian.

incisivus, Cope, 1878, Pal. Bull. No. 29, and Proc. Am. Phil. Soc., vol. 17, p. 512, Permian.
 rectiformis, Cope, 1878, Pal. Bull. No. 29, and Proc. Am. Phil. Soc., vol. 17, p. 514, Permian.
 semiradicatus, Cope, 1881, Bull. U. S. Geo. Sur. Terr., vol. 6, No. 1, p. 80, Permian.
 DIPLOCAULUS, Cope, 1877, Pal. Bull. No. 26, and Proc. Am. Phil. Soc., vol. 17, p. 187. [Ety. *diploos*, double; *kaulos*, stem.] Vertebral centra contracted medially, perforated by the foramen chordæ dorsalis, co-ossified with the neural arch and supporting transverse processes; zygosphen articulation; two rib articulations, one below the other; axis and atlas united by a long zygosphen which is not roofed by the zygantrum; no neural spine, atlas insegmented; arch extended into the foramen magnum; squamosal region developed into a horn. Skull sculptured. Type D. salamandroides.
 magnicornis, Cope, 1882, Pal. Bull. No. 35, and Proc. Am. Phil. Soc., p. 453, Permian.
 salamandroides, Cope, 1877, Pal. Bull. No. 26, and Proc. Am. Phil. Soc., vol. 17, p. 187, Permian.
 EROCYNODON, Cope, 1878, Pal. Bull. No. 29, and Proc. Am. Phil. Soc., p. 508. [Ety. *ektos*, eternal; *kuon*, dog; *odous*, tooth.] Cranium short, wide, large post frontal bones, large orbit; bones sculptured but no lyra; teeth rhizodont, crowns elongated, compressed, anterior and posterior cutting edges; one between the orbit and nostril larger and longer than the others, and lying outside of the closed dentary bone; mandibular symphysis not sutural but ligamentous. Type E. ordinatus.
 aguti, Cope, 1882, Pal. Bull. No. 35, and Proc. Am. Phil. Soc., p. 451, Permian.
 ordinatus, Cope, 1878, Pal. Bull. No. 29, and Proc. Am. Phil. Soc., p. 508, Permian.
 EDAPHOSAURUS, Cope, 1882, Pal. Bull. No. 35, and Proc. Am. Phil. Soc., p. 448. [Ety. *edaphos*, pavement; *sauros*, a lizard.] Temporal fossæ not overroofed; cranial bones not sculptured; mandibular and maxillary teeth subequal; mandibular ramus expanded inward and supporting numerous teeth; pterygoid or malar bones supporting a dense body of teeth corresponding to those in the lower jaw; teeth subconical. Neural spines greatly elongate, hollow. Type E. pogonias.
 microdus, Cope, 1884, Pal. Bull. No. 39, p. 37, Permian.
 pogonias, Cope, 1882, Pal. Bull. No. 35, and Proc. Am. Phil. Soc., p. 449, Permian.
 EMBOLOPHORUS, Cope, 1878, Pal. Bull. No. 29, and Proc. Am. Phil. Soc., vol. 17, p. 518. [Ety. '*ballo*, I throw; *em*, into;

phoros, bearing.] Neural arch co-ossified, zygapophyses and diapophyses well developed; centra not orchordal; intercentra narrowed and transversely extended; ribs two-headed, the capitulum is received into a fossa of the posterior border of the intercentrum, in advance of the vertebra which supports the diapophysis, to which the tuberculum is attached. Type E. fritillus.
 fritillus, Cope, 1878, Pal. Bull. No. 29, and Proc. Am. Phil. Soc., vol. 17, p. 518, Permian.
 EMPEDIAS, Cope, 1883, Proc. Am. Phil. Soc., vol. 20, p. 63. Proposed instead of Empedocles of Cope in 1878, which was preoccupied. Teeth with elongate crowns, with flat grinding surface but bracket-shaped in transverse vertical section, arranged transversely to the long axis of the jaws; no canines; incisors wearing chisel-shaped; temporal fossa covered; vertebrae with hyposphen on the posterior and hypanttrum on the anterior face and short quadrate neural spines. Type E. alatus.
 alatus, Cope, 1878, (Empedocles alatus,) Proc. Am. Phil. Soc., vol. 17, p. 516, Permian.
 fissus, Cope, 1883, (Empedocles fissus,) Proc. Am. Phil. Soc., p. 634, Permian.
 latibuccatus, Cope, 1878, (Diadectes latibuccatus,) Proc. Am. Phil. Soc., vol. 17, p. 505, Permian.
 molaris, Cope, 1878, (Diadectes molaris,) Am. Nat., vol. 12, p. 565, and Pal. Bull. No. 32, p. 10, Permian.
 phaseolinus, Cope, 1880, (Diadectes phaseolinus,) Pal. Bull. No. 32, p. 9, Permian.
Empedocles, Cope, 1878, Proc. Am. Phil. Soc., vol. 17, p. 516. The name was preoccupied, see Empedias.
alatus, see Empedias alatus.
fissus, see Empedias fissus.
 EOSAURUS, Marsh, 1862, Can. Nat. and Geo., vol. 7, and Acad. Geol., p. 382. [Ety. *eos*, the dawn; *sauros*, a sea-fish.] Founded upon vertebrae, with biconcave centra and free neural arch, and closed not orchordal foramen. Type E. acadianus.
 acadianus, Marsh, 1862, Can. Nat. and Geo., vol. 7, and Acad. Geol., p. 382, Coal Meas.
 Epicordylus, Cope, 1878, Pal. Bull. No. 29, and Proc. Am. Phil. Soc., vol. 17, p. 515. [Ety. *epi*, upon; *kordylos*, a water-lizard.] Syn. for Eryops.

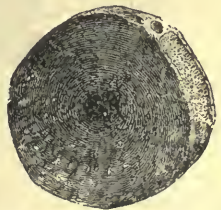


FIG. 1184.—Eosaurus acadianus. 1/2 Diam. a, Transverse section.

- erythroliticus*, see *Eryops erythroliticus*.
- ERYOPS**, Cope, 1877, Proc. Am. Phil. Soc., vol. 17, p. 188. [Ety. *eruo*, I protect; *ope*, view.] Vertebræ rhachitinous throughout; teeth of external series equal; some larger ones on the palatine bones; table of cranium produced, bounded by a notch on each side; no horns nor mucous grooves; pelvic elements co-ossified; no foramen. Type *E. megacephalus*.
- erytholeticus*, Cope, 1878, (*Epicordylus erytholeticus*), Proc. Am. Phil. Soc., p. 515, Permian.
- ferricolus*, Cope, 1878, (*Parioxys ferricolus*), Proc. Am. Phil. Soc., p. 521, Permian.
- megacephalus*, Cope, 1877, Proc. Am. Phil. Soc., vol. 17, p. 188, Permian or Triassic.
- platypus*, Cope, 1877, (*Ichthyacanthus platypus*), Proc. Am. Phil. Soc., vol. 17, p. 574, Coal Meas.
- reticulatus*, Cope, 1881, Am. Nat., p. 1020, Permian.
- EURYTHORAX**, Cope, 1875, Ohio Pal., vol. 2, p. 401. [Ety. *eury*s, broad; *thorax*, the breast.] Established on a thoracic shield, having broad, smooth surfaces on the outer borders for the contact of the overlapping margins of the lateral plates. Subround, with a large excavation from the posterior margin on each side; narrowed portion left in the middle behind has a convex outline; no sculpture. Type *E. sublævis*.
- sublævis*, Cope, 1871, Proc. Am. Phil. Soc., p. 177, and Ohio Pal., vol. 2, p. 402, Coal Meas.



FIG. 1185.—*Hylerpeton dawsoni*. Mandible and portion of cranial bone.

- HELODECTES**, Cope, 1880, Pal. Bull. No. 32, p. 11. [Ety. *helos*, a nail; *dektes*, a biter.] Two rows of subround molariform teeth in each jaw. Type *H. paridens*.
- isaaci*, Cope, 1880, Pal. Bull. No. 32, p. 12, Permian.
- paridens*, Cope, 1880, Pal. Bull. No. 32, p. 11, Permian.
- HYLERPETON**, Owen, 1862, Quar. Jour. Geo. Soc., vol. 18, p. 5. [Ety. *hyle*, wood; *erpeton*, reptile.] Teeth simple, bluntly conical, with large pulp-cavity; about 13 on one side of a jaw; two of the anterior ones of the upper jaw twice as large as the others and deeply sunk in

the jaw. Length of lower jaw $\frac{1}{2}$ inch; bones of skull puncto-striate. Type *H. dawsoni*.

- curtidentatum*, Dawson, 1876, Am. Jour. Sci. and Arts, vol. 12, Coal Meas.
- dawsoni*, Owen, 1862, Quar. Jour. Geo. Soc., vol. 18, p. 5, and Acadian Geology, p. 380, Coal Meas.
- longidentatum*, Dawson, 1876, Am. Jour. Sci. and Arts, vol. 12, Coal Meas.
- HYLONOMUS**, Dawson, 1860, Quar. Jour. Geo. Soc., vol. 16, p. 268. [Ety. *hyle*, wood; *nomos*, an abode; forest dweller.] Cranial bones thin, smooth; parietal bones arched; about 26 teeth in each maxillary, elongated, conical, set in a single series, in a furrow, protected externally by an alveolar ridge; teeth longer in intermaxillaries and extremities of mandibles than elsewhere; vertebræ ossified, biconcave, with spinous processes; ribs long and curved; pelvis large; ilium long, expanded below, ischium expanded; pubis expanded, triangular where it joins the ischium, round and arched toward the symphysis; femur thick, nearly straight; tibia short, stout; fibula slender; phalanges broad. Dermal covering of ovate bony scales. Type *H. lyelli*.



FIG. 1186.—*Hylonomus acedentatus*. Maxillary bone magnified; a, natural size.

- acedentatus*, Dawson, 1860, Quar. Jour. Geo. Soc., vol. 16, p. 268, and Acad. Geol., p. 376, Coal Meas.
- lyelli*, Dawson, 1860, Quar. Jour. Geo. Soc., vol. 16, p. 268, and Acad. Geol., p. 370, Coal Meas.
- wymani*, Dawson, 1860, Quar. Jour. Geo. Soc., vol. 16, p. 268, and Acad. Geol., p. 378, Coal Meas.
- HYPHASMA**, Cope, 1875, Proc. Acad. Nat. Sci., p. 16, and Ohio Pal., vol. 2, p. 387. [Ety. *hyphasma*, a web.] Vertebræ osseous; posterior dorsals with fan-like neural spines, ventral armature consisting of rhomboidal scuta, forming packed rows arranged in chevrons, directed backward, on top of which are the usual rod-like scales arranged in packed chevrons with the angle directed forward. Type *H. lævis*.



FIG. 1187.—*Hyphasma lævis*.

- lævis*, Cope, 1875, Proc. Acad. Nat. Sci., p. 16, and Ohio Pal., vol 2, p. 387, Coal Meas.
- ICHTHYACANTHUS**, Cope, 1877, Pal. Bull. No. 24, and Proc. Am. Phil. Soc., p. 573.

[Ety. *ichthys*, a fish; *akantha*, a spine.] Founded on the posterior dorsal and caudal vertebræ and adjacent parts. Posterior limbs well-developed, with tibia, fibula, osseous tarsus and five digits; ribs elongate, simple, curved; abdominal armature in bristle-like rods, in anteriorly directed chevrons; dorsal vertebræ short, with simple neural spines; tail large, vertebræ ossified and furnished with slender chevron bones, which terminate in a hæmal spine; neural spines slender, directed backward, caudal series somewhat resembling that of a fish; centra amphicælian. Type I. *ohioensis*.

ohioensis, Cope, 1877, Pal. Bull. No. 24, and Proc. Am. Phil. Soc., p. 573, Coal Meas.

platypus, see *Eryops platypus*.

LEPTOPHRACTUS, Cope, 1873, Proc. Acad.

Nat. Sci., p. 340, and Ohio Pal., vol. 2, p. 399. [Ety. *leptos*, delicate; *phraktos*, armored.] Founded on various portions of the cranium; jaws bear large teeth, round in section at the base, but with compressed, acute apex, and with cutting edge on anterior face; enamel delicately grooved; there is a large elongate tooth in the upper jaw in the position of a canine; sculpture of the cranium little marked; lower jaw marked with inosculating grooves. Type L. *obsoletus*.

lineolatus, Cope, 1877, Pal. Bull. No. 24, and Proc. Am. Phil. Soc., p. 576, Coal Meas.

obsoletus, Cope, 1873, Proc. Acad. Nat. Sci., p. 341, and Ohio Pal., vol. 2, p. 400, Coal Meas.

LYSOROPITUS, Cope, 1877, Pal. Bull. No. 26, and Proc. Am. Phil. Soc., vol. 17, p. 187. [Ety. *lysos*, free; *orophos*, roof.]

Founded upon the centra. Vertebræ amphicælian, perforated by the foramen chordæ dorsalis; neural arch freely articulated to the centrum; floor of neural canal deeply excavated; no processes or costal articulations on the centrum, which is excavated by longitudinal fossæ; centrum not shortened. Type L. *tricarinatus*.

tricarinatus, Cope, 1877, Pal. Bull. No. 26, and Proc. Am. Phil. Soc., vol. 17, p. 187, Permian.

METARMOSAURUS, Cope, 1878, Pal. Bull., No. 29, and Proc. Am. Phil. Soc., vol. 17, p. 516. [Ety. *meta*, down; *harmos*, a joint;

sauros, lizard.] Founded upon vertebræ. Centrum shorter than wide, deeply biconcave; diapophyses project below the base of the neural arch, are short, with small tubercular facet; capitular facet; facet for intercentrum small, and is excavated at the anterior extremity of the base of the centrum; neural canal large; articular faces of anterior zygopophyses directed downward and outward. Type M. *fossatus*.

fossatus, Cope, 1878, Pal. Bull., No. 29, and Proc. Am. Phil. Soc., vol. 17, p. 516, Permian.



FIG. 1188.—*Molgophis brevicostatus*.

MOLGOPHIS, Cope, 1868, Proc. Acad. Nat. Sci., p. 220. [Ety. *molges*, a salamander; *ophis*, serpent.]

Body long, serpentine, without dermal armature; vertebræ long, broad, with prominent zygopophyses and moderate neural spines; ribs large, curved, with tubercle and head on the dilated extremity. Type M. *macrurus*.

brevicostatus, Cope, 1875, Ohio Pal., vol. 2, p. 369, Coal Meas.

macrurus, Cope, 1868, Proc. Acad. Nat. Sci., p. 220, and Ohio Pal., vol. 2, p. 368, Coal Meas.

wheatleyi, Cope, 1875, Ohio Pal., vol. 2, p. 369, Coal Meas.

NOTHODON, Marsh, 1878, Am. Jour. Sci. and Arts, 3d ser., vol. 15, p. 410. [Ety. *nothos*, spurious; *odous*, tooth.] Type N. *lentus*.

lentus, Marsh, 1878, Am. Jour. Sci. and Arts, 3d ser., vol. 15, p. 410, Permian.

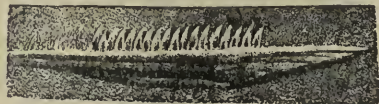


FIG. 1189.—*Oestocephalus rectidens*.

OESTOCEPHALUS, Cope, 1868, Proc. Acad. Nat. Sci. Phil., p. 217, and Ohio Pal., vol. 2, p. 380. [Ety. *oistos*, an arrow; *kephale*, the head.]

Form slender, snake-like; caudal vertebræ with dilated and sculptured neural and hæmal spines; cranium lanceolate; teeth numerous, subequal; no pectoral shields; abdomen protected by bristle-like rods, which converge forward; no scales; a pair of weak posterior limbs; branchiæ bones present. Type O. *remex*.

amphiuminus, Cope, 1868, Proc. Acad. Nat. Sci., syn. for O. *remex*.

- pectinatus*, Cope, see *Ptyonius pectinatus*.
rectidens, Cope, 1874, *Trans. Am. Phil. Soc.*,
 and *Ohio Pal.*, vol. 2, p. 386, *Coal Meas.*
remex, Cope, 1868, *Proc. Acad. Nat. Sci.*
 p. 217, (*Sauroplesura remex*), *Ohio Pal.*,
 vol. 2, p. 381, *Coal Meas.*
serrula, see *Ptyonius serrula*.
vinchellanus, see *Ptyonius vinchellanus*.
OPHIACODON, Marsh, 1878, *Am. Jour. Sci.*
 and *Arts*, 3d ser., vol. 15, p. 411. [Ety.
ophiakos, belonging to serpents; *odous*,
 tooth.] Type *O. grandis*.
grandis, Marsh, 1878, *Am. Jour. Sci.* and
Arts, 3d ser., vol. 15, p. 411, *Permian*.
mirus, Marsh, 1878, *Am. Jour. Sci.* and
Arts, 3d ser., vol. 15, p. 411, *Permian*.
ORNITHICHNITES, Hitchcock, 1836, *Am. Jour.*
Sci. and Arts, vol. 29. [Ety. *ornithos*, a
 bird; *ichnos*, a footstep.] This is not
 properly a generic name. No bird-tracks
 are known in Palæozoic rocks. The
 Batrachian tracks referred to it belong
 to another genus.
culbertsoni, King, 1845, *Am. Jour. Sci.* and
Arts, vol. 48, p. 345, *Coal Meas.*
gallinuloides, King, 1845, *Am. Jour. Sci.*
 and *Arts*, vol. 48, p. 344, *Coal Meas.*
PANTYLUS, Cope, 1881, *Bull. U. S. Geo. Sur.*
Terr., vol. 6, No. 1, p. 79. [Ety. *pan*,
 all; *tylos*, a knob.] Founded upon the
 crania; ossification complete, leaving
 only orbits, nostrils, and parietal fonta-
 nel; surface sculptured; mandible
 with an angular process; teeth conic,
 obtuse, larger anteriorly; mandible sup-
 porting several rows of teeth, which
 oppose a pavement of obtuse teeth on
 the palate; these are situated on the
 palatine or anterior part of pterygoid
 bones; quadratojugal and malar bones
 well developed; no *lyra* or mucous
 grooves. Type *P. cordatus*.
cordatus, Cope, 1881, *Bull. U. S. Geo.*
Sur. Terr., vol. 6, p. 79, *Permian*.
PARIOTICHUS, Cope, 1878, *Pal. Bull.*, No. 29,
 and *Proc. Am. Phil. Soc.*, vol. 17, p. 508.
 [Ety. *pareia*, the cheek; *teichos*, a wall.]
 Founded on the cranium. Temporal
 fossæ were covered by a roof continu-
 ous with the postorbital region; zygo-
 matic arch extends low down; orbits
 lateral; muzzle short, with terminal
 nares; teeth rooted, crowns obtuse, with
 cutting edge. Type *P. brachyops*.
brachyops, Cope, 1878, *Pal. Bull.*, No. 29,
 and *Proc. Am. Phil. Soc.*, vol. 17, p. 508,
Permian.
megalops, Cope, 1883, *Pal. Bull.*, No. 36,
 and *Proc. Am. Phil. Soc.*, vol. 20, p. 630,
Permian.
Parioxys, Cope, 1878, *Pal. Bull.*, No. 29, and
Proc. Am. Phil. Soc., vol. 17, p. 521.
 [Ety. *pareia*, cheek; *oxys*, sharp.] Syn.
 for *Eryops*.
ferricolus, see *Eryops ferricolus*.
PELLON, Wyman, 1868, *Proc. Acad. Nat. Sci.*
Phil., p. 211. [Ety. proper name.]
 Founded upon an inferior view of part
 of the skeleton; head as broad as long,

semielliptical; angles of mandibles pro-
 ject backward; mandibular rami slen-
 der, curved; vertebræ have centra as
 broad as long, and medially contracted;
 fore limbs stout; humeri long, thick-
 ened proximally, flattened and dilated
 distally; ulna and radius united proxi-
 mally, narrowing the arm proximally
 while expanded distally; left hand ex-
 hibits four digits, of which the third
 from the inner is the longer; number
 of phalanges is 2, 3, 4?; carpus not os-
 seous. Type *P. lyelli*.



FIG. 1190.—*Pellon lyelli*.

lyelli, Wyman, 1858, (*Raniceps lyelli*) *Am.*
Jour. Sci. and Arts, 2d ser., vol. 25, p. 158,
 and *Ohio Pal.*, vol. 2, p. 389, *Coal Meas.*

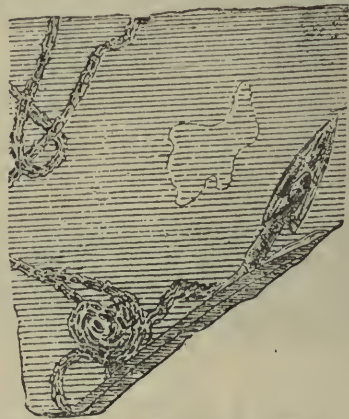


FIG. 1191.—*Phlegethontia llnearis*.

PHLEGETHONTIA, Cope, 1871, *Proc. Am.*
Phil. Soc., p. 177. [Ety. *Phlegethon*, a
 burning river of hell.] Head elongate,

triangular; body and tail extremely elongate; dorsal vertebræ without ribs, caudals without dilated spines; no vertebræ armature; no limbs. Type *P. linearis*.

linearis, Cope, 1871, Proc. Am. Phil. Soc., p. 177, and Ohio Pal., vol. 2, p. 367, Coal Meas.

serpens, Cope, 1871, Proc. Am. Phil. Soc., p. 177, and Ohio Pal., vol. 2, p. 367, Coal Meas.

PLEUROPTYX, Cope, 1875, Ohio Pal., vol. 2, p. 370. [Ety. *pleura*, a rib; *ptyx*, a fold, wing.] Founded upon the vertebral column and ribs; vertebræ of moderate length, zygapophyses well developed, short neural spine in the dorsal region, not sculptured; ribs short, stout, and support a wing on the posterior or convex border, which expands downward, and then abruptly contracts to the shaft; it is broad and truncate, and includes a medullary cavity partially filled with cancellated tissue. Type *P. clavatus*.
clavatus, Cope, 1875, Ohio Pal., vol. 2, p. 370, Coal Meas.

PTYONIUS, Cope, 1875, Ohio Pal., vol. 2, p. 373. [Ety. *ptyon*, a fan.] Form elongate, with long tail and lanceolate cranium; limbs weak, only posterior known; three pectoral shields; abdomen protected by packed osseous rods arranged in chevron with angle directed forward; neural and hæmal spines of caudal vertebræ expanded and fan-like; ribs well developed; teeth small, numerous, simple or grooved. Type *P. nummifer*.

marshi, Cope, 1875, (Colosteus marshi,) Trans. Am. Phil. Soc., vol. 14, p. 24, and Ohio

FIG. 1192.—*Ptyonius serrula*.

Pal., vol 2, p. 375, Coal Meas.
nummifer, Cope, 1875, Ohio Pal., vol. 2, p. 374, Coal Meas.

pectinatus, Cope, 1868, (Sauroplesura pectinata, Proc. Acad. Nat. Sci., p. 216, and Ohio Pal., vol. 2, p. 377, Coal Meas.

serrula, Cope, 1871, (Oestocephalus serrula,) Proc. Am. Phil. Soc., p. 177, and Ohio Pal., vol. 2, p. 379, Coal Meas.

vinchellanus, Cope, 1871, (Oestocephalus vinchellanus,) Proc. Am. Phil. Soc., p. 177, and Ohio Pal., vol. 2, p. 376, Coal Meas.

Pygopterus, Agassiz, 1833, Recherch. Poiss. Foss.

scutellatus, see *Colosteus scutellatus*.

Raniceps, Wyman, 1858, Am. Jour. Sci. and Arts. The name was preoccupied by Cuvier, and Pelion has been substituted. *lyelli*, see *Pelion lyelli*.

Rhachitonus, Cope, 1878, Pal. Bull. No. 29, and Proc. Am. Phil. Soc., vol. 17, p. 526. [Ety. *rachis*, the backbone; *tomos*, cut.] Syn. for *Eryops*.

valens, syn. for *Eryops megacephalus*.

SAUROPLEURA, Cope, 1868, Proc. Acad. Nat. Sci. Phil., p. 215, and Ohio Pal., vol. 2, p. 402. [Ety. *sauros*, a lizard; *pleuron*, a rib.] Vertebræ and ribs well developed; limbs four, large; five digits in the fore foot; carpus cartilaginous; ventral armature of closely arranged rhomboidal scuta, arranged in lines closely placed in chevrons, with the angle anterior; teeth of Labyrinthodont type, with deeply inflected enamel and acute apex. Type *S. digitata*.

digitata, Cope, 1868, Proc. Acad. Nat. Sci. Phil., p. 216, and Ohio Pal., vol. 2, p. 403, Coal Meas.

longipes, see *Tuditatus longipes*.
newberryi, Cope, 1875, Ohio Pal., vol. 2, p. 404, Coal Meas.

pectinata, see *Ptyonius pectinatus*.
remex, see *Oestocephalus remex*.

SAUROPS, Lea, 1849, Trans. Am. Phil. Soc., vol. 10. [Ety. *sauros*, a lizard; *pous*, foot.] Founded upon tracks; five robust toes, the inner having the same direction as the others, and not divergent as in *Chirotherium*; palm or sole short, wide. Type *S. primævus*.

remex, see *Oestocephalus remex*.

primævus, Lea, 1849, Trans. Am. Phil. Soc., vol. 10, Coal Meas.
sydnensis, Dawson, 1868, Acad. Geol., p. 358, Coal Meas.
ungeifer, Dawson, 1872, Geo. Mag. Lond., vol. 9, Coal Meas.

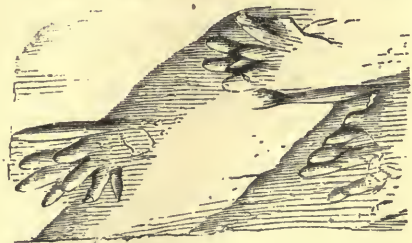


FIG. 1193.—*Saurops primævus*.

primævus, Lea, 1849, Trans. Am. Phil. Soc., vol. 10, Coal Meas.
sydnensis, Dawson, 1868, Acad. Geol., p. 358, Coal Meas.
ungeifer, Dawson, 1872, Geo. Mag. Lond., vol. 9, Coal Meas.

- SPHENACODON, Marsh, 1878, Am. Jour. Sci., and Arts, 3d ser., vol. 15, p. 410. [Ety. *sphen*, a wedge; *akis*, a barb; *odous*, tooth.] Type *S. ferox*.
- ferox*, Marsh, 1878, Am. Jour. Sci. and Arts, 3d ser., vol. 15, p. 410, Permian.
- SPHEROPEZIUM, King, 1845, Am. Jour. Sci. and Arts, vol. 48, p. 345. [Ety. *sphaira*, sphere; *pezia*, sole of the foot.] Founded upon tracks representing a round depression for the ball of the foot, and five depressions for digits. Type *S. leptodactylum*.
- leptodactylum*, King, 1845, Am. Jour. Sci. and Arts, vol. 48, p. 345, Coal Meas.
- ovidactylum*, King, 1845, Am. Jour. Sci. and Arts, vol. 48, p. 347, Coal Meas.
- pachydactylum*, King, 1845, Am. Jour. Sci. and Arts, vol. 48, p. 346, Coal Meas.
- thærodactylum*, King, 1845, Am. Jour. Sci. and Arts, vol. 48, p. 346, Coal Meas.
- THENAROPUS, King, 1845, Am. Jour. Sci. and Arts, vol. 48, p. 343. [Ety. *thenaros*, palm of the hand; *pous*, foot.] Founded upon tracks. Type *T. heterodactylus*.
- heterodactylus*, King, 1845, Am. Jour. Sci. and Arts, vol. 48, Coal Meas.
- leptodactylus*, King, 1845, Am. Jour. Sci. and Arts, vol. 48, Coal Meas.
- ovidactylus*, King, 1845, Am. Jour. Sci. and Arts, vol. 48, Coal Meas.
- pachydactylus*, King, 1845, Am. Jour. Sci. and Arts, vol. 48, Coal Meas.
- sphærodactylus*, King, 1845, Am. Jour. Sci. and Arts, vol. 48, Coal Meas.
- THEROPLEURA, Cope, 1878, Pal. Bull. No. 29, and Proc. Am. Phil. Soc., vol. 17, p. 519. [Ety. *thero*, to burn; *pleura*, side.] Pelycosaurian reptiles with free neural arch, and a capitular costal articulation on the centrum, and no known intercentrum; neural spines not elongate; teeth equal. Type *T. retroversa*.
- obtusidens*, Cope, 1880, Pal. Bull. No. 32, p. 4, Permian.
- retroversa*, Cope, 1878, Pal. Bull. No. 29, and Proc. Am. Phil. Soc., vol. 17, p. 519, Permian.
- triangulata*, Cope, 1878, Pal. Bull. No. 29, and Proc. Am. Phil. Soc., vol. 17, p. 520, Permian.
- uniformis*, Cope, 1878, Pal. Bull. No. 29, and Proc. Am. Phil. Soc., vol. 17, p. 519, Permian.
- THYRSIDIUM, Cope, 1875, Ohio Pal., vol. 2, p. 365. [Ety. *thyrsos*, a rod with leaves.] Founded upon a latero-inferior view of the spinal column; diapophyses enlarged, fan-like; centra contracted; abdomen protected by hair-like rods in chevron, with angle directed forward. Type *T. fasciculare*.
- fasciculare*, Cope, 1875, Ohio Pal., vol. 2, p. 365, Coal Meas.
- TRIMERORACHIS, Cope, 1878, Pal. Bull. No. 29, and Proc. Am. Phil. Soc., vol. 17, p. 524. [Ety. *trimeros*, tripartite; *rachis*,

the backbone.] Centrum rhachitiformous, represented by three cortical ossifications of the chorda-sheath, a median inferior and two lateral; the lateral are distinct, and in contact with the neurapophyses above, and the posterior border of the median segment in front; neural arch joins the lateral elements, and is in slight contact with the lateral summits of the inferior element; the halves of the neural arch are co-ossified, and support zygapophyses, but no neural spine; cranial bones sculptured; parasphenoid flat; external nostrils large, superior; angle of mandible little produced; glenoid cavity transverse; deep internal pterygoid fossa; no coronoid process; symphysis short; teeth conic, two series in the upper jaw, the large ones anterior; ribs short, heads expanded. Type *T. insignis*.

bilobatus, Cope, 1883, Pal. Bull. No. 36, and Proc. Am. Phil. Soc., vol. 20, p. 629, Permian.

insignis, Cope, 1878, Pal. Bull. No. 29, and Proc. Am. Phil. Soc., vol. 17, p. 524, Permian.

TUDITANUS, Cope, 1871, Proc. Am. Phil. Soc., p. 177, and Ohio Pal., vol. 2, p. 391.

[Ety. proper name.] Cranium broad, flat, bones sculptured; teeth on premaxillary and maxillary bones of nearly equal sizes; three pectoral shields, sculptured externally; form lizard-like; two pairs of medium limbs; no chevron abdominal rods. Type *T. punctulatus*.

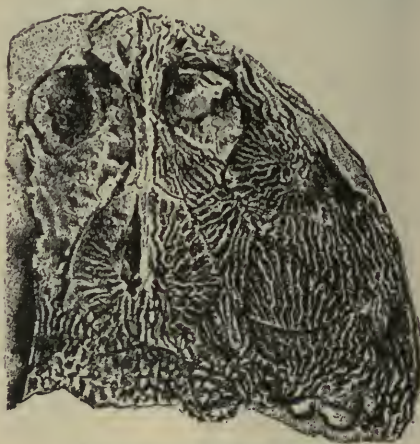


FIG. 1194.—*Tuditanus radiatus*.

brevirostris, Cope, 1874, Trans. Am. Phil. Soc., vol. 14, p. 10, and Ohio Pal., vol. 2, p. 393, Coal Meas.

huxleyi, Cope, 1874, Trans. Am. Phil. Soc., p. 10, and Ohio Pal., vol. 2, p. 397, Coal Meas.

longipes, Cope, 1874, (Sauropleura longipes,) Trans. Am. Phil. Soc., vol. 14, p. 10, and Ohio Pal., vol. 2, p. 398, Coal Meas.

- mordax*, Cope, 1875, Ohio Pal., vol. 2, p. 395, syn. for *Ceraterpeton punctolinatum*.
- obtusus*, Cope, 1868, (*Dendererpeton obtusum*), Proc. Acad. Nat. Sci. Phil., p. 213, and Ohio Pal., vol. 2, p. 396, Coal Meas.
- punctulatus*, Cope, 1874, Trans. Am. Phil. Soc., vol. 14, p. 10, and Ohio Pal., vol. 2, p. 392, Coal Meas.
- radiatus*, Cope, 1874, Trans. Am. Phil. Soc., vol. 14, p. 10, and Ohio Pal., vol. 2, p. 394, Coal Meas.
- tabulatus*, Cope, 1877, Proc. Am. Phil. Soc., p. 577, Coal Meas.
- ZATRACHYS, Cope, 1878, Pal. Bul. No. 29, and Proc. Am. Phil. Soc., vol. 17, p. 523. [Ety. *za*, an intensive; *trachys*, rough.] Teeth in single series, and anchylosed to the bottom of a shallow groove, the external boundary of which is most prominent, so the attachment of the teeth is shortly pleurodont; teeth have conic crowns and basal grooves; cranium sculptured, its table with a notch on each side; two occipital condyles; no intercalary horns. Type *Z. serratus*.
- apicalis*, Cope, 1881, Am. Naturalist, vol. 15, p. 1020, Permian.
- serratus*, Cope, 1878, Pal. Bull. No. 29, and Proc. Am. Phil. Soc., vol. 17, p. 523, Permian.



GLOSSARY

— OF —

SPECIFIC NAMES IN USE IN NORTH AMERICAN PALÆONTOLOGY.

Every adjective specific name must agree in gender with the genus to which it belongs; hence, the masculine, feminine, and neuter endings are indicated. Nouns do not change the termination, but remain the same, no matter what the gender of the genus may be. The names of persons and places are not included in this Glossary, because they should be known by the terminations they take when reduced to specific names.

Abacus—A table divided into squares.
Abbreviatus, a, um—Abbreviated, shortened.
Abnormis, e—Abnormal.
Abruptus, a, um—Abrupt, broken.
Abscissus, a, um—Steep, abrupt.
Acanthophorus, a, um—Thorn bearing.
Acanthoptera—Spine-wing.
Accinctus, a, um—Girded.
Acervulosus, a, um—Many clustered together.
Acervus—A heap considered as a body.
Acicula—A small pin or needle.
Acicularis, e—Full of small pins or needles, acicular.
Aciculatus, a, um—Like a small needle.
Acidentatus, a, um—Needle-toothed, sharp-toothed.
Acies—The edge or sharp point.
Acinaciformis, e—Scimitar-shaped.
Acinus—Any berry, or the kernel in the berry.
Aclis—A small javelin.
Acmea—Edge, point.
Acrocarpus, a, um—Pointed fruit.
Actuarius, a, um—Swift, agile.
Aculeatus, a, um—Thorny, pointed, sharp.
Aculeolatus, a, um—Thorny.
Acuminatus, a, um—Sharp-pointed.
Acus—A pin or needle.
Acutangulus—Acute angle.
Acuticosta—Sharp rib.
Acutidactylus—Sharp-fingered.
Acutifolius, a, um—Having acute leaves.
Acutiliratus, a, um—Sharp-ridged.
Acutiplicatus, a, um—Sharp-plicated.
Acutiradiatus, a, um—Sharp-rayed.
Acutirostris—Sharp beak.
Acutus, a, um—Somewhat pointed.
Acutus, a, um—Acute, sharpened.
Adiantites—From resemblance to *Adiantum*.
Adiantoides—Like *Adiantum*.

Adductus, a, um—Stretched, contracted.
Adjunctivus, a, um—Joined, united.
Adjunctus, a, um—Joined, connected.
Adnascens—Growing upon.
Adnatus, a, um—Adnate.
Adorabilis, e—Worthy of adoration.
Adultus, a, um—Adult.
Aduncus, a, um—Bent inward, hooked.
Ægilops—An acorn.
Æmulus, a, um—Emulous, vying with.
Ænigma—Obscure, a riddle.
Æqualis, e—Equal, like.
Æquibrachiatus, a, um—Equal-armed.
Æquicostatus, a, um—Equal-ribbed.
Æquidistans—Equidistant.
Æquilateralis, e—Equilateral.
Æquiradiatus, a, um—Equal-rayed.
Æquivalvis, e—Equal-valved.
Æquus, a, um—Plain, even, level, equal.
Affinis, e—Related, or near to.
Agellus—A small field.
Agglomeratus, a, um—Gathered into a mass.
Aggregatus, a, um—Aggregated.
Agilis, e—Agile, nimble.
Agrarius, a, um—Pertaining to fields or country.
Agrestis, e—Pertaining to the country.
Alatus, a, um—Winged.
Albus, a, um—White.
Alicornis, e—Elk-horned.
Alectiformis, e—In form like *Alecto*.
Aliger, gera, gerum—Bearing wings.
Alsus, a, um—Cold.
Alternans—Alternating.
Alternatus, a, um—Alternate.
Alterniradiatus, a, um—Alternately rayed.
Alternistriatus, a, um—Alternately striated.
Alternus, a, um—Alternate.
Altilis, e—Flattened.
Altidorsatus, a, um—High-backed.
Altiplicatus, a, um—Having high plications.
Altirostris—High beak.

- Altus, a, um—High, great, deep.
 Alveatus, a, um—Hollowed out like a trough.
 Alveolaris, e—Small-channeled.
 Alveolatus, a, um—Hollowed out.
 Alveolus—A small cavity.
 Amarus, a, um—Bitter, brackish.
 Ambiguus, a, um—Doubtful, changeable.
 Amœnus, a, um—Pleasant, charming.
 Amphibolus, a, um—Ambiguous.
 Amplexicaulis, e—Embracing the stalk or stem.
 Amplexus—An encircling, surrounding.
 Ampliatus, a, um—Enlarged.
 Amplus, a, um—Ample, spacious, roomy.
 Ampullaceus, a, um—In the form of a flask.
 Amygdaliformis, e—In form like the almond.
 Anabathra—A ladder.
 Analogus, a, um—Analogous.
 Anatiformis, e—Like Anatifa.
 Anatinus, a, um—Of or pertaining to the duck.
 Anceps—Double, two-headed, doubtful.
 Anchoralis, e—Of or pertaining to an anchor.
 Acella—A hand-maid.
 Anellus—A little ring.
 Anguineus, a, um—Serpent-like.
 Angularis, e—Angular, cornered.
 Angulatus, a, um—Having corners.
 Angulosus, a, um—Full of corners.
 Angustatus, a, um—Narrowed.
 Angustifolius, a, um—Narrow-leaved.
 Angustipinna—A narrow feather.
 Angustus, a, um—Narrow, straight, not spacious.
 Annectans—Connected together.
 Annularifolius, a, um—Having ring-shaped leaves.
 Annulatus, a, um—Annulated, ringed.
 Annuliferus, a, um—Ring-bearing.
 Anomalus, a, um—Anomalous, not coming under the rule.
 Anonymus, a, um—Nameless.
 Antceptus, a, um—Anticipated.
 Antennarius, a, um—Pertaining to the antennæ.
 Antheloideus, a, um—Like Anthelia.
 Anthracinus, a, um—Coal-black.
 Antiquarius, a, um—Pertaining to antiquity.
 Antiquatus, a, um—Antiquated, ancient.
 Antiquus, a, um—Ancient, old.
 Annularis, e—Relating to the signet ring.
 Annularius, a, um—Of or pertaining to the signet ring.
 Annulatus, a, um—Annulated, ringed.
 Annulus—A ring.
 Apertus, a, um—Opened, uncovered.
 Apicalis, e—Sharp-pointed.
 Apiculatus, a, um—Having a pointed termination.
 Aplatus, a, um—Flattened.
 Appendiculatus, a, um—Having lateral appendages.
 Approximatus, a, um—Approximated, approaching near to.
 Aprinus, a, um—Pertaining to a wild boar.
 Aquilinus, a, um—Pertaining to the eagle, aquiline.
 Arachniformis, e—In form like a spider.
 Arachnoideus, a, um—Like a cobweb.
 Araneolus—A small spider.
 Aratus, a, um—Plowed.
 Arborescens—Tree-like, arborescent.
 Arboreus, a, um—Pertaining to a tree.
 Arbuseula—A shrub.
 Arcanus, a, um—Closed, shut up.
 Archimediiformis, e—Archimediiform.
 Arcticus, a, um—Arctic.
 Artifossa—Close-wrinkle.
 Arctiporus, a, um—Having narrow pores.
 Arctostriatus, a, um—Closely striated.
 Arctirostratus, a, um—Narrow-beaked.
 Arctisegmentus, a, um—Having narrow segments.
 Arctus, a, um—Closed, pressed together, short.
 Arcuatus, a, um—Bent, curved like a bow.
 Arcuosus, a, um—Full of arches, bent over.
 Arenaceus, a, um—Sandy.
 Arenarius, a, um—Pertaining to sand.
 Arenosus, a, um—Sandy.
 Areolatus, a, um—Divided into irregular squares, or angular spaces.
 Argentarius, a, um—Of or pertaining to silver.
 Argenteus, a, um—Of or made of silver.
 Argenturcicus, a, um—Of or belonging to Silver City.
 Argutus, a, um—Sharply defined, distinct.
 Arietinus, a, um—Of or from a ram.
 Armatus, a, um—Armed, equipped.
 Armiger, era, erum—Armed, war-like.
 Armosus, a, um—Many armed.
 Arrectarius, a, um—Erect.
 Arrectus, a, um—Erect, steep.
 Arrosus, a, um—Gnawed.
 Articulatus, a, um—Furnished with joints, articulated.
 Articulosus, a, um—Full of knots, or divisions.
 Artemisiifolius, a, um—Like the plant Artemisia.
 Arundinaceus, a, um—Like a reed.
 Aspectans—Expected, looked for.
 Asper, era, erum—Rough, uneven.
 Asperatus, a, um—Roughened, irregular.
 Aspersus, a, um—Scattered, dispersed.
 Asprtilis, e—Rough.
 Assimilis, e—Similar.
 Atavus—Ancestor.
 Attenuatus, a, um—Made thin, attenuated.
 Attritus, a, um—Worn.
 Aucella—A little bird.
 Audaculus, a, um—Bold.
 Augustatus, a, um—Majestic.
 Augustus, a, um—August.
 Auleticus, a, um—That is suitable for a pipe.
 Aureatus, a, um—Adorned.
 Auricula—The ear.
 Auritus, a, um—Eared.
 Australis, e—Southern.
 Auxiliarius, a, um—Helping.
 Avicula—A small bird.
 Avitus, a, um—Ancestral.
 Avus—Grandfather.
 Bacca—A berry, a small, round fruit.
 Bacillum—A small staff.
 Baculiformis, e—Staff-shaped.

- Faculum*—A staff or cudgel.
Balanoides—Like *Balanus*.
Balanus—An acorn.
Balteatus, a, um—Belted.
Barbatus, a, um—Bearded.
Barydactylus, a, um—Heavy-fingered.
Basalis, e—Pertaining to the base.
Basalticus, a, um—Basaltic.
Basilaris, e—Relating to the base.
Basilicus, a, um—Splendid.
Belemnura—Having a tail like a dart.
Bellarugosus, a, um—Beautifully wrinkled.
Bellatrema—Beautiful opening.
Bellatulus, a, um—Pretty, neat.
Bellicinctus, a, um—Beautifully banded.
Bellicosus, a, um—Warlike.
Bellifer, era, erum—Warlike.
Bellilineatus, a, um—Beautifully lined.
Bellipunctus, a, um—Beautifully dotted.
Bellistriatus, a, um—Beautifully striated.
Bellulus, a, um—Very beautiful, pretty.
Bellus, a, um—Beautiful.
Bertholletiformis, e—Like *Bertholletia*.
Biacutus, a, um—Two-pointed.
Bialveatus, a, um—Two-channeled.
Biangulatus, a, um—Two-angled.
Bicarinatus, a, um—Two-keeled.
Bicarpus, a, um—Two-fruited.
Biceps—Two-headed.
Bicinctus, a, um—Two-banded.
Biclavatus, a, um—Two-clubbed.
Bicorniger, era, erum—Two-horned.
Bicornis, e—Two-horned.
Bicornutus, a, um—Two-horned.
Bicostatus, a, um—Two-ribbed.
Bicristatus, a, um—Double-peaked or two-crested.
Bicuspidatus, a, um—Two-pointed.
Bidens—Having two teeth, two-pronged.
Bidentatus, a, um—Double-toothed.
Bidorsalis, e—Double-backed.
Bidorsatus, a, um—Having a double back.
Bifarius, a, um—In two ways or parts, double.
Bifidatus, a, um—Cleft into two parts.
Bifidus, a, um—Bifid, cloven in two parts.
Bifissus, a, um—Cleft into two parts.
Bifoliatus, a, um—Two-leaved.
Biforatus, a, um—Two-holed or double-doored.
Biformatus, a, um—Two-shaped.
Biformis, e—Two-formed.
Bifrons—With two foreheads.
Bifurca—A two-pronged fork.
Bifurcatus, a, um—Bifurcated, forked.
Bifurcus, a, um—Two-pronged.
Bimbricatus, a, um—Double-imbricated.
Bijugus, a, um—Yoked two together.
Bilabiatulus, a, um—Two-lipped.
Bilamellatus, a, um—Having double lamellæ.
Bilateralis, e—Two-sided.
Bilineatus, a, um—Two-lined.
Biliratus, a, um—Two-furrowed.
Bilix—Woven with a double thread, two-threaded.
Bilobatus, a, um—Two-lobed.
Bilobus, a, um—Two-lobed.
Bimesialis, e—Having two middle parts.
Bimacronatus, a, um—Two-poin'ed.
Binervis, e—Two-nerved.
Binodus—Double knot.
Binumbonatus, a, um—Having double umbones.
Bipartitus, a, um—Two-parted.
Bipennis, e—Two-winged.
Biplicatus, a, um—Two-plicated, or in two-folds.
Bipunctatus, a, um—Bipunctate.
Bipyramidalis, e—Double-pyramidal.
Bisectus, a, um—Divided.
Biserialis, e—In two series.
Biseriatus, a, um—Having two rows or series.
Biserrulatus, a, um—Double-serrulated.
Bisinuatus, a, um—Having two depressions or furrows.
Bispinulatus, a, um—Two-spined.
Bispiralis, e—Two-whorled.
Bistriatus, a, um—Two-striated.
Bisulcatus, a, um—Two-furrowed.
Bisulus, a, um—Cloven.
Bituberculatus, a, um—Double-tuberculated.
Biturbinatus, a, um—Double-turbinated.
Bivertex—Double head.
Bivius, a, um—Having two ways or passages.
Bivittatus, a, um—Two-banded.
Bivolvis, e—Two-rolled.
Blatta—A cockroach or moth.
Blattinoides—Like *Blattina*.
Bombifrons—Having a hollow front.
Borassifolius, a, um—Leaved like *Borassus*.
Borealis, e—Northern.
Bovidens—Ox tooth.
Bovipedalis, e—Ox-footed.
Brachialis, e—Having arms.
Brachiatus, a, um—Having arms.
Brachium—An arm.
Brachynotus, a, um—Short-ridged.
Brachyops—Short sight.
Bracteatus, a, um—Covered with plates, beautiful.
Breviceps—Short head.
Brevicornis, e—Short-horned.
Brevicostatus, a, um—Short-ribbed.
Breviculus, a, um—Somewhat shortened.
Brevicurvatus, a, um—Short-curved.
Brevifolius, a, um—Short-leaved.
Brevilineatus, a, um—Short-lined.
Brevilobatus, a, um—Short-lobed.
Brevilobus—Short lobe.
Brevimarginatus, a, um—Short-margined.
Brevinodus—Short node or short knot.
Breviplicatus, a, um—Short-plicated.
Breviposticus, a, um—Made short behind.
Breviradiatus, a, um—Short-rayed.
Brevirostris, e—Short beak.
Brevis, e—Short.
Brevisulcatus, a, um—Short-furrowed.
Breviusculus, a, um—Very short.
Brisa—Grape-skins.
Bryonoides—Like moss.
Buccinum—A trumpet or horn.
Bucculentus, a, um—Wide-mouthed.
Bufo—A toad.
Bulbaceus, a, um—Bulbous.

- Bulbosus, a, um—Bulbous.
 Bulbus—A bulb.
 Bulimiformis, e—Like Bulimus.
 Bulla—A round object, bubble.
 Bullatus, a, um—Studded with knobs.
 Bulloides—Like a bubble.
 Bullulatus, a, um—Little vesicled.
 Bursa—A purse.
 Bursiformis, e—Purse-shaped.
- Cadens**—Falling, terminating.
Caduceus—The herald's staff.
Cæcigenus, a, um—Born blind.
Cælamen—A bass relief.
Cælator—A carver.
Cælatus, a, um—Engraved, carved.
Cespitosus, a, um—Turf-like.
Calamitoideus, a, um—Like a Calamite.
Calamus—A reed.
Calantica—A covering for the head.
Calathus—A wicker basket.
Calcaratus, a, um—Spurred, spur-shaped.
Calcariformis, e—Like a spur.
Calceolus—A small shoe.
Calciferus, a, um—Calciferous.
Calculus—A small stone.
Caliculus—A small cup.
Calix—A cup.
Callicephalus, a, um—Having a beautiful head.
Calliteles—A beautiful tail.
Callosus, a, um—Thick-skinned, callous.
Calyceinus—A little calyx.
Calycularis, e—Like a little cup or flower-bud.
Calyculoides—Like a little cup.
Calyculus—A flower-cup.
Calymenoides—Like Calymene.
Calyx—The cup of a flower.
Cameratus, a, um—Arched.
Cameriferus, a, um—Chambered.
Cammarus—A lobster.
Campaniformis, e—Bell-formed.
Campanulatus, a, um—Bell-shaped.
Camurus, a, um—An arch, turned inward.
Canaliculatus, a, um—Channeled, canalculated.
Canalis—A channel or groove.
Cancelatus, a, um—Cross-barred, cancellated.
Cancellosus, a, um—Finely cancellated or latticed.
Canna—A reed.
Canneus, a, um—Made of reeds.
Canniformis—Like Canna.
Cannaliratus, a, um—Reed-furrowed.
Cannula—A small reed.
Capax—Large, spacious.
Capillaceus, a, um—Similar to hair, stringy.
Capillaris, e—Of or pertaining to the hair.
Capillatus, a, um—Having hair.
Capillosus, a, um—Very hairy.
Capitalis, e—Relating to the head.
Capitatus, a, um—Having a head.
Capitellum—A small head.
Capitolinus, a, um—Pertaining to the capitol, a tower.
Caponiformis, e—Capon-formed.
Capreolus—Props, stays.
- Capularis, e**—Pertaining to a coffin.
Capuloides—Like a capulus.
Capulus—A coffin or a handle.
Caput-serpentis—Serpent-head.
Caput-testitudinis—Turtle-head.
Carabus—A small wicker boat.
Carbonarius, a, um—Of or relating to coal.
Carcharidens—Dog-fish tooth.
Cardiiformis, e—Like a cardium.
Cardinalis, e—Of or pertaining to a door-hinge, or principal.
Cardinatus, a, um—Jointed, fitted to, hinged.
Cardineus, a, um—Of or pertaining to a door-hinge.
- Carica**—A kind of fig.
Carinatus, a, um—Keeled.
Cariniferus, a, um—Keel-bearing.
Carnosus, a, um—Fleshy.
Carus, a, um—Precious, valued.
Castanea—A chestnut.
Catactus, a, um—Frail, easily broken.
Catastomus, a, um—Gaping at the lower end.
Catenoides—Chain-like.
Catenulatus, a, um—A little chain.
Catilliformis, e—Dish-shaped.
Catilloides—Dish-like.
Catillus—A small dish.
Catinus—A bowl.
Caudagalli—Tail of a cock.
Caudatus, a, um—Having a tail.
Cauliculus—Small stalk or stem of a plant.
Cavernosus, a, um—Full of hollows.
Cavifolius, a, um—Hollow-leaved.
Cavumbilicatus, a, um—Having a hollow umbilicus.
- Cavumbona**—Hollow umbo.
Cavus, a, um—Hollow, concave.
Celator—A concealer, hider.
Celebrus, a, um—Abundant.
Celer—Swift, fleet.
Cellulosus, a, um—Full of cells.
Celsipora—High pore.
Celsus, a, um—High.
Centennialis, e—The 100th year.
Centralis, e—In the middle, central.
Centratus, a, um—Central.
Centrilineatus, a, um—Central-lined.
Centronatus, a, um—Having knots or points.
Centrosus, a, um—In the central point.
Cerasiformis, e—Like a dried cherry.
Cerithioides—Like Cerithium.
Cervicornis, e—Deer-horned.
Cervinus, a, um—Pertaining to a deer.
Cessator—An idler, loiterer.
Cetratus, a, um—Shield-bearing.
Chærophylloides—Like Chærophyllum.
Chiriformis, e—Hand-shaped.
Chiormorphus, a, um—Hand-formed.
Chromaticus, a, um—Chromatic, colored.
Chrysalis—Chrysalis.
- Cicatricosus, a, um**—Full of scars.
Cicéronius—Having warts.
Ciliatus, a, um—Haired on the margin, fringed.
Cinctosus, a, um—Full of bands, girded.
Cinctulus—A small girt.

- Cinctura—A girdle.
 Cinctus, a, um—Banded, girded.
 Cinctutus, a, um—Girded.
 Cingulatus, a, um—Encircled with lines, girded.
 Cingulosus, a, um—Covered with lines or zones.
 Cingulum—A zone.
 Circinatus, a, um—Compassed, rounded.
 Circinctus, a, um—Encompassed.
 Circularis, e—Circular, round.
 Circulus—A circle.
 Circumiratus, a, um—Circular-lined.
 Cistella—A small box.
 Cistula—A little chest or coffer.
 Citus, a, um—Swift, speedy.
 Clarus, a, um—Clear, brilliant, distinct.
 Clathratus, a, um—Cross-barred, latticed.
 Clausus, a, um—Closed up.
 Clava—A stick.
 Clavacoideus, a, um—Club-shaped.
 Clavatulus—A little club.
 Clavatus, a, um—Knotted, club-shaped.
 Clavicula—A small twig.
 Clavifrons—Having a club-like front.
 Claviger—A club-bearer.
 Clavigerus, a, um—Club-bearing.
 Clavis—A bar.
 Clavulus—A little club, a small swelling.
 Clavus—A nail, spike.
 Clinatus, a, um—Inclined, bent.
 Clinocameratus, a, um—Curve-chambered.
 Clipeatum—Furnished with a shield.
 Clipeiformis, e—Shield-like.
 Clivosus, a, um—Full of hills.
 Clivulatus, a, um—Having little hills.
 Clivulus—A little hill.
 Clymenioides—Like Clymenia.
 Clypeatus, a, um—Armed with a shield.
 Clytis—Celebrated.
 Coalescens—Growing together.
 Coalitus, a, um—Grown together.
 Coaptus, a, um—Closely joined.
 Coarctatus, a, um—Compressed, joined.
 Cochlearis, e—In the form of a snail shell.
 Cochleatus, a, um—Spiral.
 Cochleola—A small snail.
 Cognatus, a, um—Near to, cognate.
 Cohærens—Adhering together.
 Collatus, a, um—Joined together, collected.
 Collectus, a, um—Collected.
 Colliculus—A little hill.
 Colligatus, a, um—Bound together, fastened.
 Collinus, a, um—Hilly.
 Colon—The great intestine.
 Colubrellus—A little snake.
 Colubrinus, a, um—Like a snake.
 Colubrosus, a, um—Winding.
 Columella—A small column.
 Columellatus, a, um—Pillared.
 Columnaris, e—Columnar.
 Comes—A companion.
 Comis, e—Friendly, nice, delicate.
 Communis, e—Common.
 Commutatus, a, um—Changed, altered.
 Comosus, a, um—Hairy.
 Compactilis, e—Pressed together.
 Compactus, a, um—Compact.
 Compertus, a, um—Discovered, ascertained.
 Complatanus, a, um—Level-d, smoothed.
 Complexatus, a, um—Encircled.
 Complexus, a, um—Surrounded, encircled.
 Compressus, a, um—Compressed.
 Comptus, a, um—Ornamented, elegant.
 Conatus—An effort.
 Concavus, a, um—Concave.
 Concentricus, a, um—Concentric.
 Concinnulus, a, um—Small and beautiful.
 Concinnus, a, um—Beautiful, neat.
 Conditus, a, um—Joined.
 Confectus, a, um—Completed.
 Confertus, a, um—Pressed close together.
 Confervoides—Like Conferva.
 Confirmatus, a, um—Made firm, established.
 Conflexus—a, um—Bent.
 Confluens—Running together, blended.
 Conformalis, e—Similar.
 Confragosus, a, um—Rough, uneven.
 Confragus, a, um—Rough.
 Confusus, a, um—Mixed together, confused.
 Congener, eris—Congeneric.
 Congestus, a, um—Accumulated, heaped.
 Conglobatus, a, um—Gathered in a round mass.
 Conglomeratus, a, um—Gathered together.
 Congregatus, a, um—Assembled together.
 Congregalis, e—Uniting together.
 Congruens—Corresponding, coinciding, running together.
 Coniculus—A little cone.
 Conicus, a, um—Conical, cone-shaped.
 Conifollis—An inflated cone.
 Conifer, era, erum—Bearing conical fruit.
 Coniformis, e—Cone-shaped.
 Conifrons—Having a conical front.
 Coniger, era, erum—Bearing fruit of a conical form.
 Conjugans—Joined, united.
 Conjunctivus, a, um—Connecting.
 Connatus, a, um—Connate, united.
 Connivens—Dissembling, closing.
 Conoideus, a, um—Somewhat conical.
 Consimilis, e—Wholly similar.
 Consobrinus—A cousin, relative, remotely allied.
 Consolidatus, a, um—Consolidated.
 Consolidus, a, um—Very firm.
 Consors—Living in common.
 Conspicuus, a, um—Visible, conspicuous.
 Constans—Standing firm.
 Constellatus, a, um—Very starry.
 Constrictostriatus, a, um—Constricted and striated.
 Constrictus, a, um—Constricted.
 Consuetus, a, um—Customary, related to.
 Contextus, a, um—Entwined.
 Continens—Holding together.
 Contractus, a, um—Contracted.
 Contritus, a, um—Worn out.
 Conulatus, a, um—Having little cones.
 Conulus—A little cone.
 Conus—A cone.
 Convergens—Converging.
 Convexus, a, um—Convex.
 Convolutus, a, um—Rolled up, spiral-whorled.
 Convolvans—Rolled together.
 Coralliferus, a, um—Coral-bearing.

- Corallinum—Like red coral.
 Coralloides—Like coral.
 Corbis—A basket.
 Corbula—A little basket.
 Corbuliformis, e—Like a basket.
 Cordatoovatus, a, um—Cordate-ovate.
 Cordatus, a, um—Cordate, heart-shaped.
 Cordiformis, e—Heart-shaped.
 Coriaceus, a, um—Coriaceous, having the texture of rough skin.
 Coriformis, e—Like Coris.
 Corinthius, a, um—Corinthian.
 Corium—A leather strap, bark.
 Corniculum—A little horn.
 Corniger, era, erum—Horned.
 Cornuformis, e—In the form of a horn.
 Cornu—A horn.
 Cornulum—A little horn.
 Cornutiformis, e—Horn-shaped.
 Cornutus, a, um—Horned.
 Coronarius, a, um—Of or belonging to a wreath.
 Coronatus, a, um—Crowned.
 Corpulentus, a, um—Corpulent.
 Corrugatus, a, um—Corrugated, wrinkled.
 Corticatus, a, um—Covered with bark.
 Corticosus, a, um—Having thick bark.
 Corylus—A hazel.
 Cosciniformis, e—Like Coscinium.
 Costa—A rib.
 Costalis, e—Ribbed.
 Costatiformis, e—Rib shaped.
 Costatulus, a, um—Small ribbed.
 Costatus, a, um—Having ribs, ribbed.
 Costelliferus, a, um—Bearing faint ribs.
 Crassatus, a, um—Thickened.
 Crassibrachiatus, a, um—Thick-armed.
 Crassicaudalis, e—Having a thick hinge.
 Crassicauda—Thick-tail.
 Crassicaulis, e—Having a thick stem.
 Crassicostatus, a, um—Thick-ribbed.
 Crassidens—Having a thick tooth.
 Crassidiscus—A thick disk.
 Crassifrons—Having a thick front.
 Crassimarginatus, a, um—Thick-margined.
 Crassinervis, e—Having thick or dense nerves.
 Crassiradiatus, a, um—Having thick rays.
 Crassitestus, a, um—Like a thick vessel or pot-lid.
 Crassolaris, e—Thickened.
 Crassus, a, um—Thick.
 Cratera—A bowl.
 Crateriformis, e—Cup shaped.
 Cratiulus, a, um—Composed of lattice-work.
 Cratis—Wicker work.
 Crebescens—Frequent, increasing.
 Crebratus, a, um—Made thick, close.
 Crebripora—Having the pores very close.
 Crebrirama—Having dense branches.
 Crebrisepius, a, um—Having many septa.
 Crebristriatus, a, um—Closely striated.
 Crenatocinctus, a, um—Notched around.
 Crenatus, a, um—Crenated, notched.
 Crenistriatus, a, um—Having wrinkled lines.
 Crenulatus, a, um—Crenulated.
 Crepidula—A small sandal.
 Crepiformis, e—Boot-shaped.
 Cretaceous, a, um—Cl alk-1 ke.
- Crebriformis, e—Full of openings like a sieve.
 Cribrarius, a, um—Pertaining to a sieve.
 Cribrosus, a, um—Full of holes like a sieve.
 Crineus, a, um—Hairy.
 Crispatus, a, um—Curled, crisped.
 Crispus, a, um—Curled, wavy.
 Cristatus, a, um—Tufted, crested.
 Cristula—A small crest.
 Cristulatus, a, um—Small-tufted.
 Crossotus, a, um—Fringed.
 Crotaliformis, e—Shaped like a bell.
 Crotalum—A bell, a rattle.
 Crucialus, a, um—Cross-shaped, twisted.
 Cruciferous, a, um—Cross-bearer.
 Cruciformis, e—Cruciform.
 Cruciger, era, erum—Cross bearer.
 Crustosus, a, um—Crusted.
 Crustula—A little shell, crust.
 Cryptatus, a, um—Concealed.
 Cryptodens—Hidden tooth.
 Cucullus—A cap, covering.
 Culeus—A leather bag.
 Culmula—A little stalk or stem.
 Culmus—A stem.
 Cultellatus, a, um—Like a little knife.
 Cultellus—A small knife.
 Cultidactylus, a, um—Elegantly fingered.
 Cultratus, a, um—Knife-formed.
 Cultriformis, e—Shaped like a pruning-knife.
 Cumulatus, a, um—Heaped.
 Cumulus—A heap.
 Cuneatus, a, um—Wedge-form d.
 Cuneiformis, e—Wedge-shaped.
 Cuneolus—A little wedge.
 Cuneus—A wedge.
 Cuniculosus, a, um—Full of caves.
 Cuniculus—A cradle, cavity.
 Cunula—A little cradle.
 Curiosus, a, um—Curious.
 Curticardinalis, e—Short-linged.
 Curtidentatus, a, um—Short-toothed.
 Curtilobus, a, um—Short-lobed.
 Curtirostratus, a, um—Short-beaked.
 Curtus, a, um—Shortened.
 Curvatus, a, um—Curved.
 Curvidens—Having curved teeth.
 Curvijuncturus, a, um—Joining in a curve.
 Curvilineatus, a, um—Having curved lines.
 Curvirostrum—A bent beak.
 Cuspidatus, a, um—Pointed.
 Cyathus—A cup.
 Cyathiformis, e—Cup-shaped.
 Cyclas—Of a round form.
 Cyclonemioides—Like a Cyclonema.
 Cyclopora—Round pore.
 Cycloptera—Circle-wing.
 Cyclopteroides—Like Cyclopterus.
 Cyclostegium—Circular covering.
 Cyclostigma—Having round scars, round-dotted.
 Cyclostomus, a, um—Having a round mouth.
 Cylindraceus, a, um—Like a cylinder.
 Cylindricus, a, m—Cylindrical.
 Cymatoides—Wave-like.
 Cymbalum—A cymbal.

- Cymbiformis, e—Boat-shaped.
 Cymbium—A small drinking cup.
 Cymbula—A small boat.
 Cynosus, a, um—Full of shoots.
 Cynodon—Dog-tooth.
 Cyrtiniformis, e—Like *Cyrtina*.
 Cyrtodontoides—Like *Cyrtodonta*.
 Cyrtolites—A curved stone.
 Cysticus—A little bladder.
- Dactyliformis, e—Finger-shaped.**
 Dactylopus, a, um—Finger-toothed.
 Dactyloides—Like thimble punctures.
 Dactylus—Growing like a finger.
 Debilis, e—Weak, feeble.
 Decabrachiatus, a, um—Ten-armed.
 Decadactylus, a, um—Ten-fingered.
 Decemplicatus, a, um—Ten-plicated.
 Decipiens—Deceiving, doubtful.
 Declivis, e—Sloping.
 Decoratus, a, um—Decorated.
 Decornis—Without horns.
 Decorosus, a, um—elegant.
 Decorticatus, a, um—Barked, decorticated.
 Decorus, a, um—Seemly, suitable, beautiful.
 Decreascens—Decreasing, growing less.
 Decurrens—Decurring, hanging down.
 Decursus, a, um—Downward, running down.
 Decurtatus, a, um—Curtailed.
 Decussatus, a, um—Arranged in pairs that cross each other.
 Defiguratus, a, um—Disfigured.
 Deflectus, a, um—Deflected.
 Deflexus, a, um—Bent, turned aside.
 Deformatus, a, um—Deformed.
 Deformis, e—Deformed, ugly-shaped.
 Degener, eris—Degenerate, unlike the ancestors.
 Delicatus, a, um—Quite delicate.
 Delicatus, a, um—Delicate, thin.
 Delphinocephalus—Dolphin-headed.
 Deltoideus, a, um—Like the Greek letter Delta.
 Deminutivus, a, um—Diminutive.
 Demissus, a, um—Hanging down.
 Demum—At last, solely.
 Denarius, a, um—Containing ten.
 Densifolius, a, um—Dense-leaved.
 Densmamillatus, a, um—Having mammillated teeth.
 Densus, a, um—Dense, thick.
 Dentalium—A plover-share.
 Dentatus, a, um—Toothed.
 Denticulatus, a, um—Denticulated, having small teeth.
 Dentilineatus, a, um—Tooth-lined.
 Denudatus, a, um—Denuded.
 Depareus, a, um—Very scarce.
 Depauperatus, a, um—Impoverished.
 Deperditus, a, um—Impoverished.
 Depressus, a, um—Depressed.
 Desertus, a, um—Deserted, forsaken.
 Desideratus, a, um—Desired, rare.
 Desmopleura—A side band.
 Desquamatus, a, um—Scaled off.
 Devexus, a, um—Sloping.
 Diadematus, a, um—Wearing a diadem.
- Dialophus—Through the neck.
 Dianthus, a, um—Double-flowered.
 Diatretus, a, um—Pierced with holes.
 Dichotomus, a, um—Divided.
 Dictyopteroides—Like *Dictyopterus*.
 Dictyota—Net-worked.
 Dictyum—A net.
 Difficilis, e—Difficult, rough.
 Diffidens—Diffident, distrusting.
 Diffuens—Flowing every way, loose.
 Diffusus, a, um—Diffused, extended.
 Digitalis, e—Belonging to the finger.
 Digitatus, a, um—That has fingers, toes, or claws.
 Dignatus, a, um—Excellent.
 Digonus, a, um—Two-angled.
 Dikrocheilus, a, um—Two-edged.
 Dilatatus, a, um—Dilated, widened.
 Dilatus, a, um—Spread out.
 Diluculum—Day-break, dawning of day.
 Diminutivus, a, um—Diminutive.
 Dimorphus, a, um—Two-formed.
 Diplosteigioides—Like *Diplostegium*.
 Diplostesta—Having two tests.
 Disciformis, e—Shaped like a quoit.
 Discoidalis, e—Discoidal.
 Discoideus, a, um—Discoid, disk-like.
 Discophorus—Disk-bearer.
 Discrepans—Different.
 Disculus—A little disk.
 Discus—A quoit.
 Disjunctus, a, um—Separated, disjoined.
 Dispalans—Straggling, stray.
 Dispandus, a, um—Spread out, stretched.
 Dispansus, a, um—Stretched out.
 Dispar—Different.
 Disparilis, e—Different, unequal.
 Dispassus, a, um—Extended, spread out.
 Dispersus, a, um—Dispersed.
 Dissectus, a, um—Cut up, dissected.
 Dissimularis, e—Dissimilar, unlike.
 Dissolutus, a, um—Weak, broken.
 Distans—Distant, standing apart.
 Distensus, a, um—Distended.
 Distinctus, a, um—Distinct.
 Distortus, a, um—Distorted, crooked, irregular.
- Divaricans—Severed, straddling.
 Divaricatus, a, um—Divaricated, wide apart.
 Divergens—Diverging.
 Diversifolius, a, um—Diverse-leaved.
 Diversus, a, um—Diverse, different, unlike.
 Divisus, a, um—Dividing.
 Docens—A teacher.
 Dodecadactylus, a, um—Twelve-fingered.
 Dolabriformis, e—Like a mattock or pick-axe.
 Dolatus, a, um—Hewed.
 Dolorosus, a, um—Wretched.
 Donaciformis, e—Like a *Donax*.
 Dorsalis, e—Dorsal.
 Dorsatus, a, um—High-backed.
 Dotis—An ornament.
 Drepanaspis—Having a sickle-shield.
 Dubius, a, um—Doubtful.
 Dumalis, e—Bushy.
 Dumosus, a, um—Bushy.
 Duodenarius, a, um—Containing twelve.
 Duplicatus, a, um—Duplicated, doubled.
 Duplicostatus, a, um—Double-ribbed.

- Eboreus, a, um**—Made of ivory.
Ebracteatus, a, um—Without scales or bracts.
Eburneolus, a, um—Of ivory.
Eccentricus, a, um—From the center.
Echinatus, a, um—Set with spines.
Ectypus, a, um—Engraved in relief, embossed.
Edax—Voracious.
Edentulus, a, um—Toothless.
Egenus, a, um—Destitute of, very poor.
Elegans—Elegant, handsome.
Elegantissimus, a, um—Very handsome.
Elegantulus, a, um—Quite elegant.
Elevatus, a, um—Elevated.
Ellipticus, a, um—Elliptical.
Elongatus, a, um—Elongated.
Elytra—The wing covering.
Elytroides—Like the elytra of beetles.
Emaceratus, a, um—Thin.
Emaciatus, a, um—Emaciated, thin.
Emarginatus, a, um—Notched.
Eminens—Prominent, standing out in relief.
Eminulus, a, um—Projecting a little.
Enormis, e—Very large.
Ensiformis, e—Sword-formed.
Eos—The dawn.
Epidermatus, a, um—Covered with a crust or skin.
Equilaterus, a, um—Equal-sided.
Equisetiformis, e—Like Equisetum.
Erectifolius, a, um—Having leaves erect.
Erectipora—Having erect pores.
Erectus, a, um—Erect, straight.
Erodus, a, um—Eroded, jagged, gnawed.
Erosus, a, um—Eroded, bitten away.
Erraticus, a, um—Wandering, erratic.
Erythroliticus—Red stone.
Escharoides—Like Eschara.
Eucharis, e—Graceful, beautiful.
Euconus—Perfect cone.
Euginum—Fertile.
Euglypheus, a, um—Well-carved, distinctly marked.
Euomphaloides—Like Euomphalus.
Euphemia—Of good omen.
Euruteines—Extending widely.
Euzona—Beautifully girdled.
Evax—An exclamation of delight.
Exacutus, a, um—Pointed.
Exanthematus, a, um—Covered with eruptions.
Excavatus, a, um—Made hollow, excavated.
Excellens—Excellent, high-rising.
Excelsior—Elevated, lofty.
Excelsus, a, um—Elevated, high.
Excerptus, a, um—Selected, picked out.
Excrescens—Growing out, increasing.
Exculptus, a, um—Adorned, chiseled out.
Exfoliatus, a, um—Exfoliated.
Exiguus, a, um—Small, petty.
Exilis, e—Thin, lean, slender, creeping.
Eximius, a, um—Choice, select, excellent.
Exornatus, a, um—Adorned.
Exortivus, a, um—Eastern.
Expansus, a, um—Expanded, widely spread.
Expatiatius, a, um—Spread out.
Explanatus, a, um—Made plain, spread out.
Explicatus, a, um—Unfolded, spread out.
Explorator—A scout, an examiner.
Exporrectus, a, um—Smooth, stretched out.
Exsculptus, a, um—Carved.
Exsertus, a, um—Projecting, thrust forth.
Exsul—A wanderer.
Extans—Standing out.
Extensus, a, um—Stretched out, extended.
Extenuatus, a, um—Made thin, slender, drawn out.
Extumidus, a, um—Swelled up.
Exutus, a, um—Divested, stripped off.
Faba—A bean.
Fabalis, e—Bean-stalks.
Fabula—A little bean.
Fabulites—A little stone-bean.
Facetus, a, um—Elegant.
Falcatus, a, um—Hooked.
Falciformis, e—Like a sickle, pruning-knife, or hook.
Fallax—Deceptive.
Falx—A hook, pruning-knife, or sickle.
Famelicus, a, um—Famished.
Fasciatus, a, um—Banded.
Fascicularis, e—Small-bundled.
Fasciculatus, a, um—Bundled.
Fasciculus—A bundle.
Fascigerus, a, um—Bearing fascies.
Fastigatus, a, um—Sloping up to a point.
Faustus, a, um—Fortunate, lucky.
Favositoideus, a, um—Like Favosites.
Favosus, a, um—Honeycomb-like.
Fax—A torch, taper.
Fecundus, a, um—Fruitful.
Felix, icis—Fertile.
Fenestella—A little window.
Fenestelliformis, e—Like Fenestella.
Fenestratus, a, um—Reticulated, having open windows.
Fenestrula—A little window.
Ferox—Fierce, hardy, stout.
Ferratus, a, um—Hard as iron, covered with iron.
Ferricolus—Iron distaff.
Ferrugineus, a, um—Of the color of iron, rusty.
Fertilis, e—Fertile, fruitful.
Ferus, a, um—Wild, cruel, fierce.
Festivus, a, um—Hastened, before the time.
Fibratus, a, um—Having small threads hanging to it.
Fibristriatus, a, um—Fiber-lined.
Fibrosus, a, um—Full of fibers or threads.
Ficoides—Like a fig.
Ficus—A fig.
Fidelis, e—Sure, faithful.
Filiciformis, e—Fern-like.
Filicosta—Having thread-like costa.
Filicula—Fern of trees, wall-fern.
Filiculme—Thread-straw.
Filiformis, e—Filiform.
Filistriatus, a, um—Having thread-like striæ.
Filitextilis, e—Woven like thread.
Filitextus, a, um—Woven like thread.
Filosus, a, um—Thready.
Fimbriatus, a, um—Fringed, jagged, scalloped.

- Fiscellostriatus, a, um—Having divided striae.
 Fiscellus—A small basket woven of slender twigs.
 Fissicosta—Having divided costae.
 Fissilis, e—Split.
 Fissiplica—Having divided plications.
 Fissuratus, a, um—Fissured.
 Fissurellus, a, um—Having a little cleft.
 Fisis, a, um—Divided, cleft, split.
 Fistulosus, a, um—Full of holes, spongy.
 Flabellatus, a, um—Fan-like.
 Flabellifer, era, erum—That bears a fan.
 Flabelliformis, e—Shaped like a fan.
 Flabellites—A stone fan.
 Flabellum—A fan.
 Flaccidus, a, um—Withered, hanging, flagging, flaccid.
 Flagellaris, e—Like a whip.
 Flagellum—A whip.
 Flagricaudus, a, um—Whip-tailed.
 Flavus, a, um—Golden, yellow.
 Flexicaulis, e—Having a flexible stem.
 Flexifolius, a, um—Having recurved leaves.
 Flexilis, e—Pliant, flexible.
 Flexuosus, a, um—Flexuous, full of turns.
 Florealis, e—Flower-like.
 Floridus, a, um—Flowery, adorned with flowers, gay.
 Florifer, era, erum—Flower-bearing.
 Floriformis, e—Flower-shaped.
 Flos—A flower.
 Fluctus—A wave, a billow.
 Fluctuosus, a, um—Full of waves, wavy, veiny.
 Fluitans—Flowing, floating.
 Fecundus, a, um—Fruitful, abundant.
 Fœtoideus, a, um—Like a tumor.
 Foliaceus, a, um—Foliaceous, like leaves, leafy.
 Foliatu, a, um—Leaved, having leaves.
 Foliosus, a, um—Leafy, full of leaves.
 Foliu—A leaf.
 Folliculus—A small sack.
 Follis—A leather sack.
 Fonticola—Fountain-dwelling.
 Fontinalis—A fountain or spring.
 Formosus, a, um—Beautiful, handsome.
 Fornacula—A little oven.
 Fornax—A furnace.
 Fornicatus, a, um—Arched, vaulted over.
 Forulatus, a, um—Having narrow furrows.
 Fossatus, a, um—Dug out.
 Fossilis, e—That may be dug out of the earth, fossil.
 Fossula—A little trench or ditch.
 Foveatus, a, um—Pitted.
 Fractus, a, um—Broken, effeminate.
 Fragarioides—Like a strawberry.
 Fragilis, e—Brittle, frail.
 Fragosus, a, um—Fragile.
 Frangens—A breaker.
 Fraternalis, a, um—Brotherly, fraternal.
 Fraxiniformis, e—Like fraxinus.
 Frequentatus, a, um—Frequent.
 Fringilla—A small bird.
 Fritillus—A dice-box.
 Frondosus, a, um—Full of leaves.
 Frutex—A shrub.
 Fruticosus, a, um—Shrubby, full of shoots.
 Fucoides—Like Fucus.
 Fulcratus, a, um—Stayed with props.
 Fulgidus, a, um—Shining.
 Fulgur—A thunder-bolt.
 Funatus, a, um—Corded.
 Fungosus, a, um—Spongy.
 Fungulus—A small mushroom.
 Funiculus—A small cord or line.
 Furcatus, a, um—Forked.
 Furcinaratus, a, um—Forked and keeled.
 Furtivus, a, um—Secret, hard to find.
 Fusibrachiatus, a, um—Having fusiform arms.
 Fusiformis, e—Fusiform, tapering at both ends.
 Fustiformis, e—Club-formed.
 Fustis—A club, staff.
 Futilis, e—Trivial.
 Galeatus, a, um—That wears a helmet.
 Galericulatus, a, um—Having a small covering.
 Galerum—A cap, hat, or tuft of feathers.
 Gallinuloides—Like a pullet.
 Gemellipara—Twin-bearing.
 Geminispinosus, a, um—Twin-spined.
 Gemma—A young bud, a gem.
 Gemmatus, a, um—Budded, set with gems.
 Gemmicula—A little bud.
 Gemmaifer, era, erum—That bears buds or gemmules.
 Gemmiformis, e—Shaped like a bud.
 Gemmula—A little bud.
 Geniculatus, a, um—Knotted, jointed.
 Geniculosus, a, um—Knotty.
 Genitivus, a, um—Natural, belonging to the same stock.
 Geometricus, a, um—Geometrical.
 Germanus, a, um—Near of kin.
 Gibber, era, erum—Bossed, hunchbacked.
 Gibberosus, a, um—Badly hunchbacked.
 Gibberulus, a, um—Somewhat hunchbacked.
 Gibberus, a, um—Humpbacked.
 Gibbosus, a, um—Gibbous, full of hunches, or humped.
 Gibbus, a, um—Hunched, gibbous.
 Giganteus, a, um—Giant-like, very large.
 Gigas—A giant.
 Glabellus, a, um—Smooth.
 Glaber, bra, brum—Smooth, bare.
 Glacialis, e—Frozen, icy.
 Gladiolus—A small sword.
 Glandulosus, a, um—Full of kernels, glandular.
 Glandulus, a, um—Having kernels, glandular.
 Glans—An acorn, chestnut, or pellet.
 Glanscerasi—Fruit of the cherry-tree.
 Glansfagea—Fruit of the beech-tree.
 Globatus, a, um—Made round.
 Globosus, a, um—Round as a ball, globose.
 Globularis, e—Globular.
 Globuliformis, e—Globe-shaped.
 Globulus—A little ball.
 Glomeratus, a, um—Confused, out of order.
 Gloriosus, a, um—Glorious.
 Glyptus, a, um—Sculptured.

- Gomphoides—Like a stake or club.
 Gomphus—A pile, stake, or club.
 Goniocercus, a, um—Angular, tailed.
 Goniolobus, a, um—Having angular lobes.
 Goniopteroides—Like Goniopteris.
 Goniurus, a, um—Angular-tailed.
 Gonopleura—Angular rib.
 Gothicus, a, um—Gothic.
 Gracilens, entis—Slender, thin.
 Gracilentus, a, um—Slender, thin.
 Gracilis, e—Small, slender, thin, weak.
 Gracilius, a, um—More slender.
 Gracillimus, a, um—Very slender, thin, or weak.
 Gracillistriatus, a, um—slender, striated.
 Gradatus, a, um—Made with steps.
 Gradicosta—Having steps and ribs.
 Gradocostatus, a, um—Having steps and ribs.
 Gramineus, a, um—Grassy or belonging to grass.
 Grandævus, a, um—Very old.
 Grandiceps—Big-headed.
 Grandiculus, a, um—Rather large.
 Grandifolius, a, um—Large-leaved.
 Grandis, e—Grand, large.
 Graniferus, era, erum—That bears grains of corn.
 Granilineatus, a, um—Lined with granules.
 Granilineus, a, um—Granule-lined.
 Granosus, a, um—Full of grains or kernels.
 Granulatus, a, um—Granulated, granular.
 Granuliferus, era, erum—Granule-bearing.
 Granulostriatus, a, um—Having granular striæ.
 Granulosus, a, um—Covered with small granules.
 Graphicus, a, um—Perfect, excellent, done to the life, written on.
 Gratosus, a, um—Agreeable.
 Gratus, a, um—Acceptable.
 Gravis, e—Weighty, full, old.
 Graviusculus, a, um—Rather deep.
 Gregalis, e—Of the common sort.
 Gregarius, a, um—Of the common sort, common, gregarious.
 Grossipicatus, a, um—Thick-plaited.
 Grumus—A little heap.
 Gypseus, a, um—Covered or plastered with gypsum.
 Gyraanthus—Round spine.
 Gyrinoides—Like a tadpole.
 Gyrocercas—Circular horn.
- Hæsitans**—Doubting.
 Haliotoides—Like Haliotus.
 Hamatilis, e—Furnished with hooks.
 Hamatus, a, um—Crooked, hooked.
 Hamulosus, a, um—Full of hooks.
 Hamulus—A small hook.
 Harpago—A hook.
 Hastatus, a, um—Bearing spears, halbert-shaped.
 Hastifolius, a, um—Spear or lance-leaved.
 Hastula—A little spear.
 Helicoides—Like a helix.
 Helicteres—A round, smooth spire.
 Heliolitiformis, e—Like Heliolites.
 Helios—The sun.
- Hemicyclus—A half-circle.
 Hemicylindrus—A half-cylinder.
 Hemiplicatus, a, um—Half-plaited.
 Hemisphericus, a, um—Hemispherical.
 Hemiteloides—Like Hemiteles.
 Hemitrypa—Having half-openings.
 Herbaceus, a, um—Grassy.
 Herculeanus, a, um—Belonging to Hercules, large of its kind.
 Heterocinctus, a, um—Irregularly girded or banded.
 Heteroclitus, a, um—Extraordinary.
 Heterodactylus, a, um—Irregular-toed or irregularly fingered.
 Heterophyllus, a, um—Irregularly or differently leaved.
 Heteropora—Having irregular pores.
 Heteropteris—Irregular fern.
 Hexadactylus, a, um—Six-fingered.
 Hexagonus, a, um—Having six angles.
 Hexagonalis, e—Hexagonal.
 Hians—Gaping, disjointed.
 Hipparionyx—A colt's hoof.
 Hirsutus, a, um—Rough, hairy, shaggy.
 Hirtus, a, um—Rough, hairy, shaggy.
 Hispidus, a, um—Rough, bristly, rugged.
 Hiulus, a, um—Gaping, cleft.
 Holopyga—Entire rump, whole back.
 Homalonotoides—Like Homalonotus.
 Horizontalis, e—Horizontal.
 Horridus, a, um—Rough, bristly.
 Hospitalis, e—Of a guest, hospitable.
 Humerosus, a, um—Humped, full of humps.
 Humerulus—A little shoulder.
 Humilis, e—Small, poor.
 Hyalina—Of glass.
 Hybrida—Intermediate between two species, a hybrid.
 Hydraulicus, a, um—Hydraulic.
 Hymenophylloides—Like Hymenophyllites.
 Hyperbæus, a, um—Extreme.
 Hyperboreus, a, um—Very far north.
 Hypniformis, e—Like Hypnum.
 Hystricosus, a, um—Thorny.
 Hystricululus, a, um—Somewhat covered with spines.
 Hystrix—Covered or beset with spines.
- Ichthyoderma**—Having a fish-skin.
 Ichthyolepis—Having fish-scales.
 Icosidactylus, a, um—Twenty-fingered.
 Idoneus, a, um—Suitable.
 Ignobilis, e—Ignoble, strange, unknown.
 Ignorabilis, e—Overlooked, unknown.
 Ignotus, a, um—Unknown, strange.
 Illicifolius, a, um—Oak-leaved.
 Illænoides—Like an Illænus.
 Illibatus, a, um—Unimpaired.
 Imago—An image, picture, also a sheath.
 Imbecillus, a, um—Feeble, frail.
 Imbricarius, a, um—Having imbrications.
 Imbricato-articulatus, a, um—Having imbricated articulations.
 Imbricatus, a, um—Laid one on another like tiles, imbricated.
 Imitator—A ressembler.
 Immaturus, a, um—Immature, abortive.
 Immersus, a, um—Immersed.

- Impar—Odd, unequal, disproportioned.
 Imparilis, e—Different.
 Imperator—A commander.
 Implexus, a, um—Interlaced, interwoven.
 Implicatus, a, um—Wrapped together, entangled.
 Impolitus, a, um—Rough, unpolished.
 Impositus, a, um—Laying over.
 Impressus, a, um—Impressed.
 Improcerus, a, um—Undersized, not tall.
 Impudicus, a, um—Shameless, immodest.
 Inæquabilis, e—Uneven, unequal.
 Inæqualis, e—Unequal.
 Inæquatus, a, um—Unequal.
 Inæquicostatus, a, um—Unequally ribbed.
 Inæquidactylus, a, um—Unequal-fingered.
 Inæquilateralis, e—Inequilateral.
 Inæquiplicatus, a, um—Unequally rayed.
 Inæquistriatus, a, um—Unequally striated.
 Inceptus, a, um—An undertaking, incipient.
 Incertus, a, um—Uncertain, inconstant.
 Incilis, e—Belonging to, or like a trench, furrow, or gutter.
 Incipiens—The beginning.
 Incisivus, a, um—Having the quality of cutting or biting.
 Inciso-lobatus, a, um—Cut into lobes.
 Incisus, a, um—Incised.
 Inclinator, a, um—Inclined, bent.
 Inclinis, e—Bending.
 Inkluspora—Having inclosed perforations.
 Inclusus, a, um—Closed up.
 Incompletus, a, um—Incomplete.
 Incomptus, a, um—Untrimmed, rough.
 Inconditus, a, um—Irregular, disordered.
 Inconspicuus, a, um—Not conspicuous.
 Inconstans—Not constant.
 Inconsuetus, a, um—Unusual.
 Incrassatus, a, um—Thickened.
 Increbescens—Abundant.
 Inerustans—Incrusting.
 Incultus, a, um—Neglected.
 Incurvus, a, um—Incurved.
 Indagator—A diligent hunter.
 Indagatus—Encircling.
 Indentatus, a, um—Indented, notched.
 Indentus, a, um—Indented, notched.
 Indeterminatus, a, um—Not determined.
 Indolatus, a, um—Unhewn.
 Inelegans—Unadorned.
 Inermis, e—Unarmed.
 Inexpectans—Not expected.
 Infelix—Useless, unhappy, miserable.
 Infernus—Underground, the lower.
 Inferus, a, um—Filled up.
 Inferus—Below, underground.
 Inflatus, a, um—Spread, swollen, inflated.
 Inflexus, a, um—Bowed, made crooked.
 Informis, e—Shapeless, rude.
 Infrequens—Rare, infrequent.
 Infula—A band, an ornament.
 Infundibularius, a, um—Pertaining to a funnel.
 Infundibuliformis, e—Funnel-shaped.
 Inundibulum, e—A funnel, hopper.
 Ingens—Very large, huge, prodigious.
 Ingentior—Larger, enormous.
 Inopinatus, a, um—Unexpected, unthought of.
 Inops—Poor, friendless, unburied.
 Inoptatus, a, um—Undesired, not wanted.
 Inordinatus, a, um—Disordered.
 Inornatus, a, um—Unadorned.
 Insculptus, a, um—Engraven, carved.
 Insectus, a, um—Uncut.
 Insertivus, a, um—Inserted.
 Insignis, e—Marked, naturally remarkable.
 Insignitus, a, um—Marked, clear.
 Insitus, a, um—Inserted, introduced.
 Insculptus, a, um—Engraved.
 Insolens—Unusual, rare.
 Insolitus, a, um—Rare, hard to find.
 Insons—Harmless.
 Inspeciosus, a, um—Not handsome.
 Insperatus, a, um—Unexpected.
 Instabilis, e—Not firm, changing.
 Insuetus, a, um—Unusual.
 Insularis, e—Upon an island.
 Intectus, a, um—Uncovered.
 Integrifolius, a, um—Whole-leaved.
 Intercalaris, e—Intercalated.
 Intercedens—Intervening.
 Intercellatus, a, um—Being intercellular.
 Intercostalis, e—Lined between costæ.
 Intercostatus, a, um—Ridged between ribs.
 Interlineatus, a, um—Interlined.
 Intermedius, a, um—Intermediate, the middle.
 Intermittens—Intermitting, ceasing for a time.
 Internascens—Growing between.
 Internodius, a, um—Space between two knots or joints.
 Interplicatus, a, um—Plicated between.
 Interruptus, a, um—Broken asunder, interrupted.
 Intersculptus, a, um—Engraved in the middle.
 Interscapularis, e—Spaced between the shoulder pieces.
 Interstinctus, a, um—Divided.
 Interstitialis, e—Having striæ between.
 Interstrictus, a, um—Drawn together.
 Intertextus, a, um—Interwoven, interlaced.
 Intervesicula—Having little vesicles between.
 Intextus, a, um—Plaited, woven.
 Intortus, a, um—Twirled, entangled, curled.
 Intralineatus, a, um—Lined, between lines.
 Inutilis, e—Not useful, very poor, insignificant.
 Invaginatus, a, um—Invaginated, sheathed, enwrapped.
 Invalidus, a, um—Weak, feeble.
 Invenustus, a, um—Unhandsome.
 Inversus, a, um—Inverted.
 Investis, e—Unclothed.
 Involutus, a, um—Involute.
 Irrasus, a, um—Unpolished, not smooth.
 Irregularis, e—Irregular.
 Islandicus, a, um—From an island.
 Ischypus, a, um—Strong-footed.
 Isosceles—Having equal legs.
 Isogramma—Equal weight.

Jaculum—A dart, javelin.
Jejunus, a, um—That has not eaten, hungry.
Jubatus, a, um—Crested.
Jucundus, a, um—Pleasant, agreeable, delightful.
Jugalis, e—Yoked together.
Juglans—A walnut.
Jugosus, a, um—Full of ridges, mountainous.
Junceus, a, um—Made of bulrushes, like a bulrush.
Junciformis, e—Shaped like a bulrush.
Junctus, a, um—Joined, coupled.
Juvenis, e—Young.

Labecula—A little spot.
Labiatus, a, um—Lipped.
Labiosus, a, um—Full lipped.
Labrosus, a, um—Having large lips, bordered.
Labyrinthicus, a, um—Labyrinthine.
Laceratus, a, um—Torn, mangled, ragged.
Lachrymosus, a, um—Full of tears.
Laciniatus, a, um—Fringed.
Laciniosus, a, um—Full of plaits, jagged, crumpled.
Lactuca—Lettuce.
Lacunosus, a, um—Full of holes, pitted, uneven.
Lacus—A vat, a basin.
Lacustris, e—Pertaining to a lake or swamp.
Lætus, a, um—Fertile, pleasant, agreeable.
Lævicosta—Having a smooth rib.
Lævicostatus, a, um—Smooth-ribbed.
Læviculus, a, um—Nearly smooth.
Lævigatus, a, um—Planed, made smooth.
Lævis, e—Smooth.
Lævissimus, a, um—Very smooth.
Lævistriatus, a, um—Having smooth striæ.
Læviusculus, a, um—Quite smooth.
Lægena—A flask.
Laguncula—A little flask.
Lamellatus, a, um—Having thin plates.
Lamellosus, a, um—In very thin plates.
Laminatus, a, um—Laminated.
Lamnoides—Like Lamna.
Lanatus, a, um—Woolly.
Lanceolatus, a, um—Spear-shaped.
Lancifer, era, erum—Lance-bearer.
Lancifolius, a, um—Lance-leaved.
Lanosus, a, um—Woolly.
Lapicida—A stone-cutter.
Lapideus, a, um—Consisting of stone.
Lapillus—A little stone, a pebble.
Laqueatus, a, um—Arched, vaulted, fluted, paneled.
Largissimus, a, um—Very large, the largest.
Largus, a, um—Plentiful, large.
Laricinus, a, um—Resembling the larch-tree.
Larvatus, a, um—Frightened, masked.
Latealatus, a, um—Broad-winged.
Lateralis, e—Belonging to the side.
Laterarius, a, um—Of or belonging to the sides.
Latericrescens—Side-growing.
Laterniformis, e—Shaped like a lantern.
Latiannulatus, a, um—Having wide annulations.

Latibrachiatus, a, um—Wide-armed.
Latibuccatus, a, um—Wide-cheeked.
Laticeps—Broad head.
Laticosta—Having wide ribs.
Laticostatus, a, um—Wide-ribbed.
Latidactylus—Wide-fingered.
Latidorsatus, a, um—Wide-backed.
Latifasciatus, a, um—Wide-bundled, or wide-banded.
Latifolius, a, um—Broad-leaved.
Latifrons—Having a wide front.
Latijuncturus, a, um—Wide-jointed.
Latimarginatus, a, um—Broad-margined.
Latior—Wider.
Latipes—Broad-footed.
Latiradius, a, um—Wide-rayed.
Latispinosus, a, um—Wide-spined.
Latissimus, a, um—Very wide, the widest.
Latitruncatus, a, um—Broadly truncated.
Lativentrus, a, um—Having a wide cavity.
Latus, a, um—Broad, wide, large.
Latusculum—A little side.
Lautus, a, um—Neat, elegant, splendid.
Laxatus, a, um—Made wider, extended, dilated.
Laxus, a, um—Loose, slack, spacious.
Ledoides—Like Leda.
Lens—A lentil.
Lenticularis, e—Lens-shaped, lenticular.
Lentiformis, e—Lens-shaped.
Lentus, a, um—Flexible, pliant, sluggish.
Leperditioides—Like Leperditia.
Lepidodendrifolius, a, um—Having leaves like *Lepidodendron*.
Lepidodrachus, e—Having a scaly ridge.
Lepidus, a, um—Pretty.
Lepis—A scale.
Leptenoides—Like *Leptena*.
Leptocephalus, a, um—Slender-headed.
Leptodactylus, a, um—Slender-toed.
Leptoderma—A thin skin.
Leptogaster—A smooth belly.
Leptonotus, a, um—Slender-backed.
Levatus, a, um—Lifted up.
Leviculus, a, um—Very small.
Levigatus, a, um—Smooth.
Levinodatus, a, um—Having smooth knots.
Levis, e—smooth.
Lichenoides—Like lichen.
Lichenoides, a, um—Like a lichen.
Ligoniformis, e—Like a mattock.
Liliformis, e—Shaped like a lily.
Lima—A file.
Limabrachiatus, a, um—File-armed.
Limatulus, a, um—Neat, fine, polished, like a little file.
Limatus, a, um—Polished, neat, elegant.
Limax—A snail, slug.
Limbatas, a, um—Bordered.
Limiformis, e—Lima-shaped.
Limitaris, e—Bounded, limited.
Limularis—Limulus, tail.
Lineanodus, a, um—Having lined knots.
Linearifolius, a, um—Having linear leaves.
Linearis, e—Pertaining to a line, linear.
Linearis, a, um—Belonging to lines.
Lineatoides—Like *lineatus*, a specific name.
Lineatus, a, um—Drawn out, lined.
Lineolatus, a, um—Fine lined.

- Lineopora—Having line-pores, lined with perforations.
 Lineopunctatus, a, um—Line-punctured or line-dotted.
 Lingualis, e—Tongue-shaped.
 Linguifer, era, erum—Tongue-bearing.
 Linguiformis, e—Tongue-shaped.
 Lingulatus, a, um—Tongue-shaped, linguulate.
 Linteum—A napkin, girdle.
 Lioderma—A smooth skin.
 Liosoma—A smooth body.
 Liratus, a, um—Furrowed.
 Lithofactor—Stone-maker.
 Litoreus, a, um—On the shore or sea-side.
 Lobatus, a, um—Lobed.
 Locellus—A little purse or bag.
 Loculosus, a, um—Full of holes or distinct places, partitioned.
 Lonchitis—Spleenwort, the fern "Adders-tongue."
 Longævus, a, um—Ancient, aged.
 Longicameratus, a, um—Long chambered.
 Longicaudatus, a, um—Long-tailed.
 Longicollis—Long-ridged.
 Longicostalis, e—Long-ribbed.
 Longidactylus, a, um—Long-fingered.
 Longidentatus, a, um—Long-toothed.
 Longifolius, a, um—Long-leaved.
 Longipes—Long-footed.
 Longirostris—Having a long proboscis.
 Longispinus, a, um—Long-spined.
 Longispira—Having a long spire.
 Longissimus, a, um—Very long, the longest.
 Longiusculus, a, um—Rather long.
 Longulus, a, um—Rather long.
 Longus, a, um—Long.
 Loriformis, e—Like a thong or whip.
 Lotoblastus—Lotus bud.
 Lucifugus, a, um—Light-shunning.
 Lunatus, a, um—Made like a half-moon, horned.
 Lunulatus, a, um—Crescentiform.
 Luxus, a, um—Dislocated.
 Lycoperdon—Puff-ball shaped.
 Lynx—An animal called a lynx.
 Lyra—A harp.
 Lyratifolius, a, um—Having lyre shaped leaves.
- Macer, cra, crum**—Lean, meager.
 Machæriiformis, e—Sword-shaped.
 Macilentus, a, um—Meager, thin, lean.
 Macrocephalus, a, um—Long-headed.
 Macrochirus, a, um—Long-handed.
 Macroductylus, a, um—Long-fingered.
 Macrodentus, a, um—Long-toothed.
 Macrolepidotus, a, um—Having long scales.
 Macrolineatus, a, um—Long-lined.
 Macromphalus, a, um—Having a large umbilicus.
 Macronotus, a, um—Long known.
 Macropetalus, a, um—Having long flower leaves.
 Macrophorus, a, um—Long-bearing.
 Macrophyllus, a, um—Long-leaved.
 Macroleptura—Having long sides.
 Macropora—Having long pores.
 Macrops—Having large eyes.
- Macropterus, a, um—Long-winged, or large-finned.
 Macrophthalmus, a, um—Long-eyed.
 Macrospira—Having a long spire.
 Macrospondylus, a, um—Having long vertebrae.
 Macrostomus, a, um—Having a long mouth.
 Macrostriatus, a, um—Having long striae.
 Macrostylus, a, um—Having long spines or columns.
 Macrothyris—Having a long foramen.
 Macrurus, a, um—Long-tailed.
 Mactriiformis, e—Shaped like Mactra.
 Mactroides—Like Mactra.
 Maculatus, a, um—Spotted, speckled.
 Maculosus, a, um—Full of spots, spotted.
 Magister—A chief, master.
 Magnicornis, e—Large-horned.
 Magnicostatus, a, um—Large-ribbed.
 Magnificus, a, um—Magnificent, stately.
 Magnifolius, a, um—Large-leaved.
 Magnisulcatus, a, um—Deep-furrowed.
 Magniventrus, a, um—Large-bellied.
 Magnoliiformis, e—Shaped like magnolia.
 Magnus, a, um—Great, large.
 Major—Greater, larger.
 Majus, a, um—Greater, larger.
 Malvaceus, a, um—Like or pertaining to mallows.
 Mamilianus, a, um—Swelling, protuberant.
 Mammatus, a, um—Covered with protuberances.
 Mammiiferus, a, um—Teat or nipple bearing.
 Mammillaris, e—Mammillated.
 Mammillatus, a, um—Covered with nipples.
 Maniformis, e—Hand-like.
 Manticula—A little wallet.
 Manus—A hand.
 Marcidus, a, um—Hanging, flagging, withered.
 Marginalis, e—Marginal.
 Marginatus, a, um—That has a border, broad rim, or margin.
 Marginicinctus, a, um—Having a banded margin.
 Marinus, a, um—Inhabiting the sea.
 Maritimus, a, um—Of or belonging to the sea.
 Masculus, a, um—Stout, hardy, masculine.
 Materiarius, a, um—Of or belonging to timber.
 Maturus, a, um—Ripe, mature.
 Matutinus, a, um—In the morning.
 Maximus, a, um—Greatest, largest.
 Medialis, e—Middle.
 Medianus, a, um—Middle.
 Mediocris, e—Middling, ordinary.
 Medius, a, um—Middle, ordinary.
 Medullaris, e—In the marrow or middle part, like a pith.
 Megacephalus, a, um—Large-headed.
 Megalops—Having large eyes.
 Megambonatus, a, um—Having a great umbo.
 Megambonus, a, um—Having a large umbo.
 Megastomus, a, um—Having a large mouth.
 Megastylus, a, um—Having large spines.
 Megistus, a, um—Very large.
 Melaniiformis, e—Shaped like Melania.

- Melanioides—Like Melania.
 Meliniformis, e—Purse-shaped.
 Melo—An apple-shaped melon.
 Melonicus, a, um—Like a small melon.
 Meloniformis, e—Melon-shaped.
 Melonoides—Like a melon.
 Membranaceus, a, um—Like a parchment, skinny.
 Meniscus, a, um—A crescent-shaped body.
 Merianopteroides—Like Merianopteris.
 Meristoides—Like Merista.
 Mesacosta—Having middle ribs.
 Mesacostalis, e—Middle-ribbed.
 Mesambonatus, a, um—Having a middle umbo.
 Mesastrialis, e—Middle striated.
 Mesialis, e—Middle parted.
 Mesolobus—Having a middle lobe.
 Meta—Any thing in a conical form.
 Metallicus, a, um—Metallic.
 Metula—A little butt or small pyramid.
 Mica—A crumb or little thing.
 Micans—Stretching out, glittering.
 Microbasalis, e—Having a small base.
 Microcarpus, a, um—Small-fruited.
 Microdentus, a, um—Small-toothed.
 Microdus, a, um—Having small teeth.
 Microlobus, a, um—Small-lobed.
 Micronema—A small thread.
 Microphorus, a, um—Small-bearing.
 Microphyllus a, um—Small-leaved.
 Micropleura—Having a small rib.
 Micropterus, a, um—Small-winged.
 Microphthalmus, a, um—Small-eyed.
 Micropus—Small foot.
 Microscopicus, a, um—Microscopic.
 Microstigma—Small dot.
 Microstylus—Small spile or pale.
 Micurus, a, um—Small-tailed.
 Micula—A little crumb or grain.
 Millebrachiatus, a, um—Many-armed.
 Milleporaceus, a, um—Having innumerable pores.
 Millepunctatus, a, um—Many-dotted.
 Mimicus, a, um—Mimic.
 Minimus, a, um—The least or smallest.
 Minor—Less, smaller.
 Minuens—Diminishing, making less.
 Minus, a, um—Less.
 Minusculus, a, um—Rather less, rather small.
 Minutisectus, a, um—Finely marked or divided.
 Minutissimus, a, um—Very minute.
 Minutus, a, um—Very small.
 Minutus, a, um—Diminished, small, minute.
 Mirabilis, e—Extraordinary, wonderful, strange.
 Mirus, a, um—Wonderful, astonishing, extraordinary.
 Miser, era, erum—Wretched, unfortunate.
 Mitella—A head-band, a kind of turban.
 Mithrax—A precious stone.
 Mitigatus, a, um—Tamed, civilized, softened.
 Mitis, e—Ripe, flexible, placid.
 Mitra—A head-band, turban.
 Mixtus, a, um—Mixed.
 Modestus, a, um—Moderate, modest.
 Modiolaris, e—Like Modiola, or a small measure.
 Modioliformis, e—Like a small measure.
 Modulatus, a, um—Symmetrical, well-proportioned.
 Modulus—A small measure.
 Molaris, e—Pertaining to grinding.
 Molestus, a, um—Troublesome, difficult.
 Mollis, e—Flexible, delicate, effeminate.
 Moniliferus, a, um—Bead-bearing.
 Moniliformis, e—Like a necklace.
 Monostigma—Single dot.
 Monstruosus, a, um—Strange, monstrous.
 Monticola—A dweller in the mountains.
 Monticuliferus, a, um—Little mountain-bearing.
 Monticulus—A small mountain.
 Morbillianus, a, um—Measly, spotted.
 Mordax—Biting, given to biting.
 Morsum—That which is bitten off.
 Mortifer, era, erum—Deadly.
 Mucro—A sharp point or edge.
 Mucronatus, a, um—Pointed.
 Mucrospinus, a, um—Sharp-spined.
 Multatenuatus, a, um—Much attenuated.
 Multibrachiatus, a, um—Many-armed.
 Multicalicatus, a, um—Much plastered.
 Multicameratus, a, um—Many-chambered.
 Multicarinatus, a, um—Many-keeled.
 Multicaulis, e—Many-stalked.
 Multicinctus, a, um—Many-girded or banded.
 Multicornis, e—Many-horned.
 Multicostatus, a, um—Many-ribbed.
 Multicosta—Having many ribs.
 Multifasciatus, a, um—Many-bundled.
 Multigranosus, a, um—Many-grained.
 Multigrumus, a, um—Much heaped up.
 Multilamella—Having many thin plates.
 Multilamellosus, a, um—Having many lamellæ.
 Multilineatus, a, um—Many-lined.
 Multiliratus, a, um—Many-furrowed.
 Multinodosus, a, um—Many-noded.
 Multinotatus, a, um—Having many marks or tracks.
 Multiplicatus, a, um—Many-folded.
 Multipora—Having many pores.
 Multiporatus, a, um—Having many pores or openings.
 Multipunctatus, a, um—Many dotted or punctured.
 Multiradiatus, a, um—Many-rayed.
 Multiramosus, a, um—Having many branches.
 Multisectus, a, um—Having many divisions or divided folds.
 Multisegmentatus, a, um—Having many segments.
 Multiseptus, a, um—Having many divisions.
 Multiseriatus, a, um—Having many rows or series.
 Multisinuatus, a, um—Many-furrowed.
 Multispinosus, a, um—Many-spined.
 Multistriatus, a, um—Many-striated.
 Multituberculatus, a, um—Having many tubercles.
 Multitubulatus, a, um—Having many pipes.
 Multivolvus, e—Many whorled or rolled.

- Mummiformis**, e—Resembling a mummy.
Mundus, a, um—Neat, trim, delicate.
Mundulus, a, um—Neat, trim, delicate.
Muralis, e—Of or belonging to a wall.
Muricatus, a, um—Full of sharp points, pointed.
Musculosus, a, um—Full of muscles.
Mutabilis, e—Inconstant, variable.
Mutatus, a, um—Altered, changed.
Mutus, a, um—Dumb, silent.
Myriophyllus, a, um—Many-leaved.
Myrmecophorus, a, um, wart-bearing.
Mytiliformis, e—Like *Mytilus*.
Mytilimeris, e—Pertaining to *Mytilus*.
Mytiloides—Like *Mytilus*.
- Nacrea**—Iridescent, like mother-of-pearl.
Nactus, a, um—Obtained, stumbled upon.
Naiadiformis, e—Like a water-nymph.
Nanus—A dwarf.
Nassa—A net, weel, wicker-basket.
Nassula—A little bag-net.
Nasutus, a, um—Large-nosed.
Natalis, e—Native, produced, natural.
Nاتور—A swimmer.
Naticoides—Like *Natica*.
Nautiloides—Like *Nautilus*.
Navalis, e—Of or belonging to ships, naval.
Navicella—A small vessel.
Naviformis, e—Ship-formed.
Navigiolum—A little boat.
Nebulosus, a, um—Full of mist, hazy.
Necis—Death.
Neglectus, a, um—Neglected, overlooked.
Nervus, a, m—Full of nerves or fibers.
Nervosus, a, um—Full of fibers, sinewy.
Neuropteroides, a, um—Like *Neuropteris*.
- Nexilis**, e—Knit, tied or wreathed together, twining.
Nexus, a, um—Linked together, interlaced.
Nitela—Brightness, splendor.
Nitens—Shining, neat, beautiful.
Nitidulus, a, um—Somewhat spruce, rather trim.
Nitidus, a, um—Neat, shining, polished.
Nobilis, e—Famous, celebrated, noble.
Nobilissimus, a, um—Most celebrated.
Nodobrachiatas, a, um—Knotty-armed.
Nodocarinatus, a, um—Knotty-keeled.
Nodocostatus, a, um—Knotty-ribbed.
Nodocosta—Having knotty-ribs.
Nododorsatus, a, um—Knotty-backed.
Nodomarginatus, a, um—Knotty-margined.
Nodosarius, a, um—Knotty.
Nodostriatus, a, um—Having knotty striæ.
Nodosus, a, um—Knotty, full of knots.
Nodulatus, a, um—Knotted.
Noduliferus, a, um—Knot or node bearing.
Nodulostriatus, a, um—Having small knotty striæ.
Nodulosus, a, um—Full of little nodes or knots.
Normalis, e—Made by the square or rule.
Notabilis, e—noteworthy, remarkable, extraordinary.
Notans—Noting, marking.
Notatus, a, um—Marked, branded, noted, dotted.
- Nothus**, a, um—Spurious, not genuine, of mixed breed.
Notus, a, um—Well known, notorious.
Nuciformis, e—Nut-shaped.
Nucleatus, a, um—Deprived of the kernel, stoned.
Nucleiformis, e—Kernel-shaped.
Nucleolatus, a, um—Like a little nut.
Nucleus—A kernel, nut.
Nuculiformis, e—Shaped like *Nucula*.
Nuculoides—Like *Nucula*.
Nudus, a, um—Naked, uncovered, empty, alone.
Numerosus, a, um—Numerous, manifold.
Nummifer, era, erum—Coin or disk bearing.
Nummiformis, e—Coin-shaped.
Nummularius, a, um—Of or pertaining to money.
Nummularis, e—Like a little coin.
Nuntius—A messenger.
Nuperus, a, um—Late, newly come or taken, recent.
Nuptialis, e—Nuptial.
Nutans—Nodding, bending backward and forward.
Nutrix—A nurse, the breast or pap.
Nux—A nut.
Nymphalis, e—Of or belonging to a fountain.
- Obcordatus**, a, um—Inversely heart-shaped.
Obesus, a, um—Fat, plump, swollen.
Oblatus, a, um—Showing, exhibiting.
Obliquatus, a, um—Bent, oblique.
Obliquinodus—Oblique-knot.
Obliquus, a, um—Oblique, sidewise.
Oblongifolius, a, um—Oblong-leaved.
Oblongus, a, um—Rather long, oblong.
Obmaximus, a, um—Large in front.
Obovatus, a, um—Inversely ovate.
Obpyramidalis, e—Inversely pyramidal.
Obscurus, a, um—Hidden, not understood, obscure.
Obsolescens—Grown old.
Obsoletus, a, um—Antiquated, obsolete.
Obtectus, a, um—Covered, disguised.
Obtusidens—Blunt-toothed.
Obtusifolius, a, um—Obtuse-leaved.
Obtusilobus, a, um—Obtuse-lobed.
Obtusiplicatus, a, um—Obtuse-plaited.
Obtusispira—Having a blunt spire.
Obtusus, a, um—Blunted, obtuse.
Obuncus, a, um—Bent in, hooked.
Obvius, a, um—Meeting, laying open, exposed.
Occasus, a, um—Crushed, stricken to the ground.
Occidaneus, a, um—Western.
Occidens—The west, western.
Occidentalis, e—Western.
Oceanus, a, um—Of or belonging to the ocean.
Ocellatus, a, um—Having little eyes.
Octobrachiatus, a, um—Eight-armed.
Octocostatus, a, um—Eight-ribbed.
Octonar'us, a, um—Of the number eight.
Octonotatus, a, um—Having eight marks or tracks.
Ocular'us, a, um—Having eyes.

- Oculiferus, a, um—Eye-bearing.
 Oculinus, a, am—Like an eye.
 Odontopteroides—Like *Odontopterus*.
 Offula—A small piece.
 Oliviformis, e—Shaped like an olive.
 Oligospiratus, a, um—Having few whorls.
 Olla—A pot.
 Ollicula—A little pot.
 Omphaloides—Like a navel or boss.
 Onustus, a, um—Filled, loaded, burdened.
 Ophioglossoides—Like *Ophioglossus*.
 Opimus, a, um—Fertile, fruitful, fat, large, plump.
 Oppletus, a, um—Filled.
 Oppositus, a, um—Opposite, placed before.
 Optatus, a, um—Wished, desired, longed for.
 Opusculum—A little fabric.
 Orbicaudatus, a, um—Having a circular tail.
 Orbicella—A little circle.
 Orbicularis, e—Circular, orbicular.
 Orbiculatus, a, um—Of a round or circular form, orbiculate.
 Orbiculostoma—Having a circular mouth.
 Orbipora—Having round pores.
 Ordinatus, a, um—Set in order, regular, ranged in rows.
 Oreopteroides—Like *Oreopterus*.
 Organum—An instrument, implement, or pipe.
 Oriens—Rising, beginning.
 Orientalis, e—Eastern.
 Originarius, a, um—Original.
 Ornatissimus, a, um—Very ornate, highly adorned.
 Ornatus, a, um—Adorned, embellished.
 Ornigranulus, a, um—Having granules.
 Ornithienoides—Like bird-tracks.
 Orthambonites—Having a straight umbo.
 Orthidoideus, a, um—Like *Orthis*.
 Orthonotus, a, um—Straight-backed.
 Osculum—A pretty little mouth.
 Ostiolatus, a, um—Having small openings.
 Ovals, e—Oval, egg-shaped.
 Ovatifolius, a, um—Ovate-leaved.
 Ovatiopora—Having oval pores.
 Ovatus, a, um—Shaped like an egg, ovate.
 Ovibos—The musk ox.
 Ovidactylus—Having ovate toes.
 Oviformis, e—Egg-shaped.
 Ovoidactylus—Having ovoid toes.
 Ovoides—Having an egg shape, ovoid.
 Ovoideus, a, um—Having a form like an egg, ovoid.
- Pabulocrinus**—Crinoid-food. A word founded on the erroneous opinion that crinoids lived on *Gasteropoda*.
 Pacator—A peace-maker.
 Pachylirus—Having a thick hand.
 Pachydactylus, a, um—Having thick fingers or thick toes.
 Pachyderma—A thick skin.
 Pachynervis, e—Having thick veins or thick nerves.
 Pachypteroides—Like *Pachypterus*.
 Pachytesta—Having a thick shell.
 Palæotrochus—Ancient *Trochus*.
 Paliformis, e—Shovel-like or stake-like.
- Palmatifidus, a, um—Divided like a hand.
 Palmatus, a, um—Marked with the palm of a hand, palmate.
 Palmipes—Broad-footed.
 Palpebra—The eyelid.
 Paludiniiformis, e—Shaped like *Paludina*.
 Palum—A pale, stake.
 Pandatus, a, um—Bent, bowed down in the middle.
 Pandoriformis, e—Shaped like *Pandora*.
 Pandus, a, um—Bent, crooked, curved.
 Panicum—A grain, panic-grass.
 Panneus, a, um—Ragged; tattered.
 Pannosus, a, um—Full of rags, ragged.
 Papilioniformis, e—Shaped like a butterfly.
 Papillatus, a, um—Bud-shaped, covered with papilli.
 Papillosus, a, um—Full of buds, verrucose.
 Papulatus, a, um—Covered with nipples, warty.
 Papulosus, a, um—Full of pimples.
 Paradoxicus, a, um—Paradoxical.
 Paradoxus, a, um—Strange, contrary to received opinions.
 Paralius, a, um—That grows by the seaside.
 Parallelus, a, um—Parallel.
 Parallelodontus, a, um—Having parallel teeth.
 Parasiticus, a, um—Parasitic.
 Paridens—Having equal teeth.
 Parilis, e—Equal, like, proportionate.
 Partitus, a, um—Proportionably divided.
 Parvibrachiatus, a, um—Small-armed.
 Parvinodus—Having a small knot.
 Parvisprostris—Having a little beak.
 Parvispira—Having a small spire.
 Parvituba—Having a small tube.
 Parviseculus, a, um—Quite small.
 Parvulipora—Having small pores.
 Parvulus, a, um—Very small.
 Parvus, a, um—Small, narrow, short, little.
 Patellarius, a, um—Belonging to a plate, plated.
 Patellifer, a, um—Dish-bearer.
 Patelliformis, e—Dish-shaped.
 Patens—Open, wide, extending, spreading.
 Paternus, a, um—Paternal.
 Patulus, a, um—Standing open or opened, wide, large.
 Paucicristatus, a, um—Few-crested.
 Paucidactylus, a, um—Few-fingered.
 Paucinodus, a, um—Having few nodes.
 Pauciradiatus, a, um—Few-rayed.
 Pauciramus, a, um—Having few branches.
 Pauciseptus, a, um—Having few septa.
 Pauper—Poor, small, impoverished.
 Pauperatus, a, um—Poor, impoverished.
 Paupereculus, a, um—Poor.
 Pecteniformis, e—Shaped like a *Pecten*.
 Pectenoides, a, um—Like a *Pecten*.
 Pectinaceus, a, um—Of or belonging to a comb, or to the *Pecten*.
 Pectinatus, a, um—Sloping two ways like a comb.
 Pectinellus, a, um—Like a little comb.
 Pectiniferus, a, um—Comb-bearing.
 Pectunculoides—Like *Pectunculus*.
 Peculiaris, e—Peculiar, remarkable, singular.

- Peduncularis, e—Of or belonging to a little foot.
 Pedunculatus, a, um—Little-footed.
 Pelagicus, a, um—Belonging to the sea.
 Pellicula—A small skin or hide.
 Pellucidus, a, um—Clear, transparent.
 Peloris—A shell fish.
 Peltatus, a, um—Armed with shields.
 Peltigerus, a, um—Shield-bearing.
 Pendens—Hanging, depending.
 Pendulus, a, um—Hanging down, pendent, pendulous.
 Penetrans—Piercing, penetrating.
 Penicilliformis, e—Brush or pencil-shaped.
 Penniculus—A painter's brush or pencil.
 Pennatus, a, um—Winged, feathered.
 Pennatulus, a, um—Provided with wings.
 Penniformis, e—Feather-shaped.
 Pentadactylus, a, um—Five-fingered.
 Pentagonus, a, um—Pentagonal.
 Pentalobus, a, um—Five-lobed.
 Pentaspinus, a, um—Five-spined.
 Peracutus, a, um—Very sharp, very acute.
 Peramplus, a, um—Very large.
 Perangulatus, a, um—Very angular.
 Perannulatus, a, um—Many-ringed, very annular.
 Perantiquus, a, um—Very ancient.
 Perarctus, a, um—Very close, small, or slender.
 Perasper, a, um—Very rough.
 Perattenuatus, a, um—Very attenuated, drawn out.
 Percarinatus, a, um—Very strongly keeled.
 Percingulatus, a, um—Encircled with many lines, many-girded.
 Perdentatus, a, um—Many-toothed.
 Peregrinus, a, um—Strange, foreign.
 Perelegans—Very neat, very elegant.
 Perextensus, a, um—Very much extended.
 Perforator—A borer through.
 Perforatus, a, um—Bored through.
 Perfossulatus, a, um—Having many little ditches.
 Pergibbosus, a, um—Very gibbous.
 Pergracilis, e—Very slender.
 Perhumerosus, a, um—Having angular shoulders.
 Perinflatus, a, um—Much inflated, swollen.
 Periprion—A round saw.
 Perizomatus, a, um—Girdled, banded.
 Perlamellosus, a, um—Very lamellose, having very thin plates.
 Perlatas, a, um—Very wide.
 Permargatus, a, um—Large-bordered.
 Permultus, a, um—Very many.
 Pernasutus, a, um—Very nasute.
 Perniformis, e—Shaped like a Perna.
 Pernodosus, a, um—Very nodose, knotty.
 Perobliquus, a, um—Very oblique.
 Peroblongus, a, um—Somewhat oblong.
 Peroccidens—From the far West.
 Perornatus, a, um—Very ornate.
 Perovalis, e—Rather oval.
 Perovatus, a, um—Very ovate, or nearly round.
 Perparvus, a, um—Very small.
 Perplanus, a, um—Very plain.
- Perplexus, a, um—Confused, entangled, intricate.
 Perplicatus, a, um—Interlaced, entangled, many-folded.
 Perpusillus, a, um—Very small.
 Perrostellatus, a, um—Having a very little beak.
 Persicaria—A genus of plants.
 Persimilis, e—Very similar.
 Persinuatus, a, um—Very sinuate or channelled.
 Personatus, a, um—Masked, assumed, disguised.
 Persiphonatus, a, um—Having a large siphuncle.
 Perspectivus, a, um—Thoroughly viewed.
 Perspicator—Sharp-sighted.
 Perspinulatus, a, um—Having many little thorns or spines.
 Perstrialis, e—Having many striæ.
 Perstriatus, a, um—Very much striated.
 Persulcatus, a, um—Very much furrowed.
 Pertenuis, e—Very thin, small, or fine.
 Pertextus, a, um—Interwoven.
 Pertinax—That holds fast, clings to.
 Perumbonatus, a, um—Having a very convex umbo.
 Perumbrosus, a, um—Very shady.
 Perundatus, a, um—Very wavy.
 Perundulatus, a, um—Very wavy.
 Perversus, a, um—Turned around.
 Pervetus, a, um—Very old.
 Pervetustus, a, um—Very old.
 Pervicax—Immovable, stern.
 Pervolutus, a, um—Very much rolled.
 Pescapreoli—Having a stock supported by a small tendril.
 Pescervæ—Having deer-feet.
 Pesovis—Having sheep-feet.
 Petasiformis, e—Cap-shaped.
 Petchialis, e—Spotted.
 Petilus, a, um—Thin, slender.
 Petrifactor—Stone-maker.
 Petrodoides—Like Petrodus.
 Pexatus, a, um—Clothed in a garment with a nap on it.
 Pharovicinus, a, um—Near the light-house.
 Phaseolus—A kidney-bean.
 Phaseolinus—Like a bean.
 Phlyctainodes—Pimply, pustulous.
 Phoca—A seal, sea-dog.
 Pholadiformis, e—Like Pholas.
 Pholadis—Like a Pholas.
 Phragmoceras—Partitioned horn.
 Phycoides—Like sea-weed.
 Piger, gra, grum—Sluggish.
 Pileatus, a, um—Covered with a cap.
 Pileiformis, e—Cap-shaped.
 Pileolus—A skull-cap, a little cap.
 Pileolum—A little cap.
 Pileus—A cap or hat.
 Pilosus, a, um—Hairy, shaggy.
 Pinaster—A wild pine.
 Pinguis, e—Fat, plump, fertile.
 Pinnatifidus—Having cleft pinnæ.
 Pinnatus, a, um—Feathered, plumed, winged.
 Pinniformis, e—Like Pinna.
 Piscator—A fisher.

- Pisiformis, e—Pea-shaped.
 Pistilliformis, e—In the form of a pestle.
 Pistillus—A pounder, pestle.
 Pisum—A pea.
 Placenta—A cake.
 Placidus, a, um—Placid, smooth.
 Plagusus, a, um—Full of wounds or stripes.
 Planiceps—Flat-headed.
 Planicosta—Having flat ribs.
 Planidorsalis, e—Flat or smooth-backed.
 Planidorsatus, a, um—Flat or smooth-backed.
 Planifrons—Having a plane front.
 Planimarginatus, a, um—Flat-margined.
 Planiramosus, a, um—Having flat branches.
 Planirostris—Having a smooth beak.
 Planispira—Having a flat spire.
 Planistria—Having flat striæ.
 Planistriatus, a, um—Having flat striæ.
 Planobasalis, e—Having a flat base.
 Planobrachiatus, a, um—Smooth-armed.
 Planoconvexus, a, um—Flat, convex.
 Planocostatus, a, um—Flat-ribbed.
 Planodiscus—Flat disk.
 Planodorsalis, e—Smooth or flat-backed.
 Planodorsatus, a, um—Having a smooth or flat back.
 Planogratus, a, um—Flat-whorled.
 Planorbiformis, e—Like Planorbis.
 Planosulcatus, a, um—Plane-furrowed.
 Planovolvis, e—Flat-whorled.
 Planulatus, a, um—Rather flat.
 Planumbonus, a, um—Having a smooth umbo.
 Planus, a, um—even, level, flat, plane.
 Platymarginatus, a, um—Flat-margined.
 Platybasis—Having a flat base.
 Platycephalus—Having a flat head.
 Platynervis, e—Flat-nerved.
 Platynotus—Having a flat ridge or back.
 Platypleurus—Having flat sides.
 Platyplus—Broad-footed.
 Platyrrachis—Having a flat rachis.
 Platus—Broad.
 Platystigma—Having flat scars, dots, or pits.
 Platystomus, a, um—Having a broad mouth.
 Plebeiformis, e—Like a plebeian.
 Plebeius, a, um—Common.
 Pleiopleura—Having wide ribs.
 Plenissimus, a, um—The largest.
 Plenus, a, um—Full, plump.
 Pleurexanthemus—Having the pleura extending out.
 Pleurites—The side, lateral.
 Pleurodictyoides—Like Pleurodictyum.
 Pleuropistha—Having the side behind.
 Pleuroptera—Having side wings.
 Pleuropteryx—Having side wings.
 Pleurovimineus, a, um—Having side wicker-work.
 Plicatellus, a, um—Having small folds.
 Plicatilis, e—That may be folded, flexible.
 Plicatulus, a, um—Having little plications or folds.
 Plicatus, a, um—Plaited, folded.
 Pliciferus, a, um—Fold-bearing or plaited.
 Plicomphalus—Folded in the middle.
 Pluma—A small feather.
- Plumarius, a, um—Embroidered with feathers.
 Plumosus, a, um—Full of feathers, feathery.
 Plumula—A little feather.
 Plumulosus, a, um—Full of feathers.
 Pluriradialis, e—Many-rayed.
 Pocillatus, a, um—Little-cupped.
 Pocilliformis, e—Cup-shaped.
 Pocillum—A little cup.
 Poculum—A cup, bowl, or goblet.
 Pogonias, a, um—A kind of comet.
 Politus, a, um—Polished, smoothed.
 Polydactylus, a, um—Many-fingered.
 Polygonus, a, um—Having many angles, polygonal.
 Polygyratus, a, um—Many coiled or whorled.
 Polymorphus, a, um—Many-formed.
 Polyphyllus, a, um—Many-leaved.
 Polypleurus, a, um—Having many ribs.
 Polysporus—Having many spores.
 Polystomellus, a, um—Having many little mouths.
 Ponderosus, a, um—Heavy, ponderous.
 Ponticulus—A little bridge.
 Porcatus, a, um—Ridged, furrowed.
 Porosus, a, um—Full of pores.
 Porrectus, a, um—Extended, stretched, or spread out.
 Posticus, a, um—Posterior.
 Postremus, a, um—The last, hindmost, worst.
 Poststriatus, a, um—Having a striated posterior.
 Potens—Powerful.
 Poterium—A drinking vessel, a cup.
 Precedens—Going before, surpassing.
 Preciptus, a, um—Anticipated, going before.
 Precursor—A forerunner.
 Praelongus, a, um—Very long.
 Præmaturus, a, um—Very early, untimely, premature.
 Præmorsus, a, um—Bitten off, jagged.
 Prænuntius, a, um—That foretells, or forebodes.
 Præumbonus, a, um—Very protuberant.
 Præteriformis, e—Præteriform.
 Pravus, a, um—Crooked, deformed, distorted.
 Preciosus, a, um—Precious, splendid.
 Precius, a, um—That brings forth ripe grapes before other vines.
 Pressulus, a, um—Somewhat pressed in, compressed.
 Pressus, a, um—Pressed.
 Pretiosus, a, um—Precious, valuable.
 Primaevus, a, um—Primeval.
 Primarius, a, um—One of the first, remarkable, principal.
 Primigenius, a, um—First of its kind, original, primitive.
 Primitivus, a, um—First of its kind, primitive.
 Primordialis, e—Primordial, original, first of all.
 Primus, a, um—The first.
 Princeps—The first, chief, original, principal.
 Principalis, e—First, original, principal.
 Priscus, a, um—Ancient, old.

- Pristiniformis*, e—An ancient form.
Pristinus, a, um—Primitive, early.
Pristis—Any sea monster or saw-fish.
Problematicus, a, um—Problematical, unsettled, uncertain.
Proboscidiialis, e—Having a proboscis.
Proboscidiatus, a, um—Having a proboscis.
Procerus, a, um—High, tall.
Proclivis, e—Sloping, steep.
Productus, a, um—Drawn out, produced.
Profundus, a, um—Deep, profound.
Projectus, a, um—Thrown out, projected.
Prolatus, a, um—Brought forth, extended, enlarged.
Prolificus, a, um—Prolific, fruitful.
Prolifer, era, erum—Prolific, productive; fruitful.
Prolixus, a, um—Stretched far out, long, broad.
Prolongatus, a, um—Prolonged.
Prolongus, a, um—Prolonged, stretched out.
Prominulus, a, um—Projecting a little, rather prominent.
Promissus, a, um—Hanging down, putting forth.
Pronis, e—Bent forward, inclined downward.
Pronus, a, um—Turned forward, bent or inclined.
Propinquus, a, um—Near, hard by, related to.
Proporoides—Like *Propora*.
Proprius, a, um—Peculiar, proper.
Prora—The prow of a ship.
Proteiformis, e—Having many shapes.
Protensus, a, um—Stretched out.
Protextus, a, um—Closely woven.
Protuberans—Projecting, protuberant.
Proximus, a, um—Nearest.
Pseudogaleatus—False *Galeatus*.
Pseudolineatus, a, um—False-lined.
Pseudo-marginalis, e—False-margined.
Pseudomurrayanus, a, um—False *Murrayanus*.
Pseudosagittatus—False *Sagittatus*.
Psilophlœus—Having rough bark.
Pterineiformis, e—Shaped like *Pterinea*.
Pterocephalus—Having a winged head.
Pteroides—Wing-like.
Pterotus, a, um—Winged, feathered.
Pudicus, a, um—Shamefaced, modest.
Pugiunculus—A small dagger.
Pugnax—War-like, combative.
Pugnus—A fist, a handful.
Pulcellus, a, um—Beautiful little.
Pulchellus, a, um—Beautiful little, or somewhat beautiful.
Pulcher, a, um—Beautiful.
Pulex—A flea.
Pulcaris—Like a flea.
Pulmoneus, a, um—Spongy like the lungs.
Pumilus, a, um—Dwarfish, diminutive, little.
Punctatus, a, um—Punctured, dotted.
Punctiferus, a, um—Puncture-bearing.
Punctifrons—Dotted in front.
Punctillatus, a, um—Finely dotted.
Punctipora—Having dotted pores.
Punctolineatus, a, um—Having dotted or pitted lines or furrows.
Punctostriatus, a, um—Having pricked or dotted striæ.
Punctulatus, a, um—Marked with small spots.
Punctuliferus, a, um—Bearing punctures or dots.
Pusillus, a, um—Very small, petty, insignificant.
Pustulatus, a, um—Blistered, covered with pustules.
Pustuliferus, a, um—Bearing blisters or pustules.
Pustulosus, a, um—Full of blisters, pimples, or pustules.
Puteatus, a, um—Having little pits or wells.
Puteolatus, a, um—Pitted.
Putillus—A child or dwarf.
Pygmæus, a, um—Dwarfish.
Pyramidalis, e—Pyramidal, pointed like a pyramid.
Pyramidatus, a, um—Pyramidal, made like a pyramid.
Pyriformis, e—Pyriform, pear-shaped.
Pyxidatus, a, um—Box-like.
Pyxidicula—A small box.
Pyxidiformis, e—Box-shaped.
Quadrangularis, e—Quadrangular.
Quadrangulatus, a, um—Quadrangular.
Quadrans—A quarter or a fourth part.
Quadraticaudatus, a, um—Square-tailed.
Quadratfolius, a, um—Quadrately-leaved.
Quadratus, a, um—Four-cornered, squared, quadrate.
Quadribrachiatus, a, um—Having four arms.
Quadriceps—Square-headed.
Quadrincinctus, a, um—Four banded or girdled.
Quadriribbatus, a, um—Four-ribbed.
Quadrilateralis, e—Quadrilateral, four-sided.
Quadrinucronatus, a, um—Having four sharp points or spines.
Quadrupartitus, a, um—Four-parted.
Quadriseriatus, a, um—Having four series.
Quadrispinus, a, um—Four-spined.
Quadrisculcatus, a, um—Four-furrowed.
Quadrivolvis, e—Four-whorled.
Quadrula—A little square.
Quasillus—A little basket.
Quaternarius, a, um—Containing four, quaternary.
Quatuordecembrachialis, e—Having fourteen arms.
Quercifolius, a, um—Oak-leaved.
Quincuncialis, e—Made in the form of a quincunx.
Quinquelobus, a, um, five-lobed.
Quinquenodus, a, um—Having five nodes or knots.
Quinquepartitus, a, um—Five-parted.
Quinquesulcatus, a, um—Five-furrowed.
Racematus, a, um—Having clusters.
Racemosus, a, um—Full of clusters, clustering.
Radians—Radiating, glittering.

- Radiatoplicatus, a, um—Rayed and plaited.
 Radiatus, a, um—Rayed.
 Radicans—Rooting.
 Radiciformis, e—Root-like.
 Radicosus, a, um—Full of roots.
 Radicula—A small root.
 Ramifer, era, erum—Branch-bearing.
 Ramosissimus, a, um—Very branchy.
 Ramosus, a, um—Full of branches, ramose.
 Ramulosus, a, um—Full of little branches.
 Ramulus—A little branch.
 Rana—A frog.
 Ranunculus—A tadpole.
 Rapax—Grasping, rapacious.
 Raphanus—A radish-root.
 Rapheidolabis—Needle-like forceps.
 Rapidens—Having grasping teeth.
 Raptor—A robber.
 Raricosta—Having few ribs.
 Raricostatus, a, um—Having few ribs.
 Rarinervis, e—Few-nerved or few-veined.
 Raripora—Having few pores.
 Rarispinus—Having few spines.
 Rarus, a, um—Having wide interstices, thin, scattered, rare.
 Recedens—Falling back, receding.
 Receptaculum—A receptacle.
 Rectangularis, e—Rectangular.
 Rectangulus, a, um—Rectangular.
 Rectiannulatus, a, um—Having straight annulations.
 Recticameratus, a, um—Straight-chambered.
 Recticardinalis, e—Having a straight cardinal line.
 Rectidorsatus, a, um—Straight-backed.
 Rectidens—Having straight teeth.
 Rectiformis, c—Straight-formed.
 Rectilatera—Having straight sides.
 Rectilateralis, e—Straight-sided.
 Rectilaterarius, a, um—Straight-sided.
 Rectilinear—Having straight lines.
 Rectinodus, a, um—Having a straight knot or node.
 Rectiplicatus, a, um—Having straight plaits or folds.
 Rectirostris—Straight beaked.
 Rectirostrus, a, um—Straight-beaked.
 Rectiseptatus, a, um—Having straight septæ.
 Rectistriatus, a, um—Having straight furrows.
 Rectistylus, a, um—Having straight stems or styles.
 Rectus, a, um—Straight.
 Recurvatus, a, um—Curved backward.
 Recurvirostris—Having a recurved beak.
 Recurvus, a, um—Turned back, bent or curved back.
 Reflexus, a, um—Bending backward, reflexed.
 Regalis, e—Regal, splendid.
 Regius, a, um—Regal, majestic.
 Regularis, e—Regular, according to a rule, of or belonging to a bar.
 Regulatus, a, um—Regulated.
 Reliquus, a, um—Remaining.
 Remex—A rower, oarsman.
 Remibrachiatus, a, um—Paddle-armed.
 Remipes—Oar-footed.
 Remotiseptum—Having distant barriers or walls.
 Remotus, a, um—Removed, distant, remote.
 Remus—An oar.
 Reniformis, e—Kidney-shaped.
 Repandus, a, um—Bent backward.
 Repens—Creeping, crawling.
 Repertus, a, um—Discovered, hit upon.
 Repositus, a, um—Restored, kept, remote, distant.
 Reservatus, a, um—Reserved.
 Restrictus, a, um—Drawn back, bound up.
 Resupinatus, a, um—Lying on one's back, bent backward.
 Resupinoides—Like a resupinate form.
 Reticularis, e—Reticulated.
 Reticulatus, a, um—Made like a net, net-like, reticulated.
 Retiferus, a, um—Net-bearing.
 Retiformis, e—Net-formed.
 Retorquatus, a, um—Turned back.
 Retractilis, e—Drawn back.
 Retrorsus, a, um—Turned backward, in reversed order.
 Retroversus, a, um—Turned backward, in reversed order.
 Retusus, a, um—Beaten back, blunt, dull.
 Reversus, a, um—Turned about, reversed.
 Revolutus, a, um—Rolled back, revolved.
 Rhabdocarpos, a, um—Rod-fruited or long-fruited.
 Rhombeus, a, um—Rhomboidal.
 Rhombicus, a, um—Rhombic.
 Rhombiferus, a, um—Rhomb-bearing.
 Rhomboidalis, e—Rhomboidal.
 Rhomboides—Rhomb-like.
 Rhomboides, a, um—Lozenge-shaped, rhomboid.
 Rhombolinearis, e—Rhomb-lined.
 Rhynchonelliformis, e—Like Rhynchonella.
 Riciniformis, e—Like a tike or tick.
 Ricinula—A little tick.
 Rictum—The mouth wide open.
 Rigens—Stiffened, standing upright.
 Rigidus, a, um—Hard, inflexible, rigid.
 Rimosus, a, um—Full of cracks, or fissures.
 Ringens—Gaping.
 Robustus, a, um—Strong, of hard wood.
 Robustus, a, um—Strong, robust.
 Rostellatus, a, um—Little-beaked.
 Rostellum—A little beak.
 Rostratus, a, um—Beaked, curved at the end.
 Rota—A wheel.
 Rotadentatus, a, um—Wheel-toothed.
 Rotalinea—Having a round line.
 Rotatorius, a, um—Whorled.
 Rotatus, a, um—Wheel-shaped.
 Rotulatus, a, um—Rounded.
 Rotuliformis, e—Little wheel-shaped.
 Rotuloides—Like a little wheel.
 Rotulus—A little wheel.
 Rotundatus, a, um—Rounded.
 Rotundifolius, a, um—Round-leaved.
 Rotundilobus, a, um—Round-lobed.
 Rotundispira—Having a round spire.
 Rotundus, a, um—Wheel-shaped, circular, rotund.
 Rubellus, a, um—Reddish.

- Ruber, bra, brum—Red, ruddy.
 Rudicula—A wooden spoon, a spatula.
 Rudis, e—Rough, unwrought, unpolished.
 Rugatinus, a, um—Having little folds or plaits.
 Rugatulus, a, um—Having little wrinkles.
 Rugicosta—Having wrinkled ribs.
 Rugilineatus, a, um—Having wrinkled lines.
 Rugiplicatus, a, um—Having wrinkled plates.
 Rugistriatus, a, um—Having wrinkled striæ.
 Rugosiusculus, a, um—Covered with small wrinkles.
 Rugosus, a, um—Wrinkled, shriveled.
 Rugulatus, a, um—Having wide furrows.
 Ruguliferus, a, um—Wrinkle-bearing.
 Ruidus, a, um—Rough.
 Rusticellus, a, um—Somewhat rustic.
 Rusticus, a, um—Rural, rustic, rough.
- Saccatus, a, um**—That is put in a bag, like a little bag.
Sacculus—A little bag.
Sagittarius, a, um—Of or belonging to an arrow.
Sagittatus, a, um—Discharging arrows, barbed like an arrow.
Salamandroides—Like a salamander.
Salebrosus, a, um—Rough, rugged, uneven.
Saliginoides—Like willow wood.
Salisburyoides—Like Salisburia.
Samariformis, e—Like elm-seed.
Sanguinolariodeus, a, um—Like Sanguinolaria.
Sarcinula—A little bundle.
Sarcululus—A little hoe.
Sarmenticius, a, um—Of or belonging to twigs.
Sarmentosus, a, um—Full of twigs or little branches.
Saxifragifolius, a, um—Leaved like Saxifraga.
Saxivadus, a, um—Creeping over stone.
Scaber, era, erum—Rough, scurfy.
Scaberrimus, a, um—Very rough, scurfy.
Scabiosus, a, um—Scabby, rough, scurfy.
Scabriculus, a, um—Rough.
Scabrosus, a, um—Rough.
Scalariformis, e—Ladder-like.
Scalaris, e—Of or belonging to a flight of steps, or a ladder.
Scalatus, a, um—Having stairs.
Scalenus, a, um—Unequal-sided, scalene.
Scalpriformis, e—Lancet-shaped.
Scapha—A skiff or boat.
Scintilla—A spark.
Scissilis, e—Split, cleft, or rent.
Scitulus, a, um—Handsome, pretty, elegant.
Scobiniformis, e—Rasp-like.
Scobina—A rasp.
Scolopendrites—Stone-scolopendrium.
Scoparius—A sweeper.
Scorpionis, e—Of or belonging to a scorpion.
Scrinium—A case, chest, or box.
Scriptiferus, a, um—Writing-bearing.
Scrutator—A searcher, investigator.
Sculptilis, e—Formed or produced by carving or graving.
- Sculptus, a, um—Engraved, sculptured, carved.**
Scutatus, a, um—Armed with a shield.
Scutellatus, a, um—Armed with a little shield.
Scutelliformis, e—Waiver-shaped.
Scutigerus, a, um—Shield-bearing.
Scutellatus, a, um—Lozenge-shaped, checkered.
Scyphulus—A small cup.
Scyphus—A cup, a goblet.
Secalinus, a, um—Like small grain.
Secans—A cutter.
Secretus, a, um—Severed, separated, secrete.
Sectifrons—Having a divided front.
Sectoralis, e—Like a sector, or cutter.
Secundus, a, um—Following.
Securiformis, e—Ax or hatchet shaped.
Securis—An ax or hatchet.
Segmentatus, a, um—Ornamented with strips, trimmed, made of pieces.
Selaginoides—Like Selago.
Selago—A plant.
Selectus, a, um—Culled, selected, chosen.
Selenurus—Having a crescent tail.
Selluliformis, e—Like a little seat or stool.
Semicarinatus, a, um—Half-keeled.
Semicircularis, e—Half-circular.
Semicostatus, a, um—Half-ribbed.
Semicylindricus, a, um—Half-cylindrical.
Semiellipticus, a, um—Half-elliptical.
Semifasciatus, a, um—Half-bundled or banded.
Semina—Seed.
Seminosus, a, um—Full of seeds.
Semiorbiculatus, a, um—Half-orbicular.
Semplicatus, a, um—Half-plaited.
Sempunctatus, a, um—Half-dotted.
Semiradiatus, a, um—Half-rayed.
Semiradicatus, a, um—Half-rooted.
Semireductus, a, um—Half bent back.
Semireticulatus, a, um—Half-reticulated.
Semirotundus, a, um—Half-round, semicircular.
Semistriatus, a, um—Half-striated.
Senarius, a, um—Consisting of six.
Senectus, a, um—Aged, very old.
Senex—Old, aged.
Sentosus, a, um—Full of thorns, thorny.
Separatus, a, um—Separated.
Septatus, a, um—Divided with partitions or septa.
Septemnotatus, a, um—Seven-marked.
Septentrionalis, e—Northern.
Septoris, e—Having seven mouths.
Septus, a, um—Inclosed, enveloped, surrounded.
Sepultus, a, um—Buried in deep sleep, slumbering.
Seriatus, a, um—In series.
Sericeus, a, um—Silken.
Serotinus, a, um—Backward, late.
Serpens—Creeping, crawling.
Serpillifolius, a, um—Thyme-leaved.
Serpuloides—Like Serpula.
Serpuloideus, a, um—Snake-like or Serpula-like.
Serratulus—A small saw.

- Serratus*, a, um—Saw-shaped, serrated.
Serrula—A small saw.
Serrulatus, a, um—Like a little saw.
Servilis, e—Of or belonging to a slave, paltry.
Sesquiplicatus, a, um—Once and a half plaited.
Setaceus, a, um—Hairy.
Setiferus, a, um—Bristle-bearing, having coarse hair.
Setigerus, a, um—Bristle-bearing, having coarse hair.
Sexarmatus, a, um—Six-armed.
Sexlobatus, a, um—Six-lobed.
Sexplicatus, a, um—Six-plaited.
Sexradiatus, a, um—Six-rayed.
Sextans—A sixth part.
Sicula—A dagger, sickle, or scythe.
Sidereus, a, um—Of or belonging to the stars, starry.
Sigaretoides—Like *Sigaretus*.
Sigillarioides—Like *Sigillaria*.
Sigillatus, a, um—Adorned with little images or figures.
Sigillum—A sign, mark.
Sigmoides—Like the Greek letter *Sigma*.
Sigmoideus, a, um—Like the Greek letter *Sigma*.
Signatus, a, um—Marked, designated.
Silicula—A little pod.
Siliqua—A pod.
Siliquoideus, a, um—Like a pod.
Similior—Similar.
Simillimus, a, um—Very similar.
Similis, e—Like, resembling, similar.
Simplex—Simple, plain.
Simplicitas—Simpleness, simplicity.
Simulans—Imitating, copying.
Simulator—A copier, imitator.
Simulatrix—A transformer.
Singularis, e—Alone, solitary, singular.
Singularitas—Singleness, being alone or single.
Sinistrorsus, a, um—Toward the left side.
Sinuatus, a, um—Hollowed out, excavated, having depressions.
Sinuosus, a, um—Full of bendings, curves, or folds, sinuous.
Sirpus—A rush, bulrush.
Smilacifolius, a, um—Smilax-leaved.
Sobrina—A cousin.
Socialis, e—Of or belonging to companionship, social.
Solarioides—Like *Solarium*.
Soleniformis, e—Solen-shaped.
Solenoides—Like *Solen*.
Solidirostris—A solid beak.
Solidissimus, a, um—Very firm or solid.
Solidulus, a, um—Solid.
Solidus, a, um—Firm, compact, solid.
Solitarius, a, um—Lonely, solitary.
Solus, a, um—Alone, single, sole.
Solutus, a, um—Separated, loosened.
Sordidus, a, um—Small, sordid, paltry.
Sororcula—A little sister.
Sparsipora—Having few pores.
Sparsus, a, um—Scattered, separated, dispersed.
Spartarius, a, um—Of or belonging to a broom.
- Spathatus*, a, um—Spatula-shaped.
Spatiosus, a, um—Ample, of great extent, spacious.
Spatulatus, a, um—Blade-shaped, spatulate.
Speciosus, a, um—Handsome, beautiful, splendid.
Spectabilis, e—Visible, admirable, remarkable.
Sphaericus, a, um—Of or belonging to a ball, spherical.
Sphaerion—A little ball or pill.
Sphaerodactylus—Spherical-toed or fingered.
Sphaeroidalis, e—Spheroidal.
Sphaerulatus, a, um—A widened sphere.
Sphenophylloides—Like *Sphenophyllum*.
Sphenopteroides—Like *Sphenopteris*.
Spicatus, a, um—Pointed, spiked.
Spiculatus, a, um—Having little points.
Spiculus, a, um—Pointed.
Spinalatus, a, um—Spine-winged.
Spiniiferus, a, um—Thorn-bearing, thorny, spiny.
Spinigerus, a, um—Thorn-bearing, thorny, spiny.
Spinobrachiatus, a, um—Having spines on the arms.
Spinoclavatus, a, um—Club-spined.
Spinoporus—Having spines and pores.
Spinosulus, a, um—Somewhat thorny.
Spinosus, a, um—Full of thorns, thorny, prickly.
Spinotentaculatus, a, um—Having spinefeelers.
Spinulicosta—Having spines and ribs.
Spinuliferus, a, um—Spine-bearing.
Spinulosus, a, um—Full of little thorns.
Spinula—A little thorn.
Spiralis, e—Spiral.
Spiratus, a, um—Spiral.
Spiriferoides—Like *Spirifera*.
Spiroeuema—Having spiral threads or lines.
Spirorbis—Spire-whorl.
Spissiseptus, a, um—Having crowded or numerous septa.
Spissus, a, um—Thick, crowded, compact, dense.
Splendens—Splendid, bright.
Splendidus, a, um—Bright, shining.
Spondyliformis, e—Shaped like *Spondylus*.
Spondylus—A vertebra, spondyle.
Spongiaxis—Sponge-axis.
Spongilla—A little sponge.
Sponsus, a, um—Promised, betrothed.
Spurius, a, um—Illegitimate.
Squalodens—A kind of fish-tooth.
Squamifer, era, erum—Scale-bearing.
Squamiformis, e—Scale-like.
Squamosus, a, um—Covered with scales, scaly.
Squamula—A little scale.
Stabilis, e—Firm, stable, durable.
Stachyoides—Like *Stachys*.
Stamineus, a, um—Full of threads, thready.
Stella—A star.
Stellaris, e—Of or belonging to a star, starry.
Stellatimulcatus, a, um—Star-furrowed.
Stellatus, a, um—Covered with stars, starred.
Stellifer, era, erum—Star-bearing, starry.
Stellifolius, a, um—Star-leaved.

- Stelliformis, e—Star-shaped.
 Stenocephalus—Having a narrow head.
 Stenopus—Having a narrow foot.
 Stigmatus, a, um—Branded.
 Stigmatosus, a, um—Full of brand-marks, branded.
 Stillativus, a, um—Dropping.
 Stipatus, a, um—Crowded together, sur-
 rounded, compressed.
 Stoloniferus, a, um—Bearing a useless sucker
 or water-shoot.
 Stragulus, a, um—Covered.
 Stramineus, a, um—Made of straw.
 Strenuus, a, um—Vigorous, strenuous.
 Striatellus, a, um—Finely channeled.
 Striatiformis, e—Shaped like *Striatus*, another
 species.
 Striatocostatus, a, um—Striæ-ribbed.
 Striatolineatus, a, um—Striæ-lined.
 Striatomarginatus, a, um—Having a striated
 margin.
 Striatopora—Having striæ and pores.
 Striatulus, a, um—Somewhat striated, or
 having small striæ.
 Striatura—Being channeled or fluted, a
 fluting.
 Striatopora—Having striated pores.
 Striatus, a, um—Furrowed, striated.
 Strictus, a, um—Drawn tight, bound, pressed
 together.
 Strigatus, a, um—Furrowed, channeled,
 grooved, fluted.
 Strigillatus, a, um—Furrowed, fluted.
 Strigosus, a, um—Lean, thin, meager.
 Striobrachiatus, a, um—Having grooved
 arms.
 Striolatus, a, um—Very minutely striated.
 Strix—A furrow, channel, groove.
 Strophium—A twisted girdle, a band.
 Strophomenoides—Like *Strophomena*.
 Styliola—A truncated column.
 Stylus—A pointed instrument, stake, or pale.
 Subabbreviatus, a, um—Somewhat abbrevi-
 ated.
 Subaculeatus, a, um—Somewhat prickly.
 Subæqualis, e—Subequal.
 Subæquatus, a, um—Somewhat equal.
 Subæquilaterus, a, um—Somewhat equal-
 sided.
 Subalatus, a, um—Somewhat winged.
 Subangularis, e—Somewhat angular.
 Subangulatus, a, um—Somewhat angulated.
 Subarcuatus, a, um—Somewhat curved or
 arcuate.
 Subattenuatus, a, um—Somewhat drawn
 out or attenuated.
 Subcæspitosus, a, um—Somewhat cæspitose.
 Subcancellatus, a, um—Subcancellated.
 Subcarbonarius—Below the coal.
 Subcardiiformis, e—Somewhat heart-shaped.
 Subcarinatus, a, um—Somewhat keeled.
 Subcavus, a, um—Somewhat excavated,
 hollowed out.
 Subcentralis, e—Subcentral.
 Subcircularis, e—Subcircular.
 Subclavatus, a, um—Somewhat club-shaped.
 Subcompressus, a, um—Subcompressed.
 Subconcaus, a, um—Subconcaue.
 Subconicus, a, um—Subconical.
 Subconoideus, a, um—Somewhat conoidal.
 Subconstrictus, a, um—Subconstricted.
 Subcordiiformis, e—Somewhat heart-shaped.
 Subcoronatus, a, um—Somewhat adorned.
 Subcorpulentus, a, um—Somewhat corpu-
 lent.
 Subcrassus, a, um—Somewhat thick.
 Subcrenulatus, a, um—Somewhat crenu-
 lated.
 Subcuneatus, a, um—Somewhat wedge-
 shaped.
 Subcuspoidatus, a, um—Somewhat pointed.
 Subcylindricus, a, um—Somewhat cylin-
 drical.
 Subcymbiformis, e—Somewhat boat-shaped.
 Subdecussatus, a, um—Somewhat arranged
 in pairs that cross each other.
 Subdemissus, a, um—Somewhat hanging
 down.
 Subdepressus, a, um—Somewhat depressed.
 Subelegans—Somewhat elegant.
 Subellipticus, a, um—Subelliptical.
 Subemarginatus, a, um—Slightly emargin-
 ated.
 Subfalcatatus, a, um—Somewhat scythe-
 shaped, subfalcate.
 Subfurcatus, a, um—Somewhat forked.
 Subfusiformis, e—Somewhat spindle-
 shaped.
 Subgloboseus, a, um—Somewhat globose.
 Subgracilis, e—Somewhat slender.
 Subhorridentus, a, um—Somewhat rough.
 Subimbricatus, a, um—Somewhat imbric-
 ated.
 Subimpressus, a, um—Somewhat engraved.
 Sublævis, e—Nearly smooth.
 Sublamellosus, a, um—Somewhat in thin
 plates.
 Sublineatus, a, um—Somewhat striated.
 Subliratus, a, um—Somewhat lined.
 Sublunatus, a, um—Somewhat lunate.
 Submarginatus, a, um—Somewhat mar-
 gined.
 Submucronatus, a, um—Somewhat sharp-
 pointed.
 Submutans—Somewhat changing.
 Subnasutus, a, um—Somewhat nasute.
 Subnervosus, a, m—Somewhat veiny.
 Subnodosus, a, um—Somewhat knotty or
 nodose.
 Suborbicularis, e—Somewhat orbicular or
 orb-shaped.
 Suborbiculatus, a, um—Somewhat orbicular.
 Subovalis, e—Suboval.
 Subovatus, a, um—Subovate.
 Suboviformis, e—Somewhat egg-shaped.
 Subpapillosum, a, um—Somewhat papillose.
 Subpapyraceus, a, um—Somewhat like
 Papyrus, the paper-reed.
 Subplanus, a, um—Somewhat flat.
 Subplicatus, a, um—Somewhat plaited.
 Subpulchellus, a, um—Somewhat handsome.
 Subquadrans—Somewhat squared.
 Subquadratus, a, um—Somewhat squared.
 Subramosus, a, um—Somewhat ramose.
 Subramulosus, a, um—Somewhat branchy.
 Subrectus, a, um—Somewhat straight.
 Subretiformis, e—Somewhat net-shaped, or
 net-like.

- Subrhomboides, a, um—Somewhat rhomb-like.
- Subrigidus, a, um—Somewhat rigid.
- Subrotundatus, a, um—Somewhat rounded.
- Subrugosus, a, um—Somewhat wrinkled.
- Subscalaris, e—Somewhat ladder-shaped.
- Subscutulus, a, um—Somewhat hand-some.
- Subsiduus, a, um—Sinking down, settling.
- Subsinuatus, a, um—Somewhat sinuated.
- Subsinuosus, a, um—Somewhat sinuous.
- Subspatulatus, a, um—Somewhat spatula-shaped.
- Subsphericus, a, um—Subspherical.
- Subspinosus, a, um—Somewhat spiny.
- Subspinulosus, a, um—Somewhat covered with small spines.
- Substellatus, a, um—Somewhat starred.
- Substriatellus, a, um—Somewhat finely striated.
- Subsulcatus, a, um—Somewhat furrowed.
- Subteniatius, a, um—Somewhat banded.
- Subtentus, a, um—Extended underneath, bent.
- Subtextilis, e—Somewhat like net-work.
- Subtextus, a, um—Woven under, affixed.
- Subtilis, e—Fine, thin, slender, delicate.
- Subtilitas, a, um—Fine, thin.
- Subtilstriatus, a, um—Finely striated.
- Subtortilis, e—Somewhat twisted.
- Subtortuosus, a, um—Somewhat tortuous.
- Subtrigona—Somewhat three-angled.
- Subtrigonalis, e—Somewhat three-angled, subtrigonal.
- Subtruncatus, a, um—Somewhat shortened.
- Subtubulatus, a, um—Somewhat pipe or tube formed.
- Subtumidus, a, um—Somewhat tumid.
- Subturbatus, a, um—Somewhat top-shaped.
- Subulatus, a, um—Awl-shaped.
- Subumbonatus, a, um—Somewhat protuberant.
- Subumbrosus, a, um—Somewhat umbrella-like.
- Subundatus, a, um—Somewhat waved.
- Subundiferus, a, um—Somewhat wave-bearing.
- Subvadius, a, um—Somewhat creeping.
- Subvaricosus, a, um—Subvaricose.
- Subventricosus, a, um—Subventricose.
- Subvesicularis, e—Subvesicular.
- Succinctus, a, um—Girded, contracted, succinct.
- Succulens—Succulent, sappy.
- Sulcatinus, a, um—Small-furrowed.
- Sulcatus, a, um—Furrowed.
- Sulciferus, a, um—Furrow-bearing.
- Sulcomarginatus, a, um—Having the margin furrowed.
- Sulcoplicatus, a, um—Grooved along the middle of the plications.
- Superbus, a, um—Superior, excellent, superb.
- Superlatus, a, um—Extravagant, excessive, exaggerated.
- Supracingulatus, a, um—Encircled or girded in the upper part.
- Supraplanus, a, um—Flat above.
- Surgens—Rising.
- Symmetricus, a, um—Symmetrical.
- Tabulatus, a, um—Floored, tabulated.
- Tæniopteroides—Like Tæniopteris.
- Tæniopteroideus, a, um—Like Tæniopteris.
- Tantillus, a, um—So little, such a little thing.
- Tapetiformis, e—Formed like tapestry.
- Tardus, a, um—Slow, sluggish.
- Taxinus, a, um—Like the yew-tree.
- Tectorius, a, um—Of or belonging to a cover, rough east.
- Tegulatus, a, um—Tiled, thatched.
- Tegulum—A covering, thatch.
- Telliniformis, e—Like Tellina.
- Telum—A dart, spear, or javelin.
- Temerarius, a, um—Accidental, casual.
- Tenax—Holding fast, gripping, tenacious.
- Tenellus, a, um—Somewhat delicate, young.
- Tener, era, erum—Delicate, tender, young.
- Teneris, e—Delicate.
- Tenerrimus, a, um—Very tender, very delicate.
- Tenerus, a, um—Tender, delicate.
- Tentaculatus, a, um—Having feelers.
- Tenuiannulatus, a, um—Having slight annulations.
- Tenuibrachiatus, a, um—Slender-armed.
- Tenuicarinatus, a, um—Finely keeled.
- Tenuiceps—Having a slender head.
- Tenuicinctus, a, um—Finely girded.
- Tenuicornis, e—Slender-horned.
- Tenuicostatus, a, um—Fine-ribbed.
- Tenuicosta—Having fine ribs or costæ.
- Tenuicristatus, a, um—Slender-peaked.
- Tenuidactylus, a, um—Slender-fingered.
- Tenuidens—Having slender teeth.
- Tenuidiscus—Having a thin-disk.
- Tenuiflum—Fine thread.
- Tenuifolius, a, um—slender-leaved, narrow-leaved.
- Tenuilamellatus, a, um—Having thin plates.
- Tenuilineatus, a, um—Fine-lined.
- Tenuiliratus, a, um—Fine-lined.
- Tenuimarginatus, a, um—Thin-margined.
- Tenuimuralis, e—Thin-walled.
- Tenuinervis, e—Thin-veined, slender-nerved.
- Tenuiradiatus, a, um—Slender-rayed.
- Tenuiradius—Having slender rays.
- Tenuiramosus, a, um—Having slender branches.
- Tenuis, e—Thin, fine, slender, narrow.
- Tenuisculptus, a, um—Finely engraved.
- Tenuiseptus, a, um—Having thin septa.
- Tenuissimus, a, um—Very thin or slender.
- Tenuistriatus, a, um—Fine-lined.
- Terebra—A borer, an auger.
- Terebralis, e—Like an auger.
- Terebriformis, e—Shaped like Terebra, or like an auger.
- Teres—Rounded, well turned, smooth, polished.
- Teretiformis, e—Of a long, round shape.
- Terminalis, e—Terminal.
- Tersus, a, um—Neat, wiped off, nice.
- Tessellatus, a, um—Checked, tessellated.

- Testudinarius, a, um—Arched like a tortoise shell.
 Tetragonocephalus—Having a quadrangular head.
 Tetragonophthalmus—Having square eyes.
 Tetragonum—A quadrangle.
 Tetrptyx—Having four folds.
 Tetricus, a, um—Forbidding, stern.
 Textiligerus, a, um—Web-bearing.
 Textilis, e—Woven, plaited, textile.
 Textus, a, um—Woven, fabricated.
 Therodactylus, a, um—Hinge-toed.
 Thallyformis, e—Shaped like Thallus, frond-like.
 Tholus—A rotunda or cupola.
 Tiariformis, e—Shaped like a tiara or turban.
 Torquis—A necklace, wreath, or ring.
 Tortalina—Twisted line.
 Tortuosus, a, m—Full of turns or crooks, tortuous.
 Tortus, a, um—Twisted, distorted.
 Transiens—Transient.
 Transitionis, e—A passing over.
 Translatus, a, um—Carried over, transported.
 Transsectus, a, um—Cut across.
 Transversalis, e—Transverse, crosswise.
 Transversus, a, m—Transverse, crosswise, wider than long.
 Triangularis, e—Of or belonging to a triangle, triangular.
 Triangulatus, a, um—Triangulated.
 Triarthrus—Having three joints.
 Tribulis—One of the same tribe.
 Tribulosus, a, um—Full of thorns or thistles.
 Tricarinatus, a, um—Three-keeled.
 Tricenarius, a, um—Of or containing thirty.
 Trichoideus, a, um—Hair-like.
 Trichomanoides—Like Trichomanes, the maiden-hair fern.
 Tricungulatus, a, um—Three-banded.
 Tricornis, e—Three-horned.
 Tricostatus, a, um—Three-ribbed.
 Tricuspidatus, a, um—Three-pointed.
 Tridactylites—Having three fingers.
 Tridactylus, a, um—Three-fingered.
 Tridens—Having three teeth, tines, or prongs.
 Tridenterus, a, um—Bearing three teeth prongs.
 Tridigitatus, a, um—Three-fingered.
 Trifoliatus, a, um—Three-leaved.
 Trifolius, a, um—Three-leaved.
 Trigonalis, e—Trigonal.
 Trigonolepis—Having triangular scales.
 Trigonostomus, a, um—Having a triangular mouth.
 Trigonus, a, um—Trigonal.
 Trilineatus, a, um—Three-lined.
 Triliratus, a, um—Three-lined.
 Trilix—Triple-twilled.
 Trilobatus, a, um—Three-lobed.
 Trilobus, a, um—Three-lobed.
 Trilocularis, e—Three-chambered.
 Trinervis, e—Three-veined.
 Trinodus, a, um—Having three knots.
 Trinucleus—Having three kernels.
 Tripinnatus, a, um—Three-winged.
 Triplicatellus, a, um—Having three plications in one fold.
 Triplicatus, a, um—Three-plaited.
 Triplistriatus, a, um—Three-lined.
 Tripunctatus, a, um—Three-dotted.
 Triquetrus, a, um—Three-cornered, triangular.
 Triradiatus, a, um—Three-rayed.
 Triserialis, e—In three series.
 Triseratus, a, um—Three-notched.
 Trisinuatus, a, um—Three-furrowed.
 Trisulcatus, a, um—Three-furrowed.
 Trisutura—Having three sutures.
 Trituberculatus, a, um—Having three tubercles.
 Trivolvus, e—Three-whorled.
 Trochiformis, e—Shaped like Trochus.
 Trochiscus—A small, round ball, a pill.
 Tropidophorus, a, um—Keel-bearing.
 Trudiferus, a, um—Pike-bearing.
 Truncatulus, a, um—Somewhat truncated.
 Truncatus, a, um—Truncated, cut short.
 Tuber—A hump, bump, or protuberance.
 Tuberculatus, a, um—Tuberculated, covered with tubercles.
 Tuberculosis, a, um—Full of tubercles.
 Tuberosus, a, um—Full of humps or protuberances.
 Tubiformis, e—Pipe, tube, or trumpet-formed.
 Tubiporoides—Like Tubipora.
 Tubularis, e—Hollow like a pipe.
 Tubulatus, a, um—Formed like a pipe or tube.
 Tubulostriatus, a, um—Having tube-like striæ.
 Tubulosus, a, um—Abounding in tubes.
 Tubulus—A small pipe or tube.
 Tumidifrons—Swelling front.
 Tumidosus, a, um—High-swelling.
 Tumidulus, a, um—Swollen, tumid.
 Tumidus, a, um—Swollen, tumid.
 Tumulosus, a, um—Full of hills, hilly.
 Tumulus—A mound.
 Tunicatus, a, um—Coated, covered with skin or peel.
 Turbidus, a, um—Confused, disordered, turbid.
 Turbinatus, a, um—Turbinate, cone-shaped.
 Turbiniformis, e—Top-shaped.
 Turgidus, a, um—Swollen, inflated, turgid.
 Turricula—A little tower, a turret.
 Turretella—A little tower.
 Turretiformis, e—Tower-like.
 Turritus, a, um—Fortified with towers.
 Tutus, a, um—Safe, secure, examined.
 Typicalis, e—Typical.
 Typus—The type.
 Tyrans—A tyrant.
- Uber**—A teat, pap, or udder.
Umbella—A parasol, umbrella.
Umbelliferus, a, um—Umbrella-bearing.
Umbilicatus, a, um—Made like an umbilicus.
Umbo-natus, a, um—Having a shield, embossed.
Umbraculum—A shade, umbrella.
Umbrus, a, um—Shady, umbrageous.

- Uncinatus, a, um—Barbed, furnished with hooks or tenters.
 Uncus, a, um—Hook-curved, barbed.
 Undans—Waving.
 Undatus, a, um—Wavy.
 Undosus, a, um—Full of waves, billowy.
 Undulatus, a, um—Diversified as with waves, undulated.
 Undulostratus, a, um—Having wavy striæ.
 Undulosus, a, um—Full of undulations, wavy.
 Unguiculus, a, um—Having claw-like processes.
 Unguifer, era, erum—Claw-bearing.
 Unguiformis, e—Claw-shaped.
 Ungula—A claw, talon, hoof.
 Ungulatus, a, um—Having claws or hoofs.
 Unguloideus, a, um—Hoof-like or claw-like.
 Uniangulatus, a, um—One-angled.
 Unicarinatus, a, um—One-keeled.
 Unicornis, e—One-horned.
 Unicostatus, a, um—One-ribbed.
 Unicus, a, um—One and no more, single, sole.
 Uniformis, e—Having only one shape, uniform.
 Unilargus, a, um—One large, of one size.
 Unilobatus, a, um—One-lobed.
 Unioniformis, e—Like Unio.
 Unionoides—Like Unio.
 Uniserialis, e—Having a single row or series.
 Unispinus—Having one spine.
 Unisulcatus, a, um—Having one furrow.
 Unitus, a, um—United.
 Uræus, a, um—Of or belonging to the tail.
 Urniformis, e—Urn-shaped.
 Urophyllus, a, um—Sharp-leaved.
 Utriculus—A little matrix, a bud or hull.
Vadosus, a, um—Full of shadows.
 Vagans—Wandering, vagrant.
 Valens—Vigorous.
 Validus, a, um—Strong, powerful.
 Vallorus, a, um—Intrenched.
 Valvatiformis, e—Like folding doors, or like Valvata.
 Valvulus—A pod, like the shell of a bean.
 Varians—Varying, varied.
 Variabilis, e—Changeable, variable.
 Varius, a, um—Straddling.
 Varicosus, a, um—Having threads or lines enlarged, varicose.
 Varicostatus, a, um—Variably ribbed.
 Variolatus, a, um—Variable width or distances apart.
 Variolosus, a, um—Full of changes.
 Variopora—Having different pores.
 Varistriatus, a, um—Having variable striæ.
 Varius, a, um—Diverse, manifold, different, various.
 Varns, a, um—Bent, stretched or grown apart.
 Vascularius, a, um—Vascular, consisting of small vessels.
 Vasiformis, e—Vase-shaped.
 Vastator—A desolator, ravager.
 Vaticinus, a, um—Prophetic.
 Vellicatus, a, um—Vellicated, pinched.
 Velox—Swift, fleet, fitted for motion.
 Velutinus, a, um—Velvety.
 Velum—A sail, awning, curtain, veil.
 Venatus, a, um—Veined.
 Venosus, a, um—Full of veins, veiny.
 Ventralis, e—Ventral.
 Ventricosus, a, um—Bulging out, ventricose.
 Venulosus, a, um—Full of small veins.
 Venustulus, a, um—Lovely, charming.
 Venustus, a, um—Lovely, beautiful, graceful.
 Verbenifolius, a, um—Leaved like Verbena.
 Vernicularis, e—Worm-shaped.
 Vermiculus—A little worm, grub.
 Verrucosus, a, um—Full of warts, rough, rugged.
 Versiformis, e—Changing its form, changeable.
 Vertebralis, e—Somewhat like vertebræ.
 Vertebratus, a, um—Articulated, jointed, vertebrated, like a backbone.
 Verticalis, e—Vertical.
 Verticillatus, a, um—Whorled.
 Verticillus—The whorl of a spindle.
 Verus, a, um—True, real, genuine.
 Vesicularis, e—Vesicular.
 Vesiculatus, a, um—Vesicled.
 Vesiculosus, a, um—Full of blisters or vesicles, vesiculous.
 Vesperalis, e—Belonging to the evening.
 Vestitus, a, um—Covered, clothed, adorned.
 Veterator—One who has grown old.
 Vetulus, a, um—Old.
 Vetustus, a, um—Old, ancient.
 Vexabilis, e—Disturbed, vexed, troublesome.
 Viaticus, a, um—Of or belonging to a journey.
 Viator—A wayfarer, traveler.
 Vicinus, a, um—Near, neighboring, kindred.
 Victus, a, um—Conquered, vanquished.
 Vigilans—Watchful, vigilant.
 Villosus, a, um—Hairy, shaggy, rough.
 Viminalis, e—Bearing twigs for plaiting.
 Vinculus, a, um—Bounded, fettered, girded.
 Vinculatus, a, um—Bound.
 Vindex—A defender.
 Vinosus, a, um—Full of wine.
 Viola—The violet.
 Virgatus, a, um—Made of twigs, twig-like.
 Virgo—A maid.
 Virgosus, a, um—Full of twigs.
 Virgulatus, a, um—Striped, like a small rod.
 Virguncula—A little maid.
 Vittatus, a, um—Bound with a fillet, banded.
 Volans—Flying.
 Volutus, a, um—Rolled, turned around, whorled.
 Vomer—A plowshare.
 Vomerium—A plowshare.
 Vorax—Ravenous, voracious.
 Vorticellatus, a, um—Whorled.
 Vulgatus, a, um—General, usual, common.
Xiphias—A sword-fish.
 Xylobioides—Like Xylobius.
Yoldiiformis, e—Like Yoldia.
Zaphrentiformis, e—Shaped like Zaphrentis.
 Ziczac—Slanting in straight lines from side to side, having sharp turns.
 Zonatus, a, um—Zoned, belted.
 Zonulatus, a, um—Small-girdled.
 Zygopus—With joined feet.

INDEX OF GENERA.

In addition to alphabetically indexing all the Palæozoic genera in this work, and placing in italics those which have been used but do not belong to North America, the gender of each genus is designated as follows: *m*, for masculine; *f*, for feminine; *n*, for neuter.

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<i>Asterophyllites</i> , <i>m</i>	107	<i>Billingsia</i>	398	<i>Camarophoria</i> , <i>f</i>	338
<i>Asteropteris</i> , <i>f</i>	108	<i>Blastoidocrinus</i> , <i>m</i>	229	<i>Cameratheca</i> , <i>f</i>	389
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<i>Spirigera</i> ,	377	Subretepora, <i>f</i>	326	Trematis, <i>f</i>	385
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<i>Spirophyton</i> , <i>n</i>	144	Sulcopora, <i>f</i>	326	<i>Trematocrinus</i> ,	287
Spirorbis, <i>m</i>	521	Symphylurus, <i>m</i>	568	Trematodiscus, <i>m</i>	455
<i>Spirula</i> ,	454	Synbathocrinus, <i>m</i>	284	Trematopora, <i>f</i>	328
<i>Spongia</i> ,	165	Synocladia, <i>f</i>	326	Trematospira, <i>f</i>	385
Sporangites, <i>m</i>	144	Syntrielsasma, <i>n</i>	383	Treptichnus, <i>m</i>	581
Sporocystis, <i>m</i>	144	Syngocrinus, <i>m</i>	285	<i>Triacrinus</i> ,	287
<i>Squamaster</i> ,	282	Syngodendron, <i>n</i>	146	Triarthrella, <i>f</i>	568
Staphylopteris, <i>f</i>	144	Syngolites, <i>m</i>	205	Triarthrus, <i>m</i>	568
Staurocephalites, <i>m</i>	521	<i>Syringophyllum</i> ,	166	Trichiulus, <i>m</i>	573
Staurograptus, <i>m</i>	203	Syringopora, <i>f</i>	206	Trichomanites, <i>m</i>	147
Steganoocrinus, <i>m</i>	282	Syngostroma, <i>n</i>	166	Trichophycus, <i>n</i>	147
Stellipora, <i>f</i>	203	Syngothyris, <i>f</i>	384	Trichospongia, <i>f</i>	166
Stemmatocrinus, <i>m</i>	282	Syngoxylon, <i>n</i>	146	Tricælocrinus, <i>m</i>	287
Stemmatodus, <i>m</i>	612			Trigonocarpum, <i>n</i>	147
Stemmatopteris, <i>f</i>	144	TENIASTER, <i>m</i>	285	<i>Trigonodus</i> , <i>m</i>	613
Stenacanthus, <i>m</i>	612	Tæniodictya, <i>f</i>	327	<i>Trigonotreta</i> , <i>f</i>	386
Stenaster, <i>m</i>	282	Tæniodus, <i>m</i>	612	Trimerella, <i>f</i>	386
<i>Stenocrinus</i> ,	283	Tæniophyllum, <i>n</i>	146	Trimerorhachis, <i>f</i>	626
Stenopora, <i>f</i>	203	Tæniopora, <i>f</i>	327	<i>Trimerus</i> ,	568
Stenopterodus, <i>m</i>	612	Tæniopteris, <i>f</i>	146	Trinucleus, <i>m</i>	568
Stenoschisma, <i>n</i>	377	Talarocrinus, <i>m</i>	285	Triphylopteris, <i>f</i>	148
Stenotheca, <i>f</i>	392	Tanaodus, <i>m</i>	612	Triplesia, <i>f</i>	387
Stephanocrinus, <i>m</i>	283	Taonurus, <i>m</i>	146	<i>Trochita</i> , <i>f</i>	428
Stereoocrinus, <i>m</i>	283	Taxocrinus, <i>m</i>	285	Trochoceras, <i>n</i>	455
Sternbergia, <i>f</i>	145	Technocrinus, <i>m</i>	285	Trocholites, <i>m</i>	456
Stictopora, <i>f</i>	323	Technophorus, <i>m</i>	514	Trochonema, <i>n</i>	428
Stictoporella, <i>f</i>	325	Teleiocrinus, <i>m</i>	285	Trochophyllum, <i>n</i>	207
<i>Stictotrypa</i> ,	325	Telephus, <i>m</i>	568	<i>Trochus</i> ,	428
Stigmaria, <i>f</i>	145	<i>Tellina</i> ,	514	Troostocrinus, <i>m</i>	287
Stigmarioides, <i>m</i>	145	Tellinomya, <i>f</i>	514	Tropidoleptus, <i>m</i>	387
Stomatopora, <i>f</i>	325	Tellinopsis, <i>f</i>	515	Tropidopora, <i>f</i>	329
Straparollina, <i>f</i>	426	Temnochilus, <i>n</i>	454	Tryblidium, <i>n</i>	429
Straparollus, <i>m</i>	426	Tentaculites, <i>m</i>	393	<i>Tuberculopora</i> ,	329
Streblopteria, <i>f</i>	514	Terataspis, <i>f</i>	568	<i>Tubipora</i> , <i>f</i>	207
Streblotrypa, <i>f</i>	325	Teratichnus, <i>m</i>	454	Tuditanus, <i>m</i>	626
Strephochetus, <i>m</i>	165	Terebratula, <i>f</i>	384	Turbo, <i>m</i>	429
<i>Strephodes</i> ,	204	<i>Terebratulites</i> ,	385	<i>Turbonilla</i> ,	429
Streptaxis, <i>m</i>	427	Termes, <i>m</i>	581	Turrilepas, <i>m</i>	569
Streptelasma, <i>n</i>	204	Tetradium, <i>n</i>	206	Turritella, <i>f</i>	429
Streptoceras, <i>n</i>	454	Tetragraptus, <i>m</i>	206		
Strobilepis, <i>f</i>	468	<i>Textularia</i> ,	166	ULODENDRON, <i>n</i>	148
Streptorhynchus, <i>n</i>	378	<i>Thaleops</i> , <i>f</i>	568	<i>Ungulina</i> ,	515

	PAGE.		PAGE.		PAGE.
<i>Unio</i> ,	515	<i>Vitulina</i> , <i>f.</i>	387	<i>Xystracanthus</i> , <i>m.</i>	614
<i>Unitrypa</i> ,	329	<i>Volkmania</i> , <i>m.</i>	148	<i>Xystrodus</i> , <i>m.</i>	614
<i>Uphantænia</i> , <i>f.</i>	166	<i>WALCHIA</i> , <i>f.</i>	148	<i>YOLDIA</i> , <i>f.</i>	516
<i>VALVULINA</i> , <i>f.</i>	167	<i>Walcottia</i> , <i>f.</i>	522	<i>ZAPHRENTIS</i> , <i>f.</i>	208
<i>Vanuxemia</i> , <i>f.</i>	515	<i>Waldheimia</i> , <i>f.</i>	387	<i>Zaptychius</i> , <i>m.</i>	430
<i>Vasocrinus</i> , <i>m.</i>	287	<i>Whittleseyia</i> , <i>f.</i>	148	<i>Zatrachys</i> , <i>n.</i>	627
<i>Vaticinodus</i> , <i>m.</i>	613	<i>Worthenopora</i> , <i>f.</i>	330	<i>Zeacrinus</i> , <i>m.</i>	288
<i>Venus</i> ,	516	<i>XENOCRINUS</i> , <i>m.</i>	287	<i>Zittelella</i> , <i>f.</i>	167
<i>Venustodus</i> , <i>m.</i>	613	<i>Xenoneura</i> , <i>f.</i>	581	<i>Zonites</i> , <i>m.</i>	430
<i>Vermipora</i> , <i>f.</i>	207	<i>Xenophora</i> , <i>f.</i>	430	<i>Zygospira</i> , <i>f.</i>	388
<i>Vertumnia</i> , <i>f.</i>	516	<i>Xylobius</i> , <i>m.</i>	574		
<i>Vesicularia</i> , <i>f.</i>	208				

FIRST APPENDIX, 1892.

As THIS work was intended for the use of beginners in the pursuit of geological and palæontological information, as well as for the most advanced students, it has been urged that I should have accented the technical words, with a view of bringing about correct and uniform pronunciation.

This criticism may be well taken, but there are only a few words commonly mispronounced, and a few examples will suffice to correct the pronunciation of most of these.

Words ending in *ceras*, *crinus*, *pora*, and *lepis* are accented on the antepenult, as Orthoc'eras, Cyrtoc'eras, Gomphoc'eras, Actinoc'rinus, Xenoc'rinus, Platyc'rinus, Monticulip'ora, Leptop'ora, Chirol'epis, Bothriol'epis, etc. Words ending in *ites* have the *i* long and the accent on the penult, as Cypricardi'tes, Dalmani'tes, Favosi'tes, Litu'i'tes, Trocholi'tes, etc. Words ending in *nema*, *mena*, etc., have the accent on the penult, as Cyclone'ma, Loxone'ma, Strophome'na, Calyme'ne, etc. We say Ath'yris, Cari'na, Cerat'odus, Cœlentera'ta, Epithe'ca, Onych'odus, Palæas'pis, and Syringoth'yris.

I have seen no reason to change the established nomenclature of the Groups of rocks as set forth in the geological part of this work, notwithstanding there may be some who apply the word Cambrian to rocks indiscriminately from the Taconic to the Devonian. It seems to be a word that is easily pasted over ignorance, and some use it for that reason.

VEGETABLE KINGDOM.

THERE have been very few fossil plants described since the publication of this work.

BYTHOTREPHIS *pergracilis*, Dawson, 1889, Trans. Roy. Soc. Can., vol. 7, p. 54, Up. Taconic.

Cruziana carleyi, James, 1885, Jour. Cin. Soc. Nat. Hist., vol. 7, p. 155. Not recognized.

DACTYLOIDES *bulbosus*, Hall, 1886, 39th Rep. N. Y. St. Mus. Nat. Hist., p. 160. Obscure markings supposed to represent marine algae, graptolites, or traces of a spongoid substance.

DICRANOPHYLLUM. Type *D. gallicum*.

LEPIDODENDRON *cliftonense*, Dawson, 1891, Bull. G. S. A., vol. 2, p. 533, Coal Meas. *murrayanum*, Dawson, 1891, Bull. G. S. A., vol. 2, p. 532, Coal Meas.

Nematophyllum was preoccupied by McCoy for a genus of corals in 1851, and hence could not be used again by Fontaine & White as a generic name. I now propose for *Nematophyllum* of Fontaine & White in Permian or Upper Carboniferous Flora of West Virginia and S. W. Pennsylvania, p. 35, the generic name *Nematophyllites* with *N. angustus*, Fontaine & White as the type.

RUSOPHYCUS, from its etymology, should be spelled *Rhysophycus*.

acadicum, Dawson, 1861 (*Rusichnites acadicus*), Can. Nat. and Geol., vol. 1, p. 363, and Acad. Geol., p. 410, Coal Meas.

- carbonarium, Dawson, 1868 (Rusichnites carbonarius), Acad. Geol., p. 257, Carboniferous.
- clintonense, Dawson, 1890 (Rusichnites clintonensis), Quar. Jour. Geol. Soc., vol. 46, p. 598, Clinton Gr.
- grenvillense, Dawson, 1890 (Rusichnites grenvillensis), Quar. Jour. Geol. Soc., vol. 46, p. 598, Up. Taconic.
- SPHENOPHYLLUM vetustum, Newberry, 1889, Jour. Cin. Soc. Nat. Hist., vol. 12, p. 55, Up. Held. Gr.
- SPHENOPTERIS salisburyi, Lesquereux, 1887, Franklin Soc. Rep. on R. I., p. 69, Coal Meas.
- SPIRAXIS, Newberry, 1884, Ann. N. Y. Acad. Sci., vol. 3, p. 217. An elongated spiral cast, supposed to represent a fucoid. Type *S. major*. Another species, *S. randalli*, is also described. Both from the Chemung Gr.
- TRIGONOCARPUM ambiguum, Lesquereux, 1890, Dict. of Foss. Pa., vol. 3, p. 1213, Coal Meas.
- VOLKMANNIA brevistachys, Lesquereux, 1890, Dict. of Foss. Pa., vol. 3, p. 1253, Coal Meas.

ANIMAL KINGDOM.

SUBKINGDOM PROTOZOA.

THE animals of this Subkingdom are supposed to have consisted of protoplasm, in a cell or cells, capable of secreting an outer wall, but without hardened tissues or alimentary organs. I arrange the palæozoic sponges in this Subkingdom and in the Class Porifera, because I see no reason to suppose such forms as *Pattersonia*, *Dystactospongia*, *Archæocyathus*, *Strephochetus*, etc., were any more highly developed than *Rhizopoda*. It may be part of the Class has shown such variation and development as to point to a higher organization, which is in accordance with all intelligent views of evolution, but I see no evidence to warrant raising the Class to the rank of a Subkingdom in the animal scale, as some have done. In any view presented by those who claim that the Porifera occupy a place between Protozoa and Cœlenterata, I discover no ground for raising it to the rank of a Subkingdom, if any regular grade is to be maintained, in the classification of animals.

ERRATA.—For family “*Leptonitidæ*,” on page 153, read “*Family Leptomitidæ*.—*Leptomitus*,” and strike “*Leptomitus*” from those enumerated under “*Family Affinity Uncertain*.” On page 161 change the specific names under *Palæacis* to the feminine gender.

ACANTHODICTYA, Hinde, 1889, Trans. Roy. Soc. Can., vol. 7, p. 47. [Ety. *akanitha*, a spine; *dictyon*, net.] Subcylindrical, skeletal mesh-work of longitudinal and transverse spicular strands or fibres; longitudinal strands composed of somewhat loosely arranged fascicles of elongated overlapping spicules, and the spicules of the slender transverse fibres are, as a rule, disposed in a single series. From the outer surface of the sponge, numerous spicular rays project outward at right angles. Anchored, probably, by a basal prolongation of the longitudinal strands. Some of the elongated longitudinal spicules are cruciform, and their transverse rays form the cross fibres. The general structure resembles *Cyathospongia*, but is char-

acterized by the presence of the projecting surface rays. Type *A. hispida*, described in the same place, from Upper Taconic rocks.

Actinodictya placenta, Hall, 1892, 9th Ann. Rep. State Geologist, p. 59, Chemung Gr. Not entitled to recognition for want of illustration.

ACTINOSTROMA fenestratum, Nicholson, 1889, Monog. Brit. Stromatoporoids, p. 146, and *A. tyrrelli*, 1891, Ann. and Mag. Nat. Hist., vol. 7, p. 317, Devonian.

Biopalla, Wallace, 1878, Am. Jour. Sci., vol. 115, p. 369. [Ety. *bios*, life; *palla*, a ball.] Founded upon very imperfect and uncertain material from the geodes of the Keokuk Group, with the statement that “there is uncertainty as to the distinction of species,” and yet *B.*

keokuk, *B. grandis*, *B. wortheni*, *B. woodmani*, *B. haecklei*, *B. hyatti*, *B. alicei*, and *B. palmata* are named, with almost characterless descriptions, without illustration.

CIDAROSPONGIA, Gurley, 1884, New Carb. Foss. Bull., No. 2, p. 4. Round hemispherical bodies, with flattened irregular base, full hemispherical top or dome, which, along the margin, is distinctly divided into twelve lobes, being quite regular in size and extending fully one-half the distance from the margin to the center of the dome, where they become obsolete, leaving a smooth, slightly depressed, central, circular area, whose diameter is about one-half that of the body. The top of the dome is punctured by two well-defined circular openings, which are situated close together, and at the margin of the smooth circular area. During growth the dome becomes elevated, and a lower or basal portion becomes developed, extending from the flattened base to the margin of the dome. This lower portion is somewhat irregularly marked by concentric lines of growth. The sides, below the dome, are moderately straight. Type C. ella. Described at the same place, from the Coal Meas.

CRYPTOZOON steeli, Brainard & Seely, 1890, Bull. Am. Mus. Nat. Hist., vol. 3, p. 6, Calceiferous Gr.

Cryptodictya alleni, Hall, 1892, 9th Ann. Rep. State Geologist, p. 60, Chemung Gr. Not entitled to recognition for want of illustration.

CUCUMULITES, Gurley, 1884, New Carb. Foss. Bull., No. 2, p. 2. Body consisting of a thin, punctate, elongate, tubular shell, which is slightly arcuate and expanding; being closed and rounded at the larger extremity and somewhat pointed, with a well-defined terminal or oral opening at the smaller extremity. Surface ornamented by more or less numerous pointed elevations or tubercules, which along the central portion of the shell become arranged in longitudinal rows, breaking up and becoming irregular in crossing the larger rounded end and toward the smaller extremity. Type C. tuberculatus. Described at the same place with *C. tricar-inatus* from the Warsaw Group.

Cyathophycus siluriana, James. Too poorly defined to be recognized.

CYATHOSPONGIA quebecensis, Dawson & Hinde, 1889, Trans. Roy. Soc. Can., vol. 7, p. 44, Up. Taconic.

FIG. 1195.—Cyclo-spongia discus. Lower side.

CYCLOSPONGIA, S. A. Miller, 1891, Advance Sheets 17th Rep. Geol. Sur. Indiana, p. 5. [Ety. *kuklos*, a circle; *spongia*,

sponge.] Sponge, circular, button-shaped or discoid, and consisting of numerous thin, calcareous laminae, having a concentric structure and filled with minute canals or interstices. The structure has some resemblance to that of *Strephochetus richmondense*, but the laminae are much thinner, and the interlaminar spaces are much less marked, and no vertical tubes have been found within them. That was a free sponge; this one is supposed to have been attached to some other object.

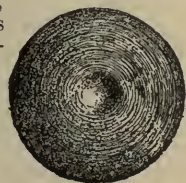


FIG. 1196.—Cyclo-spongia discus. Upper side.

Type C. discus. Described in the same place, from the Upper Helderberg Gr.

Dictyophyton amalthea, *D. halli*, *D. randalli*, *D. sceptrum*, *D. scitum*, *D. tomaculum*, *D. vascellum*, Hall, 1892, 9th Rep. State Geologist, N. Y., pp. 56 to 58, Chemung Gr. Such descriptions, without illustrations, are not entitled to recognition.

HALICHONDRIES, Dawson, 1889, Trans. Roy. Soc. Can., vol. 7, p. 52. Oval or irregular masses of small simple spicules, imbedded in patches of pyrite, and, without any definite arrangement or root, spicules may indicate the presence of a halichondroid sponge. In the best preserved specimens the spicules appear to be biacerate and more slender and pointed than in *Lasiothrix*, and they seem to be in two series, inclined at a very oblique angle to each other. In some specimens elongated spaces, with well-defined margins, are covered with thin films of pyrites, which may have resulted from the replacement or incrustation of a mass of minute spicules, of which traces remain in some places. He observed that sponges having originally much keratose or other dense animal matter, would naturally aggregate in and around themselves a greater quantity of pyrite than those of a more purely siliceous character. Type H. confusus. Named at the same place, from the Upper Taconic.

Hyalostelia metissica, Hinde, 1889, Trans. Roy. Soc. Can., vol. 7, p. 49, Up. Taconic. Founded upon a confused mass of supposed spicules.

LASIOTHRIX, Hinde, 1889, Trans. Roy. Soc. Can., vol. 7, p. 50. [Ety. *lasios*, shaggy; *thrix*, hair.] Sponge small, depressed oval in outline, the outer surface covered by a layer of longitudinally arranged, apparently simple, acerate spicules; beneath this is another layer of spicules disposed transversely. From the base of the sponge several simple elongated spicules extend. Type L. curvicostata. Described in the same place, from the Upper Taconic. L. fiabellata is also described.

- PALEACIS cavernosa*, S. A. Miller, 1891, Advance Sheets 17th Rep. Geo. Sur. Ind., p. 4, Waverly Gr.
- PROTOSONGIA coronata*, P. cyathiformis, P. delicatula, P. mononema, P. polynema, and P. tetranema, Dawson & Hinde, 1889, Trans. Roy. Soc. Can., vol., 7, pp. 37 to 43, Up. Taconic.
- Ptychostylus*, Gurley, 1884. The name was preoccupied by Gabb in 1865.
- RECEPTACULITES elrodi*, S. A. Miller, 1892, Advance Sheets of 18th Rep. Geo. Sur. Ind., p. 3, Up. Held. Gr.
- Rhombodictyon globosus*, James. Too poorly defined to be recognized.
- Spiroclyathus*, Hinde. Synonym for *Archæocyathus*.
- Stephanella sancta*, Hinde, 1891, Lond. Geo. Mag., vol. 8, p. 22. Radiating lines of pyrites supposed to represent spicules. No generic or specific characters.
- Stromatopora ludlowensis* and *S. tubularis*, James. Too poorly defined to warrant any recognition.
- SYRINGOSTROMA. Type *S. densum*.

SUBKINGDOM CŒLEENTERATA.

THE Order Rugosa has been called Tetracoralla, because the septa are said to be some multiple of four; and the Tabulata, Hexacoralla, because the septa are said to be a multiple of six. The internal cavity of a Graptolite, so far as I have been able to discover, is divided longitudinally into three or four departments, which is altogether different from the structure of the living Hydrozoa, where the interior part of the body consists of a single undivided cavity. It may be the Order Graptolida should be raised to the rank of a Class, because it is so different in composition and structure from the living Hydrozoa.

ERRATA.—On page 168, insert "Family Calceolidæ.—Calceola," and remove "Baryphyllum" to the "Cyclolitidæ." On page 169, for "Family Helioporidæ" read "Family Heliolitidæ." On page 177, strike out "Chonophyllum validum." In the eleventh line from the top of page 189, read "F. alpenensis" for "F. dumosus." In the sixth line from the bottom of page 194, read "1669" for "1869." In the first line on top of page 196, read "Description" for "Describers." In the third and seventh lines from the top of page 199, read "Hamilton" for "Chemung." In the fifteenth and sixteenth lines from the bottom of page 201, read "Edwards & Haime, 1850," for "Lonsdale, 1839, Sil. Syst., p. 691, and E. & H." For the word "lamellæ," in the definition of *Zaphrentis*, on page 208, read "septæ," and add Clifford as an author of the genus with Rafinesque. On page 209, under *Z. elliptica*, read "Pal., No. 8," instead of Pal., No. 6."



FIG. 1197.—*Amplexus blairi*.

- ACTINOCYSTIS variabilis*, Whiteaves, 1892, Cont. to Can. Pal., p. 271, Devonian.
- Alveolites roemeri* refer to *Cladopora*.
- AMPLEXUS blairi*, A. bicostatus, A. corniculum, S. A. Miller, 1891, Advance Sheets 17th Rep. Geo. Sur. Ind., p. 8. The *blairi* and *corniculum* from the Chouteau limestone and *bicostatus* from the Burlington Group.
- cinctus*, S. A. Miller, 1892, 18th Rep. Geo. Sur. Ind., p. 5, Niagara Group.

- coralloides*, probably, not an American species.
- CHETETES ponderosus*, Rominger, 1892, Am. Geol., vol. 10, p. 61, Up. Held. Gr.
- CŒNOGRAPTUS*, Hall, 1868, 20th Rep. N. Y. Mus. Nat. Hist., pp. 210, 211, 251. [Ety. *koinos*, living together; *grapho*, I write.] Polypary compound, developed bilaterally from the initial point; cellules on one side of slender branches, which are developed on one or two sides of a long slender axis or rachis, the free extremities of which are likewise celluliferous. Not branching dichotomously. Type C. *divergens*.
- divergens*, Hall, 1859 (*Graptolithus divergens*), Pal. N. Y., vol. 3, p. 509, Hud. Riv. Gr.
- gracilis*, Hall, 1847 (*Graptolithus gracilis*), Pal. N. Y., vol. 1, p. 274, Utica Slate.

surcularis, Hall, 1868, 20th Rep. N. Y. Mus. Nat. Hist., p. 210, Utica Slate.

COLUMNARIA disjuncta, Whiteaves, 1892, Cont. to Can. Pal., p. 269, Devonian.

Crepidophyllum is a synonym for *Craspedophyllum*, and the species under it should be referred to *Craspedophyllum*.

CYATHOPHYLLUM athabascense, Whiteaves, 1891, Cont. to Can. Pal., vol. 1, p. 202, Devonian. *C. petraoides* and *C. waskasense*, 1892, pp. 264 and 265, Devonian.

C. juvene, refer to *Heliophyllum juvene*.

C. panicum refer to *Diphyphyllum panicum*.

CYSTELASMA, S. A. Miller, 1891, Advance Sheets 17th Rep. Geo. Sur. Ind., p. 12,

[Ety. *kustis*, a cavity; *elasma*, lamellæ.] Corallum simple, irregularly turbinate or cylindrical, consisting of an outer wall, transversely



FIG. 1198.—*Cystelasma* wrinkled or conical. Summit and side views.

connected by oblique plates, irregularly disposed, that give to the interior cystose chambers of unequal size and irregular shape. No septa or regular tabulæ. Structure vesicular. Type *C. lanesvillense*, described in the same place from the Warsaw Gr.

CYSTIPHYLLUM greenii, S. A. Miller, 1892, Advance Sheets 18th Rep. Geo. Sur. Ind., p. 4, Up. Held. Gr.

DAWSONIA are small, conical or bell-shaped, and each has a minute spine at the summit. They have not been found in connection with any Graptolite.

DICTYONEMA pertenne and *D. scalariforme*, Føerste, 1887, Bull. Denison Univ., vol. 2, p. 107, Niagara Gr.

DIPHYPHYLLUM panicum, Winchell, 1866, (*Cyathophyllum panicum*.) Rep. Low. Penin. Mich., p. 90, Ham. Gr.

DIPLOTRYPA westoni, Ulrich, 1889, Micro-palæontology of Can., pt. 2, p. 30, Hud. Riv. Gr.

Graptolithus alatus, *G. crucifer*, *G. headi*, *G. logani*, *G. octobrachiatus* refer to *Loganograptus*. *G. divergens* and *G. gracilis* refer to *Cænograptus*.

Hadrophyllum aplatum, Cummins, 1891, 2d Ann. Rep. Geo. Sur. Texas, p. 552, Coal Meas.

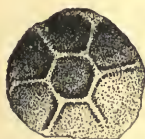
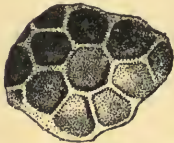


FIG. 1199.—*Leptopora gorbyi*. Summit views.

HELIOPHYLLUM juvene, Rominger, 1876, (*Cyathophyllum juvene*.) Foss. Corals, p. 101, Ham. Gr.

parvulum, Whiteaves, 1891, Cont. to Can. Pal., p. 203, Devonian.

LEPTOPORA gorbyi, S. A. Miller, 1891, Advance Sheets 17th Rep. Geo. Sur. Ind., p. 6, Chouteau limestone.

LOGANOGRAPTUS, Hall, 1868, 20th Rep. N. Y. St. Mus. Nat. Hist., pp. 207 and 251.

[Ety. proper name; *grapho*, I write.] Polypary compound, growing bilaterally from the initial point, and consisting of four, eight or more simple stipes numerously divided

near the base and below the commencement of the cells; furnished with a corneous central disc. Type *L. headi*. To

this genus is also referred the species described as *Graptolithus alatus*, *G. crucifer*, *G. logani* and *G. octobrachiatus*.

MICROCOCYLUS blairi, S. A. Miller, 1892, Advance Sheets 18th Rep. Geo. Sur. Ind., p. 7, Chouteau limestone.

MONOTRYPELLA confuens, Føerste, 1887, Bull. Denison Univ., vol. 2, p. 172, Niag. ara Gr.

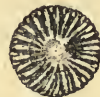


FIG. 1201.—*Micrococylus blairi*.

unjiga, Whiteaves, 1891, Cont. to Can. Pal., vol. 1, p. 214, Devonian.

Monticulipora clintonensis, *crustulata*, *cleavelandi*, *milfordensis* and *nicholsoni*, James, 1888, Jour. Cin. Soc. Nat. Hist., vol. 11, pp. 15 to 36, Hud. Riv. Gr. Some of these are synonyms for species described under other genera, by Ulrich. Others are not defined so as to be recognized. Whether or not any of them will stand is a question. *M. falesi* and *ohioensis* by the same party, 1884, same Journal, vol. 3, p. 137, Hud. Riv. Gr. Not recognized.

M. molesta, Nicholson, seems to be a synonym for *M. mammulata*.

parasitica, var. *plana*, Ulrich, 1889, Micro-palæontology of Canada, pt. 2, p. 29, Hud. Riv. Gr.

OLDHAMIA antiqua was described in 1844, in Jour. Geo. Soc. Dublin, vol. 3, p. 60.

PACHYPHYLLUM devoniense, Edwards & Haime, 1851, Polyp. Foss. Terr. Pal., p. 397, Devonian.

PRASOPORA parmula, Føerste, 1887, Bull. Denison Univ., vol. 2, p. 170, Niagara Group.

Stenopora ohioensis, Føerste, 1887, Bull. Denison Univ., vol. 2, p. 85, Coal Meas.

STRIATOPORA gorbyi, S. A. Miller, 1892, Advance Sheets 18th Rep. Geo. Sur. Ind., p. 7, Niagara Gr.

ZAPHRENTIS calyculus, *Z. chouteauensis*, *Z. declinis*, *Z. exigua*, *Z. tantilla*, and *Z. tenella*, S. A. Miller, 1891, Advance Sheets 17th Rep. Geo. Sur. Ind., pp. 10, 11, and 12. All from the Chouteau limestone except *Z. declinis*, which is from the Keokuk Gr.

SUBKINGDOM ECHINODERMATA.

CLASS CRINOIDEA.

THE only systematic classification of crinoids into families, so far as learning has extended, is based upon the number and arrangement of the plates in the calyces. See "The Structure, Classification, and Arrangement of American Palæozoic Crinoids into Families," 16th Rep. Geo. Sur., Indiana, p. 302. The number of basal plates is first in importance. There are no rudimentary basals. Second in importance is the presence or absence of subradials. Third, the presence or absence of regular interradials. Fourth, the structure of the azygous side. Families having only two basal plates are confined to the Subcarboniferous and Carboniferous. Those having three basals extend from the Lower Silurian to the Subcarboniferous. Those having four basals extend from the Lower Silurian to the Devonian. And those having five basals extend from the earliest crinoids throughout Palæozoic time.

GENERA HAVING TWO BASALS.

FAMILY ACROCRINIDÆ.—Acrocrinus.

FAMILY DICHOCRINIDÆ.—Dichocrinus, Cotyledonocrinus, Talarocrinus.

FAMILY PTEROTOCRINIDÆ.—Pterotoocrinus.

GENERA HAVING THREE BASALS, NO SUBRADIALS, REGULAR INTER-RADIALS.

FAMILY ACTINOCRINIDÆ.—Actinocrinus, Agaricocrinus, Alloprosallocrinus, Amphocrinus, Batoocrinus, Blairocrinus, Cylicocrinus, Dorycrinus, Eretmocrinus, Gennæocrinus, Megistocrinus, Physetocrinus, Saccocrinus, Steganocrinus, Strotocrinus, Teleiocrinus.

FAMILY ARTHRACANTHIDÆ.—Arthracantha.

FAMILY DOLATOCRINIDÆ.—Alloocrinus, Dolatocrinus, Hadrocrinus, Stereocrinus.

FAMILY PLATYCRINIDÆ.—Coccoocrinus, Cordyloocrinus, Eucladoocrinus, Macrotyloocrinus, Marsupioocrinus, Platycrinus.

GENERA HAVING THREE BASALS, SUBRADIALS, NO REGULAR INTER-RADIALS.

FAMILY AMPHERISTOCRINIDÆ.—Ampheristocrinus, Closterocrinus.

FAMILY ICHTHYOCRINIDÆ.—Ichthyocrinus, Lecanocrinus, Mespilocrinus.

GENERA HAVING THREE BASALS, SUBRADIALS, AND REGULAR INTER-RADIALS.

FAMILY TAXOCRINIDÆ.—Forbesocrinus, Onychocrinus, Taxocrinus.

GENERA HAVING THREE BASALS, NO SUBRADIALS, NO REGULAR INTER-RADIALS. THE FAMILIES ARE ANOMALOUS AND HAVE NO NEAR AFFINITY WITH EACH OTHER.

FAMILY CALCEOCRINIDÆ.—Calceocrinus, Deltacrinus, Halysiocrinus.

FAMILY SYNATHOCRINIDÆ.—Synbathocrinus.

FAMILY ZOPHOCRINIDÆ.—Zophocrinus.

GENERA HAVING FOUR BASALS, NO SUBRADIALS, REGULAR INTERRADIALS.

FAMILY EUCALYPTOCRINIDÆ.—Callierinus, Eucalyptocrinus, Hypanthocrinus.

FAMILY MELOCRINIDÆ.—Compsoocrinus, Mariaocrinus, Melocrinus, Technocrinus.

FAMILY XENOCRINIDÆ.—Xenocrinus.

GENERA HAVING FIVE BASALS, FIVE SUBRADIALS, NO REGULAR INTER-RADIALS.

FAMILY AGASSIZOCRINIDÆ.—Agassizocrinus.

FAMILY CYATHOCRINIDÆ.—Abrotocrinus, Arachnocrinus, Bursacrinus, Carabocrinus, Cyathocrinus, Graphiocrinus, Palæocrinus.

FAMILY DENDROCRINIDÆ.—Dendrocrinus, Ottawacrinus.

FAMILY ERISOCRINIDÆ.—Erisocrinus, Menocrinus, Stematocrinus.

FAMILY EUPACHYCRINIDÆ.—Æsiocrinus, Delocrinus, Eupachyerinus, Ulocrinus.

FAMILY MEROCRINIDÆ.—Merocrinus.

FAMILY POTERIOCRINIDÆ.—Atelestocrinus, Barycrinus, Celiocrinus, Euspiocrinus, Goniocrinus, Homocrinus, Hydreionocrinus, Poteriocrinus, Scaphiocrinus, Vasocrinus, Zeacrinus.

GENERA HAVING FIVE BASALS, FIVE SUBRADIALS, REGULAR INTER-RADIALS.

FAMILY GLYPTASTERIDÆ.—Cyphocrinus, Glyptaster, Lampteroocrinus, Thy-sanocrinus.

FAMILY GAUROCRINIDÆ.—Gaurocrinus, Retiocrinus.

FAMILY RHODOCRINIDÆ.—Archæocrinus, Goniasteroidocrinus, Lyriocrinus, Rhaphanocrinus, Rhodocrinus.

GENERA HAVING FIVE BASALS, NO SUBRADIALS, REGULAR INTERRADIALS.

FAMILY CLEIOCRINIDÆ.—Cleioocrinus.

FAMILY GLYPTOCRINIDÆ.—Cupuloocrinus, Glyptoocrinus, Pycnoocrinus, Schizocrinus, Siphonocrinus.

GENERA HAVING FIVE BASALS, NO SUBRADIALS, NO REGULAR INTER-RADIALS.

FAMILY ANOMALOCRINIDÆ.—Anomalocrinus.

FAMILY BELEMNOCRINIDÆ.—Belemnocrinus.

FAMILY CATILLOCRINIDÆ.—Catillocrinus.

FAMILY GAZACRINIDÆ.—Gazacrinus.

FAMILY HAPLOCRINIDÆ.—Allagecrinus, Haploocrinus.

FAMILY HETEROCRINIDÆ.—Ectenocrinus, Heterocrinus, Iocrinus, Ohiocrinus.

FAMILY HYBOCRINIDÆ.—Hybocrinus.

FAMILY MISSOURICRINIDÆ.—Missouricrinus.

GENERA BELONGING TO ANOMALOUS FAMILIES.

FAMILY PISOCRINIDÆ.—Pisocrinus. This family has five basals, followed by three plates, that are both radial and subradial in position.

FAMILY EDRIOCRINIDÆ.—Edriocrinus. The base is solid in this family, and is followed by five radials.

FAMILY CAMAROCRINIDÆ.—Camarocrinus. Distinct from all other families.

FAMILY ANCYROCRINIDÆ.—Ancyrocrinus. Distinct from all other families.

GENERA UNCERTAIN AS TO FAMILY AFFINITY.

Aspidocrinus, Brachioocrinus, Coronocrinus, Cystocrinus, Nipteroocrinus, Pachycrinus, and the fossil described by Hall as Myrtillocrinus americanus.

ORDER CYSTOIDEA.

FAMILY STRIBALOCYSTIDÆ.—Stribalocystites.

ABROTOCRINUS, Miller & Gurley, 1890, Desc. New Gen. and Spec. Echinodermata,

p. 30, and 16th Rep. Geo. Sur. Ind., p. 350. [Ety. *abrotos*, immortal; *kri-non*, lily.] Calyx bowl-shaped, depressed below; basals 5, occupying a shallow concavity; subradials 5, as high as wide; first radials pentagonal, wider than high, truncated horizontally the entire width of the plates, sutures gaping; brachial or second radials constricted in the middle and bearing upon the upper sloping sides the free arms; arms bifurcate frequently and bear pinules; no regular inter-radials. First azygous plate in line with the first radials, horizontally truncated above and having a gaping suture; second plate constricted in the middle, and followed by a single series of plates. Type A. *cymosus*, which is described at the same place, from the Keokuk Gr.

ACTINOCRINUS blairi and A. brittsi, S. A. Miller, 1892, Adv. Sheets 18th Rep. Geo. Sur. Ind., p. 35,

36, Burlington Gr., and A. *chouteauensis*, p. 18, from the Chouteau limestone, and A. *fossatus*, p. 40, from the Burlington Gr.



FIG. 1202.—Abrotocrinus cymosus.

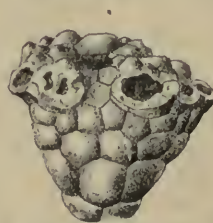


FIG. 1203.—Actinocrinus chouteauensis. Azygous view.

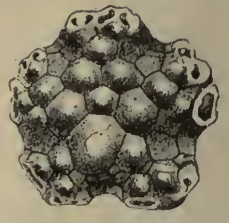


FIG. 1204.—Actinocrinus chouteauensis. Summit view.



FIG. 1205.—Actinocrinus chouteauensis. Basal view.

grandis, Miller & Gurley, 1890, Desc. New Gen. and Spec. Echinodermata, p. 25, and 16th Rep. Geo. Sur. Ind., p. 346, Keokuk Gr. *nodosus*, S. A. Miller, 1891, Bull. No. 4, Geo. Sur. Mo., p. 33, Burlington Gr.

puteatus, Rowley & Hare, 1891, Kansas City Scientist, vol. 5, p. 101, Burlington Gr.

sedaliensis, S. A. Miller, 1892, Advance Sheets 18th Rep. Geo. Sur. Ind., p. 16, Burlington Gr.

senarius, Hall, 1860, Supp. Geo. Rep. Iowa, p. 25, syn. for *Physetocrinus ornatus*.

ÆSIOCRINUS, Miller & Gurley, 1890, Jour. Cin. Soc. Nat. Hist., vol. 13, p. 14. [Ety. *aisios*, auspicious, coming at good time;

krinon, lily.] Column pentagonal, calyx bowl-shaped, plates smooth or granular. Basals five, forming a pentagonal, flattened or concave disc. Subradials large, four hexagonal, one heptagonal, and curving upward half the height of the calyx. First radials 5, truncated above; one or more brachials in each ray supporting strong arms, composed of a single series of plates; arms 10, bearing pinnules. No regular interradials. An azygous interradial rests upon a subradial, between two first radials, and is followed by two plates that connect with the proboscis. Proboscis long, composed of four series of plates bearing numerous transverse fissures on the sides of the plates. Type *Æ. magnificus*, described at the same place, from the Up. Coal Meas. *Æ. harii* was described at the same time, and *Æ. basilicus* was described in Desc. New Gen. and Spec. Echinodermata, p. 53, from the Up. Coal Meas. All of which were republished in 16th Rep. Geo. Sur. Indiana, pp. 337, 338, and 369.

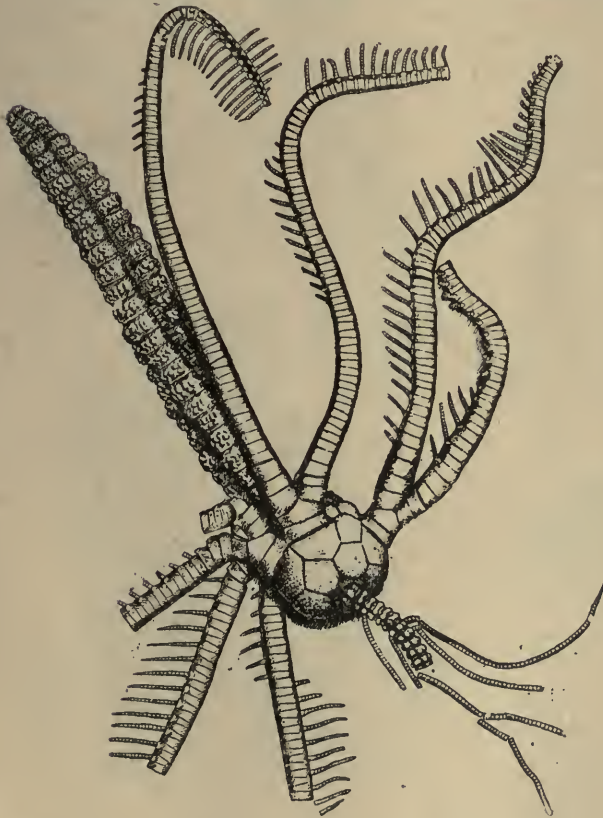


FIG. 1206.—*Aesloerinus magnificus*.

lykinsi, Butts, 1891, Kansas City Scientist, vol. 5, p. 144, Coal Meas.

AETHOCYSTITES, S. A. Miller, 1892, Advance Sheets 18th Rep. Geo. Sur. Ind., p. 9.

[Ety. *aethes*, unusual; *kustis*, bladder.]

This genus consists of the bodies of elongated, subelliptical Cystoidea of undetermined family affinity. Probably they do not belong to any defined family. There are only three ranges of plates. In the first range there are three plates, they

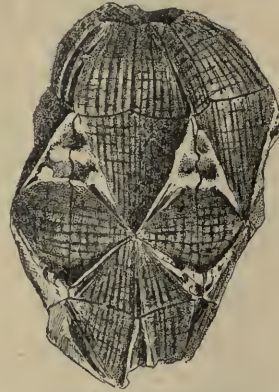


FIG. 1207.—*Aethocystites sculptus*.

form an obconical cup, commencing from a small column. In the second range there are five elongated plates.

The third range consists of five much shorter plates. The plates are ornamented with wrinkles, and bear tubular ridges radiating from a central point, in the middle range, which follow the longitudinal sutures or center of the first and third ranges, and have porous connection with the interior of the body. The plates do not possess pores after the manner of *Holocystites* or *Caryocrinus*, and no pores have been determined, except as above stated. Type *A. sculptus*. Described at the same place, from the Niagara Gr.

AGANASTER, Miller & Gurley, 1890, Desc. New Gen. and



FIG. 1208.—*Aganaster gregarius*. Dorsal side.

Spec. Echinodermata, p. 57, republished in 16th Rep. Geo. Sur. Ind., p. 372. [Ety. *agan*, very much; *aster*, star.] Circular disc with five long, narrow rays. Dorsal side covered with small polygonal plates, not inter-

rupted by the presence of the rays, thus showing the disc has a greater depth than the rays have. Rays narrow, convex, spine-bearing, and composed of plates arranged opposite each other. Ventral side has a deep central disc and ten oral plates. Type *A. gregarius*. Described by Meek and Worthen as *Protaster gregarius*.



FIG. 1209.—*Aganaster gregarius*. Dorsal side of arm, magnified.

AGARICOCRINUS blairi

and *A. sampsoni*, S. A. Miller, 1892, Advance Sheets 18th Rep. Geo. Sur. Ind., pp. 20 and 21, Chouteau limestone, and *A. chouteauensis* and *A. germanus*, pp. 42 and 43, Chouteau limestone.

dissimilis, S. A. Miller, 1891, Advance Sheets 17th Rep. Geo. Sur. Ind., p. 55, Keokuk Gr. And also at the same time and place, from the same Group, *A. gorbyi* and *A. indianensis*.

decornis, Rowley & Hare, 1891, Kansas City Scientist, vol. 5, p. 117, Burlington Gr.

splendens, Miller & Gurley, 1890, Jour. Cin. Soc. Nat. Hist., vol. 13, p. 18, republished in 17th Rep. Geo. Sur. Ind., p. 55, Keokuk Gr.

AGELACRINUS blairi, S. A. Miller, 1892, Advance Sheets 18th Rep. Geo. Sur. Ind., p. 12, Keokuk Gr.

ALLOCRINUS benedicti, S. A. Miller, 1891, 17th Rep. Geo. Sur. Ind., p. 37, Niagara Gr.



FIG. 1210.—*Allocrinus benedicti*. Basal view.

ALLOPROSALLOCRINUS gurleyi, S. A. Miller, 1891, 17th Rep. Geo. Sur. Ind., p. 58, Keokuk Gr.

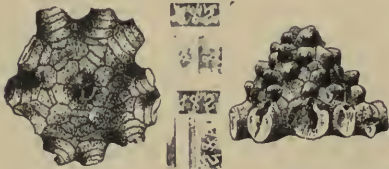


FIG. 1211.—*Allopsallocrinus gurleyi*. Basal and side views.

ARACHNOCRINUS canadensis, Whiteaves, 1891, Cont. to Can. Pal., p. 208, Devonian.

ARCHIEOCIDARIS legrandensis, Miller & Gurley, 1890, Desc. New Gen. and Spec. Echinodermata, p. 59, Kinderhook Gr.

A TELEOCYSTITES, Billings, is probably a good genus, and not a synonym for *Anomalocystites*. In that case, *Ateleocystites huxleyi* would be the type, and the

genus may include *A. balanoides*, which does not seem to belong to Hall's genus *Anomalocystites*.

BARYCRINUS blairi and *B. boonvillensis*, S. A. Miller, Bull. No. 4, Geo. Sur. Mo., p. 25, Keokuk Gr.

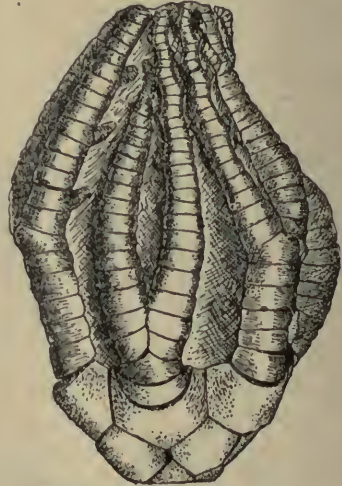


FIG. 1212.—*Barycrinus princeps*.

latus, Hall, 1861, (*Cyathocrinus latus*), Proc. Bost. Soc. Nat. Hist., p. 292, Burlington Gr.

princeps, Miller and Gurley, 1890, Desc. New Gen. and Spec. Echinodermata, p. 52, Keokuk Gr.

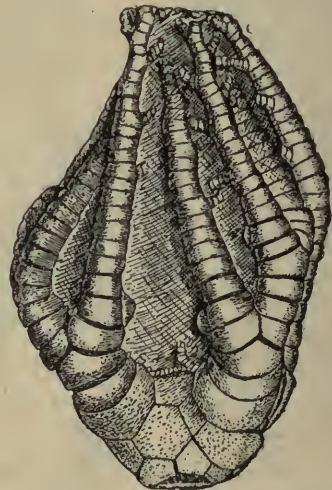


FIG. 1213.—*Barycrinus princeps*. Azygous view.

stellifer, S. A. Miller, 1892, Advance Sheets 18th Rep. Geo. Sur. Ind., p. 46, Keokuk Gr.

BATOCRINUS agnatus, B. boonvillensis, B. crawfordsvillensis, B. decoris, B. gorbui, B. gurleyi, B. medicris, B. pulchellus, B. spergenensis, B. venustus, S. A. Miller, 17th Rep. Geo. Sur. Ind., pp. 53, 60 to 68. All from the Keokuk Gr. except B. decoris and B. spergenensis, which are from the Warsaw Gr.



FIG. 1214.—Batocrinus icosidactylus.

gurleyi, and sweeti are from the Keokuk Gr., B. davisi from the Kaskaskia Gr., and the others from the Burlington Gr.

cantonensis, B. facetus, B. jucundus, B. marinus, B. poculum, Miller and Gurley, 1890, Desc. Echinodermata, pp. 19, 20, 34 to 36, B. jucundus and B. marinus were published in the Jour. Cin. Soc. Nat. Hist., vol. 13, pp. 19 and 20, and all were republished in the 16th Rep. Geo. Sur. Ind., pp. 340, 341, 352, 353, and 354. B. poculum is from the Kinderhook Gr., the others from the Keokuk Gr. calvini, Rowley, 1890, Am. Geol. vol. 5, p. 146, Burlington Gr.



FIG. 1215.—Batocrinus irregularis.

brittsi and B. comparilis, S. A. Miller, 1892, Advance Sheets 18th Rep. Geo. Sur. Ind., pp. 32 and 33, Burlington Gr.

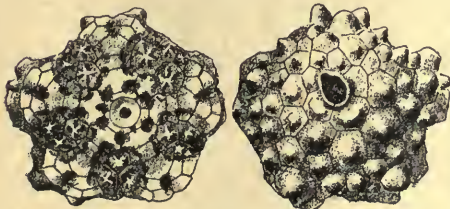


FIG. 1216.—Blairocrinus arrosus. Basal and summit views.

and B. decrepitus, p. 34, Keokuk Gr., and B. blairi, p. 39, Burlington Gr. divalis, S. A. Miller, 1892, Advance

Sheets 18th Rep. Geo. Sur. Ind., p. 22, Keokuk Gr., and at same place republished B. icosidactylus and B. irregularis.

BELEMNOCRINUS sampsoni, S. A. Miller, 1890, Bull. No. 4, Geo. Sur. Mo., p. 26, Burlington Gr.

BLAIROCRINUS, S. A. Miller, 1891, Advance Sheets 17th Rep. Geo. Sur. Ind., p. 69. [Ety. proper name; *krinon*, lily.] Calyx low, saucer-shaped, but not depressed at the base. Surface deeply sculptured and bears radial ridges, though the interradial ridges are not sunken; vault elevated above the arm openings, more or less convex above, with a short subcentral proboscis, having an opening on top, surrounded by numerous small plates. Basals, 3, forming a flat hexagonal disc; primary radials, 3 x 5;



FIG. 1217.—Blairocrinus trijugis. Basal, summit, and side views.

secondary radials, 1 x 10, axillary; tertiary radials, 1 x 20; regular interradials, one large plate resting upon the first radials, followed by one or two ranges of two plates each, and these by two elongated plates that connect with the plates of the vault. First azygous plate in line with the first radials, followed by ranges of two plates until they connect with the plates of the vault. Type B. trijugis, described at the same time and place from the Chouteau limestone.

arrosus and B. bullatus, S. A. Miller, 1892, Advance Sheets 18th Rep. Geo. Sur. Ind., p. 41, Chouteau limestone.

CALCEOCRINUS should be corrected, p. 230, ninth line from the top, so as to read "three" instead of "four" anchylosed plates.

indianensis, S. A. Miller, 1891, Advance Sheets 17th Rep. Geo. Sur. Ind., p. 35, Niagara Gr.

CALLICRINUS, D'Orbigny, 1850, Prodrome Pal. Stratigraphique, 1, p. 45. [Ety. *kallos*, beautiful; *krinon*, lily.] Body oblong, cylindrical; calyx cup-shaped, base excavated for the insertion of the column. Basals 4, unequal, cuneate; no subradials; radials 3 x 5; first one hexagonal, transverse, arcuate below; second one short, quadrangular; third, pentagonal, axillary; secondary radials, 2 x 10, the second axillary and supporting the arms, which are composed of a double series of plates bearing pinnules; first interradial large, decagonal, bearing two elongated plates in the second series, like Eucalyptocrinus; vault and proboscis as in Eucalyptocrinus; surface

deeply sculptured or bearing a more or less developed spine on each radial and interradial plate. Type *C. costatus*. *acanthinus*, Ringueberg, 1890, Ann. N. Y. Acad. Sci., vol. 5, p. 302, Niagara Gr. *beachleri*, Wachsmuth & Springer, 1892, Am. Geol., vol 10, p. 140. Not defined so as to be recognized.

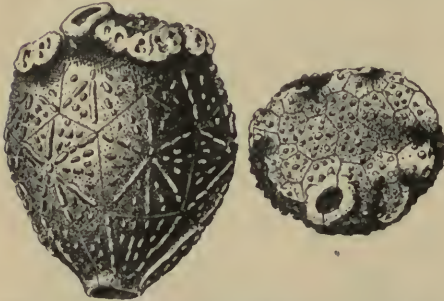


FIG. 1218.—*Caryocrinus indianensis*. Side and summit views.

CARYOCRINUS indianensis, S. A. Miller, 1891, Advance Sheets 17th Rep. Geo. Sur. Ind., p. 19, Niagara Gr.

CLIOCINUS, p. 231, is, probably, incorrectly defined. See my remarks, p. 323, 16th Rep. Geo. Sur. Ind.

CODASTER gracilinus and *C. grandis*, Rowley and Hare, 1891, Kansas City Scientist, p. 99, Burlington Gr.

CODONITES inopinatus, Rowley and Hare, 1891, Kansas City Scientist, pp. 100 and 118, Burlington Gr.

CYATHOCRINUS benedicti, C. gurleyi, C. labyrinthicus, S. A. Miller, 1891, Advance Sheets 17th Rep. Geo. Sur. Ind., pp. 47 to 49, *C. benedicti*, from the Niagara Gr. and the other two species from the Keokuk Gr.

boonvillensis, and *C. sampsoni*, S. A. Miller, 1891, Bull. No. 4, Geo. Sur. Mo., p. 29, Keokuk Gr.

gorbyi, S. A. Miller, 1892, Advance Sheets 18th Rep. Geo. Sur. Ind., p. 44, Keokuk Gr. *inflexus*, see *Delocrinus inflexus*. *latus*, see *Barycrinus latus*.

multibrachiatus var *squamosus*, Hall, 1872, in a note to photographic plate No. 5, sometimes distributed with Desc. New Spec. Crin. from the Carb. rocks of the Miss. Valley, Keokuk Gr. *opimus*, Miller and Gurley, 1890, Desc.

New Gen. and Spec. Echinodermata, p. 28, and 16th Rep. Geo. Sur. Ind., p. 348, Keokuk Gr.



FIG. 1220.—*Cylicocrinus canaliculatus*.

CYLICOCRINUS, S. A. Miller, 1892, Advance Sheets 18th Rep. Geo. Sur. Ind., p. 31. [Ety. *kulis*, *ikos*, a cup; *krinon*, a lily.] Calyx urn-shaped, truncated below. Basals 3, expanded; primary radials, 3 x 5,—the first one very large; second one, small, quadrangular; third, small, pentagonal; secondary radials 2 or more; arms 10. Regular interradials consist of one large plate followed by very small ones between the arm-bases that connect with the vault-plates; first azygous plate in line with the first radials, followed by three plates in the second and in the third ranges, which are connected with smaller plates that connect with the vault. The vault is convex and covered with minute plates, except the ambulacral grooves, which are open and have serrated edges as if protected by some kind of cilia. The primary radials resemble those in some species of *Batoerinus*; the azygous area resembles *Saccoerinus*; the vault is different from that in all other known genera of crinoids. Type *Cylicocrinus canaliculatus*, described at the same place from the Niagara Gr.

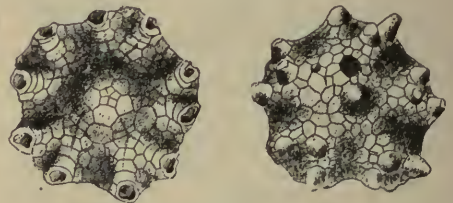


FIG. 1221.—*Cyphocrinus gorbyi*. Basal and summit views.

CYPHOCRINUS, S. A. Miller, 1892, Advance Sheets 18th Rep. Geo. Sur. Ind., p. 50. [Ety. *kyphos*, bowed down; *krinon*, lily.] Calyx obconoidal or obpyramidal as high as the first interradials, then rapidly expands and curves downward until the periphery and ambulacral orifices are directed below a horizontal line. Basals 5, forming a pentagonal disc; sub-radials 5, hexagonal, except one which is truncated by the first azygous plate; it is heptagonal; primary radials 3 x 5; 3 of the first ones heptagonal,

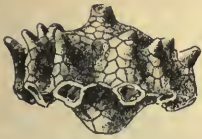


FIG. 1222.—*Cyphocrinus gorbui*. Side view of calyx.

and the other two hexagonal; second radials quadrangular; third radials pentagonal, and bear on the upper sloping sides secondary radials; regular interradials numerous; the first one large and resting between the short upper sloping sides of the first radials; it is followed, in the second range, by two plates, and by three plates in succeeding ranges until they unite with the plates of the vault; intersecondary radials present; first azygous plate large, truncates a subradial, and is followed by three or four plates in each succeeding range, until they unite with the plates of the vault; vault convex and covered with more or less numerous plane, convex, or spinous plates; a large spinous plate occupies the center of the vault, and the anal orifice, without any prominence, is on the azygous side of it. Type *Cyphocrinus gorbui*, described at the same place from the Niagara Gr.

DELOCRINUS, Miller and Gurley, 1890, Jour. Cin. Soc. Nat. Hist., vol. 13, p. 9, and 16th Rep. Geo. Sur. Ind., p. 333. [Ety. *delos*, manifest; *krinon*, lily.] Calyx basin-shaped; arms broad, composed of a double series of interlocking plates; column round; surface smooth or granulous; plates thick; basals 5, occupying a concavity and forming a cone in the interior; subradials 5, large, inflexed below the middle, regularly arched, and the upper part terminating in an acute angle; first radials wider than high, truncated above and separated from the second radial on the outer face by a gaping suture, but immediately within, a straight crenated ridge extends from one outer angle of the plates to the other, having a furrow on each side so

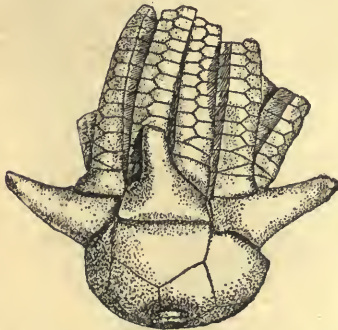


FIG. 1223.—*Delocrinus hemisphericus*.

as to form a toothed hinge on which the second plate articulates; behind this hinge, in the middle part of each plate, there is a socket for the reception of a

tooth-like projection; second radials or brachials produced externally in a strong spine; no regular interradials; one azygous interradial resting on a subradial and followed by another piece above the top of the calyx. Type D. hemisphericus.

craigii, Worthen, 1875, (*Eupachycrinus craigii*), Geo. Sur. Ill., vol 6, p. 527, Coal Meas.

fayettensis, Worthen, 1873, (*Eupachycrinus fayettensis*), Worthen, Geo. Sur. Ill., vol. 5, p. 565, Up. Coal Meas.

hemisphericus, Shumard, 1858, (*Poteroocrinus hemisphericus*), Trans. St. Louis Acad. Sci., vol. 1, p. 221, and 16th Rep. Geo. Sur. Ind., p. 335, Up. Coal Meas.

inflexus, Geinitz, 1866, (*Cyathocrinus inflexus*), Carb. und Dyas, in Neb., p. 62, and White's Cont. to Pal., No. 6, p. 128, Up. Coal Meas.

missouriensis, Miller and Gurley, 1890, Jour. Cin. Soc. Nat. Hist., vol. 13, p. 14. Up. Coal Meas.

DENDROCRINUS nodobrachiatus, Ringueberg, 1890, Ann. N. Y. Acad. Sci., vol. 5, p. 303, Niagara Gr.

DICHOCRINUS blairi, S. A. Miller, 1891, Advance Sheets 17th Rep. Geo. Sur. Ind., p. 36, Keokuk Gr.

cinctus, Miller & Gurley, 1890, Jour. Cin. Soc. Nat. Hist., vol. 13, p. 21, and 16th Rep. Geo. Sur. Ind.,

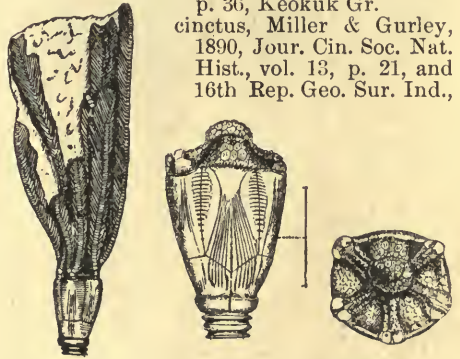


FIG. 1224.—*Dichocrinus cinctus*. Two of the views are magnified.

p. 342, Kinderhook or Waverly Gr. *humbergi*, S. A. Miller, 1891, Bull. No. 4, Geo. Sur. Mo., p. 26, and Advance Sheets 17th Rep. Geo. Sur. Ind., p. 36, Keokuk Gr.

parvulus, S. A. Miller, 1891, Bull. No. 4, Geo. Sur. Mo., p. 27, Keokuk Gr.

ulrichi, Miller & Gurley, 1890, Desc. New Gen. and Spec. Echinodermata, p. 48, and 16th Rep. Geo. Sur. Ind., p. 366, Keokuk Gr.

DOLATOCRINUS has only three basals, as shown by a specimen belonging to Mr. Gurley.

DORYCRINUS amoenus, and *D. confragosus*, S. A. Miller, 1890, Bull. No. 4, Geo. Sur. Mo., p. 34, Burlington Gr.

elegans, S. A. Miller, 1892, Advance Sheets 18th Rep. Geo. Sur. Ind., p. 17, Burlington Gr.

inflatus, Rowley & Hare, 1891, Kansas City Scientist, p. 114, Burlington Gr.
ECHINODISCUS sampsoni, S. A. Miller, 1891, Advance Sheets 17th Rep. Geo. Sur. Ind., p. 76, Keokuk Gr.

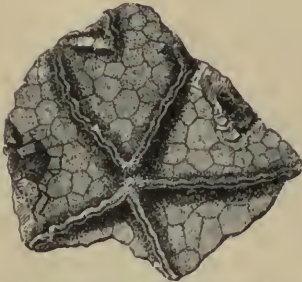


FIG. 1225.—*Echinodiscus sampsoni*.

EOCIDARIS blairi, S. A. Miller, 1891, Advance Sheets 17th Rep. Geo. Sur. Ind., p. 73, Keokuk Gr.

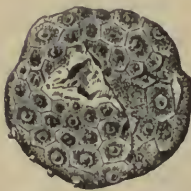


FIG. 1226.—*Eocidaris blairi*.



FIG. 1227.—*Eocidaris blairi*. Showing spines.

ERETMOCRINUS lyonanus, S. A. Miller, 1891, Advance Sheets 17th Rep. Geo. Sur. Ind., p. 59, Keokuk Gr.
prægravis, S. A. Miller, 1892, Advance Sheets 18th Rep. Geo. Sur. Ind., p. 37, Keokuk Gr.
Erisocrinus inflexus. See *Delocrinus inflexus*.

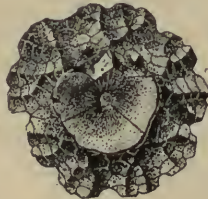


FIG. 1228.—*Eretmocrinus lyonanus*. Side and basal views.

EUCALYPTOCRINUS ellipticus, E. elrodi, E. gorbyi, E. subglobosus, S. A. Miller, 1891, Advance Sheets 17th Rep. Geo. Sur. Ind., pp. 37 to 40, Niagara Gr.
muralis, Ringueberg, 1890, Ann. N. Y. Acad. Sci., vol. 5, p. 305, Niagara Gr.
lindahli, Wachsmuth & Springer, 1892, Am. Geol., vol. 10, p. 139. Not defined so as to be recognized.

EUPACHYCRINUS craigi. See *Delocrinus craigi*.
fayettensis. See *Delocrinus fayettensis*.
hemisphericus. See *Delocrinus hemisphericus*.



FIG. 1229.—*Eupachyrcrinus harii*.

harii, S. A. Miller, 1891, Advance Sheets 17th Rep. Geo. Sur. Ind., p. 71, Up. Coal Meas.
magister, Miller & Gurley, 1890, Jour. Cin. Soc. Nat. Hist., vol. 13, p. 4, and 16th Rep. Geo. Sur. Ind., pp. 328, 371, Up. Coal Meas.
sphaerialis, Miller & Gurley, 1890, Jour. Cin. Soc. Nat. Hist., vol. 13, p. 5, and 16th Rep. Geo. Sur. Ind., p. 329, Up. Coal Meas.

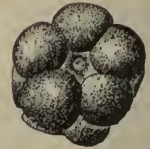
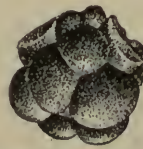


FIG. 1230.—*Eupachyrcrinus tumulosus*. Azygous and basal views.

tumulosus, S. A. Miller, 1891, Advance Sheets 17th Rep. Geo. Sur. Ind., p. 70, Kaskaskia Gr.
FORBESOCRINUS elegantulus, S. A. Miller, 1891, Bull. No. 4, Geo. Sur. Mo., p. 40, Keokuk Gr.
speciosus, Miller & Gurley, 1890, Desc. New Gen. and Spec. Echinodermata,



FIG. 1231.—*Forbesocrinus speciosus*.

p. 27, and 16th Rep. Geo. Sur. Ind., p. 347, Keokuk Gr.
spinifer instead of "spiniger."

GAZACRINUS, S. A. Miller, 1892, Adv. Sheets 18th Rep. Geo. Sur. Ind., p. 49. [Ety. *gaza*, treasury; *krinon*, lily.] Calyx obconoidal; basals 5, one truncated by the azygous plate; primary radials, 3 x 5; secondary

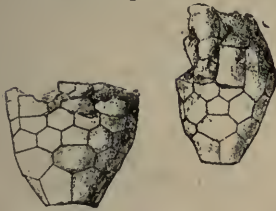


FIG. 1232.—*Gazacrinus inornatus*.

radials 2 x 10; arms composed of a single series of flattened plates, one plate in each radial area; vault sustained by a specialized frame-work, with ambulacral canals connecting the arms with a central orifice. Type *Gazacrinus inornatus*. Described at the same place, from the Niagara Gr.



FIG. 1233.—*Gazacrinus inornatus*.

GLYPTASTER *lockportensis*, Ringueberg, 1890, Ann. N. Y. Acad. Sci., vol. 5, p. 304, Niagara Gr.

GONIASTEROIDOCRINUS *tuberosus* is from the Keokuk Gr. It is re-defined in the Advance Sheets 17th Rep. Geo. Sur. Ind., p. 51, and several errors respecting it are corrected.

GONIOCRINUS, Miller & Gurley, 1890, Desc. New Gen. and Spec. Echinodermata, p. 32, and 16th Rep. Geo. Sur. Ind., p. 351. [Ety. *gonia*, an angle; *krinon*, a lily.] Calyx small, basin-shaped; plates convex or angular. Basals 5, small, extending beyond the column. Sub-

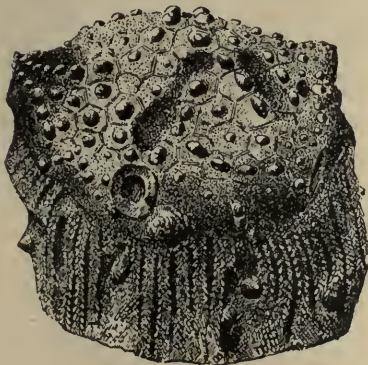


FIG. 1234.—*Gonioasteroidocrinus tuberosus*. Showing the pendulous arms.

radials five, about the same size as the basals; first radials larger, wider than long, and supporting on the slightly concave upper faces, a little shorter

than the width of the plates, the brachials; brachials 3 in each ray, flanged at the sides; arms resembling Scaphiocrinus; no regular interradials; azygous interradials, consisting of a series of plates, the first one like a first radial, and resting upon the upper truncated face of a subradial, which is followed by plates very much like the brachials, which



FIG. 1235.—*Gonioocrinus sculptilis*. Natural size and magnified.

form a convex, arm-like appendage that curves in toward the proboscis at or above the base of the free arms. A small azygous plate also exists on the right side of the area resting between the upper sloping sides of two subradials and the under sloping side of a first radial, and the azygous plate which truncates a subradial. Column pentagonal, bearing cirrhi, and composed of thicker and thinner plates; canal pentagonal. Type *G. sculptilis*, which is described at the same place, from the Waverly or Kinderhook Gr.

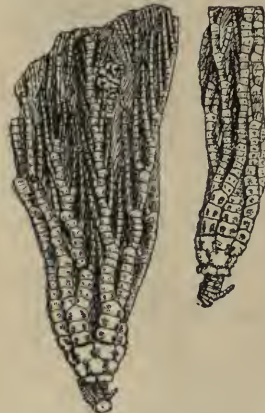
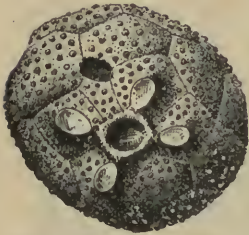


FIG. 1236.—*Gonioocrinus sculptilis*. Left side view and azygous side. Both magnified a little.

GRANATOCRINUS *aplatus*, *G. concinnulus*, *G. excavatus*, *G. exiguus*, *G. pyriformis*, Rowley & Hare, 1891, Kansas City Scientist, vol. 5, pp. 99, 100, 117, 118, Burlington Gr.

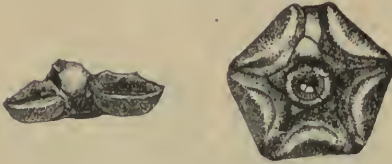
GRAPHIOCRINUS must be restored, as described by De Koninck & Lehon, and the redefinition of Wachsmuth & Springer wholly set aside. The generic formula is as follows: Basals 5; radials 2 x 5; anal 1; arms 10; none bifurcate. There is not a shadow of reason or evidence for supposing De Koninck and Lehon were mistaken in their diagnosis.

Holocystites adipatus,FIG. 1237.—*Holocystites subovatus*. Summit.

to 18, Niagara Gr.

amplus, S. A. Miller, 1892, Advance Sheets 18th Rep. Geo. Sur. Ind., p. 8, Niagara Gr.

Hydrionocrinus pentagonus, Miller & Gurlley, 1890, Jour. Cin. Soc. Nat. Hist., vol. 13, p. 17, and 16th Rep. Geo. Sur. Ind., p. 339, Up. Coal Meas.

FIG. 1238.—*Hydrionocrinus pentagonus*.

Hyptiocrinus typus, Wachsmuth & Springer, 1892, Am. Geo., vol. 10, p. 138. Not defined so as to be recognized.

Ichthyocrinus conoideus, Ringueberg, 1890, Ann. N. Y. Acad. Sci., vol. 5, p. 305, Niagara Gr.

greenii, S. A. Miller, 1892, 18th Rep. Geo. Sur. Ind., p. 52, Keokuk Gr.

Idiocrinus elongatus and *I. ventricosus*, Wachsmuth & Springer, 1892, Am. Geo., vol. 10, p. 135. Not defined so as to be recognized.

Lecanocrinus tennesseensis, S. A. Miller, 1891, Advance Sheets 17th Rep. Geo. Sur. Ind., p. 41, Niagara Gr.

Mariacrinus aureatus, S. A. Miller, 1891, Advance Sheets 17th Rep. Geo. Sur. Ind., p. 34, Niagara Gr.

granulosus, S. A. Miller, 1891, Advance Sheets 17th Rep. Geo. Sur. Ind., p. 35, Niagara Gr.

Melocrinus aequalis, S. A. Miller, 1892, Advance Sheets 18th Rep. Geo. Sur. Ind., p. 48, Niagara Gr.

oblongus, *M. parvus*, Wachsmuth & Springer, 1892, Am. Geo., vol. 10, p. 143. Not defined so as to be recognized.

Melonites was preoccupied when Owen & Norwood used it, and Meek & Worthen proposed instead of it *Melonechinus*.

Menocrinus has five basals, and does not have any near affinity with *Platycrinus*, nor belong to the same family.

Missouricrinus, S. A. Miller, 1890, Bull. No. 4, Geo. Sur. Mo., p. 31. [Ety.

H. benedicti, H. colletti, H. commodus, H. gorbvi, H. indianensis, H. madisonensis, H. ornatissimus, H. papulosus, H. parvulus, H. parvus, H. scitulus, H. spangleri, H. subovatus, H. wykoffi, S. A. Miller, 1891, Advance Sheets 17th Rep. Geo. Sur. Ind., pp. 13

proper name; *krinon*, lily.] Calyx obconoidal or basin-shaped; plates smooth or granulous; basals 5, forming a small cup; no subradials; no regular interradials; primary radials 1x5, wider than high, and separated from the brachials by an external gaping suture; brachials axillary, except in the ray

FIG. 1239.—*Missouricrinus admonitus*.

opposite the azygous side; arms resembling those in *Scaphiocrinus*; first azygous interradial rests between two primary radials and truncates a basal plate; column pentagonal. Type *M. admonitus*, which was described at the same time, from the Burlington Gr.

Myelodactylus gorbvi, S. A. Miller, 1891, Advance Sheets 17th Rep. Geo. Sur. Ind., p. 72, Niagara Gr.

Nipterocrinus has five basals.

FIG. 1240.—*Onychaster asper*.

Onychaster asper, *O. confragosus*, *O. demissus*, S. A. Miller, 1891, Advance Sheets 17th Rep. Geo. Sur. Ind., p. 74, Keokuk Gr.

Onychocrinus cantonensis, Miller & Gurlley, 1890, Desc. New Gen. and Spec. Echinodermata, p. 41, and 16th Rep. Geo. Sur. Ind., p. 358, Keokuk Gr.

ulrichi, Miller & Gurlley, 1890, Jour. Cin. Soc. Nat. Hist., vol. 13, p. 17, and 16th Rep. Geo. Sur. Ind., p. 339, Keokuk Gr.

FIG. 1241.—*Onychaster demissus*.

norwoodi, Meek & Worthen should be restored, as it is not a synonym for *O. exulplutus*.

Ottawacrinus, p. 265, first line at top of page read subradial instead of "basal."

Paleocystites, p. 267, is described in Decade 3.

Pentremites basilaris and *P. broadheadi*

are described on p. 159, and *P. clavatus* and *P. hemisphericus*, on p. 157; *P. gemmiformis*, p. 553; *P. nodosus*, p. 155; *P. sampsoni*, p. 551; and *P. spinosus*, p. 154, of vol. 4, Trans. St. Louis Acad. Sci. *P. cherokeus* was not defined by Troost, and as Roemer described *P. sulcatus* in 1852, it was too late for Hall to call the same species *P. cherokeus* in the Geo. Sur. Iowa, in 1858.

laterniformis, see *Troostocrinus laterniformis*.

PISOCRINUS benedicti, *P. campana*, *P. gorbyi*, S. A. Miller, 1891, Advance Sheets 17th Rep. Geo. Sur. Ind., pp. 28 to 32, Niagara Gr. *P. gemmiformis* is redefined at the same place and the generic characters discussed.



FIG. 1242.—*Pisocrinus benedicti*. Side and basal views.

pyriformis was described in 1884.

PLATYCRINUS absentivus, *P. æquitermus*, *P. allophyllus*, *P. annosus*, *P. brittsi*, *P. ollicula*, from the Chouteau limestone; *P. acclivus*, *P. batiola*, *P. blairi*, *P. broadheadi*, *P. carchesium*, *P. concinnus*, *P. gorbyi*, *P. lautus*, *P. occidentalis*, *P. pulcellus*, *P. rotundus*, *P. sampsoni*, *P. sulcatus*, from the Burlington Gr.; and *P. æternalis*, *P. amabilis*, *P. boonvillensis*, *P. pentagonus*, from the Keokuk Gr., Bull. No. 4, Geo. Sur. Mo., pp. 8 to 23, S. A. Miller, 1890.



FIG. 1243.—*Pisocrinus gorbyi*. Summit and side view showing arm-blades.

alabamensis, S. A. Miller, 1891, Advance Sheets 17th Rep. Geo. Sur. Ind., p. 50, Kaskaskia Gr.

altdorsatus, *P. corbuliformis*, *P. marginatus*, *P. pisum*, *P. planobasalis*, from the Burlington Gr.; *P. curryvillensis*, *P. insolens*, from the Chouteau limestone; Rowley & Hare, 1891, Kansas City Scientist, pp. 97, 98, 113.

caducus, S. A. Miller, 1892, Advance Sheets 18th Rep. Geo. Sur. Ind., p. 13, Keokuk Gr., and at same place *P. chouteauensis* and *P. colletti* from the Chouteau limestone.

POTERIOCRINUS agnatus, *P. amœnus*, *P. boonvillensis*, *P. coryphæus*, S. A. Miller, 1891, Advance Sheets 17th Rep. Geo. Sur. Ind., pp. 42 to 45, Keokuk Group.

arcanus, *P. cantonensis*, *P. crawfordsvillensis*, *P. granilineus*, *P. subramosus*, *P. verus*, from the Keokuk Gr.; *P. genista*, *P. legrandensis*, *P. scope*, *P. spartarius*, from the Kinderhook Gr.; Miller and Gurley, 1890, Jour. Cin. Soc. Nat. Hist., vol. 13, pp. 23, 24, and Desc.

New Gen. and Spec. Echinodermata, pp. 29, 37 to 40, 49, republished, 16th Rep. Geo. Sur. Ind., pp. 343, 344, 348, 355 to 358, 365.

brittsi, S. A. Miller, 1890, Bull. No. 4, Geo. Sur. Mo., p. 30, Keokuk Gr.

meekanus refer to *Cyathocrinus meekanus*, Chouteau limestone.

waltersi, Rowley and Hare, 1891, Kansas City Scientist, p. 101, Burlington Gr.

Protaster gregarius, see *Aganaster gregarius*.

RHODOCRINUS benedicti, S. A. Miller, 1892, Advance Sheets 18th Rep. Geo. Sur. Ind., p. 15, Keokuk Gr.

cælatus, *R. sculptus*, Miller and Gurley, 1890, Desc. New Gen. and Spec. Echinodermata, pp. 42, 43, and 16th Rep.

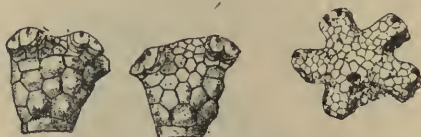


FIG. 1244.—*Saccocrinus howardi*. Side, azygous, and summit views.

Geo. Sur. Ind., pp. 359, 360, Kinderhook Gr.

parvus, S. A. Miller, 1891, Bull. No. 4, Geo. Sur. Mo., p. 39, Keokuk Gr.

SACCOCRINUS benedicti and *S. howardi*, S. A. Miller, 1892, Advance Sheets 18th Rep. Geo. Sur. Ind., pp. 29 and 30, Niagara Gr.

gorbyi, S. A. Miller, 1891, Advance Sheets 17th Rep. Geo. Sur. Ind., p. 57, Niagara Gr.

SCAPHIOCRINUS bellus, *S. bonoensis*, *S. disparilis*, *S. granuliferus*, *S. graphicus*, *S. lacunosus*, *S. manus*, *S. præmorsus*, *S. reptertus*, Miller & Gurley, 1890, Jour. Cin. Soc. Nat. Hist., vol. 13, p. 24, and Desc. New Gen. and Spec. Echinodermata, pp. 29, 45 to 52, republished in 16th Rep. Geo. Sur. Ind., pp. 345, 349, 362 to 367, Keokuk Gr.

boonvillensis, *P. constrictus*, S. A. Miller, 1891, Bull. No. 4, Geo. Sur. Mo., pp. 37, 38, Keokuk Gr.

gorbyi, *S. porrectus*, *S. sampsoni*, S. A. Miller, 1891, Advance Sheets 17th Rep. Geo. Sur. Ind., pp. 42, 46; *S. sampsoni* from the Chouteau limestone, the others from the Keokuk Gr.



FIG. 1245.—*Scaphiocrinus gorbyi*.

lyoni, and *S. manifoldis*, S. A. Miller, 1892, Advance Sheets Geo. Sur. Ind., p. 45, Keokuk Gr.



FIG. 1246.—*Schoenaster legrandensis*.

Sur. Ind., p. 371, Kinderhook Gr.

STEGANOCRINUS benedicti, S. A. Miller, 1892, Advance Sheets 18th Rep. Geo. Sur. Ind., p. 27, Keokuk Gr.

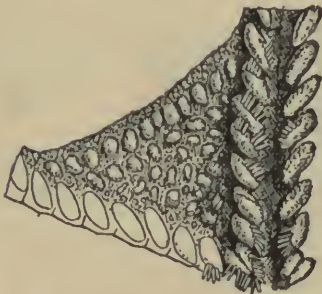


FIG. 1247.—*Schoenaster legrandensis*. Part of ventral side magnified $6\frac{1}{2}$ diameters.

STEPHANOCRINUS elongatus, S. hammelli, S. obpyramidalis, S. A. Miller, 1891, 17th Rep. Geo. Sur. Ind., pp. 22 to 26, Niagara Gr. *S. osgoodensis* is redescribed and the genus is discussed at the same place.

cornetti, S. A. Miller, 1892, Advance

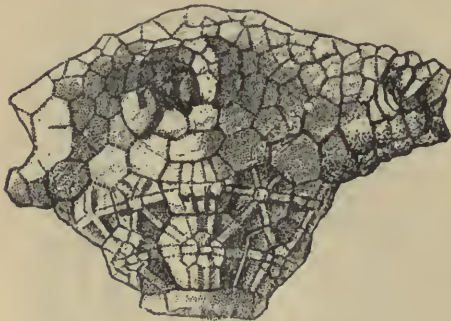


FIG. 1248.—*Steganocrinus benedicti*.

Sheets 18th Rep. Geo. Sur. Ind., p. 12, Niagara Gr.

STRIBALOCYSTITES, S. A. Miller, 1891, Advance Sheets 17th Rep. Geo. Sur. Ind., p. 20. [Ety. *stribalos*, close pressed, thick, in allusion to the thick tumid plates; *kustis*, bladder.] Body rudely

subovate or subelliptical, and covered by about five series of tumid plates.



FIG. 1249.—*Stribalocystites gorbyi*. Side, summit, and basal views.

Basals 4, unequal; second series of plates 6, unequal; fourth and fifth series irregular and covering the summit; no arms; orifice near the summit on the azygous side, and another on the left near the summit, both being above the third range of plates; sometimes there is a central orifice. Type *S. tumidus*, from the Niagara Gr.



FIG. 1250.—*Stribalocystites tumidus*. Side and basal views.

gorbyi, S. A. Miller, 1892, Advance Sheets 18th Rep. Geo. Sur. Ind., p. 11, Niagara Gr.

SYNBATHOCRINUS blairi, S. A. Miller, 1891, Bull. No. 4, Geo. Sur. Mo., p. 32, Keokuk Gr.

wachsmuthi, Meek & Worthen, 1869, Proc. Acad. Nat. Sci., p. 67, and Geo. Sur. Ill., vol. 5, p. 437, Burlington Gr.

TAXOCRINUS spinifer, Hall, 1861, Proc. Bost. Soc. Nat. Hist., p. 318, Burlington Gr.

subovatus, Miller & Gurley, 1890, Desc. New Gen. and Spec. Echinodermata, p. 26, and 16th Rep. Geo. Sur. Ind., p. 347, Keokuk Gr.



FIG. 1251.—*taxocrinus subovatus*.

TECHNOCRINUS spinulosus is the type of the genus.

TROOSTOCRINUS laterniformis, Owen & Shumard, 1850 (*Pentremites laterniformis*), Jour. Acad. Nat. Sci. 2d ser., vol. 2, p. 66, Kaskaskia Gr.

nitidulus, Miller & Gurley, 1890, Desc. New Gen. and Spec. Echinodermata, p. 58, and 16th Rep. Geo. Sur. Ind., p. 373, St. Louis Gr.

wachsmuthi, Gurley, 1884, New Carb. Foss. Bull. No. 2, p. 1, Warsaw Gr.

ULOCRINUS, Miller & Gurley, 1890, Jour. Cin. Soc. Nat. Hist., vol. 13, p. 6, and 16th Rep. Geo. Sur. Ind., p. 330. [Ety. *oulos*, solid, substantial; *krinon*, lily.] Calyx globular or pyramidal, large, plates more or less convex, smooth or granular. Basals 5, forming a pentagonal disc or low cup; columnar opening pentagonal; subradials 5, very large; first radials large, pentagonal, upper face projects over the interior of the calyx so as to make a broad articu-

lating face for the first brachial; no regular interradians. A quadrangular azygous plate placed obliquely forms part of the calyx, and a small plate

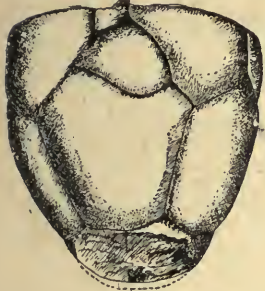


FIG. 1252.—*Uloocrinus buttsi*.

rests upon its upper angle at the top of the calyx, and projects slightly above the top of the first radials; column round. Type *U. buttsi*, described at the same place, from the Upper Coal Meas. *U. kansasensis* is also described at the same place, from the same rocks.

Z. commaticus, *Z. pocillum*, S. A.

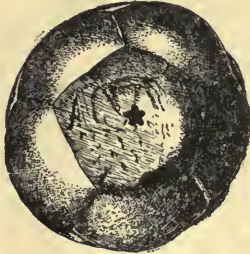


FIG. 1253—*Uloocrinus kansasensis*.

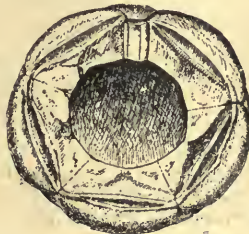


FIG. 1254.—*Zophocrinus howardi*. Side and summit views.

Miller, 1891, Bull. No. 4, Geo. Sur. Mo., pp. 28, 36, Keokuk Gr.

dubius, Miller & Gurley, 1890, Desc. New Gen. and Spec. Echinodermata, p. 44, and 16th Rep. Geo. Sur. Ind., p. 361, Keokuk Gr.

faggi, Rowley & Hare, 1891, Kansas City Scientist, p. 103, Burlington Gr.

ZOPHOCRINUS, S. A. Miller, 1891, Advance Sheets 17th Rep. Geo. Sur. Ind., p. 32. [Ety. *zophos*, dark, obscure; *krinon*, lily.]

Body ovate or pear shaped, and covered by two circles of plates and the vault. Basals or first circle of plates 3, forming an obconoidal cup, higher than wide; two of the plates are of equal size, and quadrangular; the other is larger and pen-



tagonal; second circle of plates 4, 3 pentagonal and 1 quadrangular; they are horizontally truncated on top, and bear a circle of numerous pinnules surrounding a convex vault. Seven plates constitute the test of the calyx. It possessed a column with a small columnar canal. Type *Z. howardi*, described at the same place, from the Niagara Gr.

The paper entitled "Descriptions of New Species of Crinoidea, from investigations of the Iowa Geological Survey, Preliminary Notice, by James Hall," dated February 25, 1861, has never been published, as required by the laws of nomenclature, and is not, therefore, entitled to recognition. It is a private pamphlet, that was never kept for sale, and was not generally distributed among those conversant with the subject, and contains no figures of any of the organisms, which, with such meagre and imperfect descriptions as the text contains, would be absolutely necessary to enable an expert palæontologist to determine the organism intended to be named. Hall says, on page 10, that he published the abstract of the descriptions to get ahead of the publications of the Geological Survey of Illinois. A very selfish excuse for such poor work, and it does not add any vitality to the publication, which was never entitled to recognition under the laws of nomenclature, as shown on page 95 of this work. One genus and two species have been redefined in valid publications, and they will stand as of the date of the redefinition. The following names, never having appeared with valid definitions, should be stricken out, as of no more value than the names in a private catalogue: *Actinoocrinus carica*, sometimes referred to *Eretmocrinus*; *A. ovatus*, *A. multibrachiatus* var. *echinatus*, *A. lucina*, *A. thetis*, *A. thoas*. *A. quaternarius* var. *spiniferus*, *A. themis*; *A. remibrachiatus*, sometimes referred to *Eretmocrinus*; *A. tenuiradiatus*, sometimes referred to *Strotocrinus* or *Teleocrinus*; *A. eryx*, *A. (Calathocrinus) erodus*, sometimes referred to *Strotocrinus* or *Teleocrinus*; *A. (Calathocrinus) insculptus*, sometimes referred to *Strotocrinus* or *Teleocrinus*; *A. (Calathocrinus) althea*, sometimes referred to *Teleocrinus*; *A. lagena*, *A. thalia*; *A. matuta*, sometimes referred to *Eretmocrinus*; *A. matula* var. *attenuata*, sometimes referred to *Eretmocrinus*; *A. (?) tenuidiscus*, *A. securis*, *A. infrequens*, *A. locellus*, *A. doris*, *Platycrinus olla* (name preoccupied), *P. regalis*, *P. glyptus*, *P. calyculus*, *P. nodobrachiatus* (name preoccupied), *P. parvinodus*, *P. eminulus*, *P. aqualis* (*P. aqualis* in Geo. Sur. Ill., vol. 5, p. 456), *Synbathocrinus papillatus*, *Rhodocrinus wachsmuthi*, *Heterocidaris keokuk*, and *H. lewispinus*. All of the above, including *Lepidechinus*, *L. imbricatus*, and *Protaster (?) barrisi*, which have been since defined, in proper publications, are

printed in the above named private pamphlet, on about nine pages. In other words, thirty-eight new species and two new genera are defined on about nine pages, without a single figure of any kind, and without mentioning a locality from which any of them came, or informing any one of the age of the rocks further than to write "Burlington limestone."

Wachsmuth (who has probably seen some of the so-called types) has condemned, as synonyms of other species, the above named *Actinocrinus multibrachiarus* var. *echinatus*, *A. thetis*, *A. thoas*, *A. quaternarius* var. *spiniferus*, *A. themis*, *A. eryx*, *A. lagina*, *A. securis*, *A. locellus*, *A. doris*, *Platycrinus olla*, *P. glyptus*, *P. calyculus*, *P. nodobrachiatus*, and *Synbathocrinus papillatus*.

Had I been able to see a copy of the pamphlet, none of the names would have appeared as valid in the first edition of this work; but none of my correspondents had ever seen one, and I borrowed most of the names from references made to them by Meek & Wachsmuth. More recently Wm. F. E. Gurley, of Danville, Illinois, has been able to obtain a copy of all except the last page of the pamphlet, and I have been allowed to examine it, with the above result.

SUBKINGDOM MOLLUSCOIDA.

CLASS BRYOZOA.

SOME genera were by accident placed in two families in this Class. Correct by striking *Peronopora* out of the *Batostomellidæ*; *Eridopora*, *Lichenotrypa*, *Sagenella*, and *Selenopora* from the *Ceramoporidæ*; *Coscinella*, *Reptaria*, and *Semiopora* from the *Fenestellidæ*; *Anisotrypa* from the *Rhabdomesontidæ*; *Heliotrypa* from the *Stictoporidae*; *Criseinella* from the *Thamniscidæ*; *Acanthoclema*, *Amplexopora*, *Atactopora*, *Bactropora*, *Chilotrypa*, *Nemataxis*, and *Tropidopora* from the *Trematoporidae*. Strike out the family *Labechiidæ* because it belongs, probably, to the Protozoa. Place *Semiopora* with the *Ptylodictyonidæ*; *Sagenella* and *Reptaria* with the *Tubuliporidae*.

The bryozoum is sometimes called *cœnœcium* (*koinos*, common; *oikos*, house) or *polyzoarium*, especially when *Polyzoa* is used for the Class instead of *Bryozoa*. *Gymnolœmata*, in the last line on page 289, is from, *gymnos*, naked; *laimos*, the throat.

ARTHROCLEMA *armatum*, *A. cornutum* and *Arthrostylus conjunctus* and *A. obliquus*, Ulrich, 1890, Jour. Cin. Soc. Nat. Hist., vol. 12, pp. 193 and 194 and pp. 189 and 190, Trenton Gr.

Ceramopora concentrica and *C. whitei*, James, 1888, Jour. Cin. Soc. Nat. Hist., vol. 11, p. 38. Not recognized.

CHAINODICTYON, at the top of p. 297, is from *chaino*, gaping; and *dictyon*, net.

DIASTOPORINA, Ulrich, 1890, Jour. Cin. Soc. Nat. Hist., vol. 12, p. 177. [Ety. diminutive of *Diastopora*.] Zoarium bifoliate, flabellate; zoecia tubular, prostrate, not entirely immersed; apertures constricted, oblique, the anterior side not elevated; interspaces, striated. Type *D. flabellata*, described, at the same time, from the Trenton Gr. He also described at the same time from the Trenton Gr., *Enallopora mundula* under the name of *Mitoclema mundulum*. He gives his reasons for not using the ge-

neric name *Enallopora* in vol. 8, Geo. Sur. Ill. p. 683.

DRYMOTRYPA, Ulrich, 1890, Geo. Sur. Ill., vol. 8, p. 399. [Ety. *drumos*, a thicket; *trupa*, perforation.] Zoarium dichotomous, reverse striated; zoecia in ranges, tubular, thick walled in tangential sections, springing from a thin plate; superficial apertures angular, oval within. Type *D. diffusa*, Hall's *Retepora diffusa*, and includes Hall's *Thamniscus cisseis* and *T. niagarensis*.

Fenestella hemitrypa, see *Hemitrypa proutana*.

FISTULIPORA *laxata*, Ulrich, 1889, Micro-palæontology of Canada, p. 37, Hud. Riv. Gr. The genus *Fistulipora* is referred by some authors to the *Alcyonaria*, because the larger pores increase by *cœnenchymal* gemmation, a method of increase said to be unknown among *Bryozoa*.

Glyptotrypa on p. 307, read *Glyptopora*.

- HELOPORA alternata*, H. mucronata, Ulrich, 1890, Jour. Cin. Soc. Nat. Hist., vol. 12, p. 192, Trenton Gr.
- NEMATOPORA conferta*, N. granosa, N. ovalis, Ulrich, 1890, Jour. Cin. Soc. Nat. Hist., vol. 12, pp. 196, 197, Trenton Gr.
- PACHYDICTYA emaciata*, P. obesa, P. turgida, Foerste, 1887, Bull. Denison Univ., vol. 2, pp. 162 to 165, Niagara Gr.
- pumula*, P. triserialis, Ulrich, 1890, Jour. Cin. Soc. Nat. Hist., vol. 12, pp. 186, 187, and in *Micropalæontology*, pp. 42, 43, P. hexagonalis and P. magnipora, Trenton Gr.
- PALESCHARA quadrangularis*, Nicholson, 1874, (*Chetetes quadrangularis*,) Rep. Pal. Prov. Ont., p. 61, Devonian.
- PINACOTRYPA marginata*, Whiteaves, 1892, Cont. to Can. Pal., p. 278, Devonian.
- POLYPORA manitobensis*, Whiteaves, 1892, Cont. to Can. Pal., p. 280, Devonian.
- RHINIDICTYA exigua*, R. humilis and R. minima, Ulrich, 1890, Jour. Cin. Soc. Nat. Hist., vol. 12, pp. 183 to 185, Trenton Gr.
- RHOMBOPORA multipora*, Foerste, 1887, Bull. Denison Univ., vol. 2, p. 72, Coal Meas.
- STICTOPORELLA rigida*, Ulrich, 1890, Jour. Cin. Soc. Nat. Hist., vol. 12, p. 188, Trenton Gr.
- STOMATOPORA moniliformis*, Whiteaves, 1891, Cont. to Can. Pal., vol. 1, p. 212, Devonian; S. tenuissima, Utica Gr. and S. turgida, Hud. Riv. Gr., Ulrich, 1890, Jour. Cin. Soc. Nat. Hist., vol. 12, pp. 175 and 176.
- SUBRETEPORA halli* and S. sublaxa, Ulrich, 1890, (*Philloporina halli* and P. sublaxa,) Jour. Cin. Soc. Nat. Hist., vol. 12, pp. 179 and 181, Trenton Gr. Ulrich gives his reasons for not using *Subretepora* in vol. 8, p. 686, Geo. Sur. Ill.
- VINELLA*, Ulrich, 1890, Jour. Cin. Soc. Nat. Hist., vol. 12, p. 173. [Ety. proper name.] Zoarium attached to foreign bodies, consisting of exceedingly slender, ramifying, thread-like tubes, occasionally radiately arranged; surface faintly lined longitudinally; a row of widely separated pores along the surface of the tubes. Type V. repens, described at the same time from the Trenton Gr.

CLASS BRACHIOPODA.

ONE valve of the shells in this Class is always larger than the other. A line drawn vertically from the beak to the base will divide the shell into two equal parts. The flattened space between the beaks is called the hinge area or the cardinal area; the aperture in one of the beaks is called the foramen; and the triangular plate in front of the foramen and sometimes forming part of its circumference is called the deltidium, but in some genera it does not exist. When there are no teeth, as in *Crania*, the valves are held together by the adductor muscles. The shells are found in all Groups of rocks, from the Taconic to the most recent; but the Class seems to have reached its maximum development in the Devonian, and to have slowly declined since the Carboniferous age.

Beecher says the main characters common to the Class are, the bivalve shell, the pedicled or fixed condition, the animal composed of two pallial membranes intimately related to the shell, a visceral sac, and two arms or appendages near the mouth. The extreme range of variation does not eliminate any of these features, and consequently no univalve or multivalve forms are found, nor any strictly free swimming species, nor growths or modifications adapting the organism to a Pelagic life. All Brachiopods have a common form of embryonic shell called the protegulum. (Ety. *pro*, early; *tegos*, a covering.) The protegulum is semicircular or semielliptical in outline, with a straight or arcuate hinge-line, and no hinge area. A slight posterior gaping is produced by the pedicel valve being usually more convex than the brachial. The modifications noted are apparently due to accelerated growth, by which characters primarily neologic become so advanced in the development of the individual as to be impressed finally upon the embryonic shell.

Acrothele dichotoma refer to *Acrotreta dichotoma*.

Acrotreta gulielmi refer to *Discinopsis gulielmi*.

Anoplia, Hall, 1892, Pal. N. Y., vol. 8, p. 309. Proposed as a subgeneric name with *Leptaena* (?) nucleolata, Hall, as the type. It is only necessary to say it has no place in nomenclature as a subgeneric name. If it is a name which deserves retention, it should be in a generic sense, and probably it should be placed in that rank.

ATHYRIS angelica var. *occidentalis*, Whitcaves, 1891, Cont. to Can. Pal., vol. 1, p. 227, Devonian.

ashlandensis, Herrick, 1888, Bull. Denison Univ. vol. 4, p. 24, Waverly Gr.

brittsi, and *A. ottervillensis*, S. A. Miller, 1892, 18th Rep. Geo. Sur. Ind., p. 60, Ham. Gr.

ATRYPA calvini, and *A. reticularis*, var. *niagarensis*, Nettleroth, 1889, Kentucky Foss. Shells, pp. 89, 92, Niagara Gr.

deflecta, Hall, see *Zygospira deflecta*.
ellipsoidea, Nettleroth, 1889, Kentucky Foss. Shells, p. 90, Up. Held Gr.

missouriensis, S. A. Miller, 1892, Advance Sheets 18th Rep. Geo. Sur. Ind., p. 61, Ham Gr.

Aulosteges spondyliiformis, see *Strophalosia spondyliiformis*.

BARROISELLA, Hall, 1892, Pal. N. Y., vol. 8, p. 62. [Ety. proper name.] Lingulate-like shell; pedicel-valve bears a high cardinal area, appearing as a thickened triangular plate, divided by a broad pedicel-groove, and having at each basal angle a boss or condyle which served as a muscular fulcrum or as a point of articulation; the interior has a subquadrate depressed area in continuation of the pedicel-groove, and from its antelateral angles diverge two linear depressions, which extend about one-fourth the length of the shell; from outside and behind the extremities of these depressions begins a pair of long, curved furrows, composed of two shorter curves, the posterior rounding over the extremities of the linear depressions; the anterior and longer curves gradually approximate, and nearly meet at about one-third the length of the shell from the anterior margin; these furrows are accompanied by low ridges along their inner margin. A low median ridge, with elevated edges, begins at the posterior umbonal impression, and continues to the center of the valve, widening near its anterior extremity; behind its termination there is a pair of indistinct muscular impressions. In the brachial valve the beak is scarcely prominent, and the muscular markings are essentially as in the opposite valve, but more sharply developed; beneath the beak there is a faint umbonal scar. The long compound lateral curves have

a greater degree of curvature than in the pedicel-valve, and their posterior portion incloses a thickened area, which is continued into a low median septum that bifurcates in the middle of the valve, and has extending from the angle an intercalated ridge. Type *Lingula subspatulata*, Meek & Worthen.

BILLINGSSELLA, Hall, 1892, Pal. N. Y., vol. 8, p. 230. [Ety. proper name.] Shell *Orthis*-like, transverse; subquadrate or semicircular in outline; contour concave or plano convex; surface striate; pedicel-valve the more convex; cardinal area moderately high, vertical or slightly incurved; delthyrium covered by a convex plate, which may be minutely perforated at the apex; teeth well developed, but dental plates are continued along the bottom of the umbonal cavity, inclosing a small subelliptical muscular area near the apex. In the brachial valve the cardinal area is greatly inclined, making an obtuse angle with that of the opposite valve; delthyrium partly covered by a convex deltidium, which never attains the development seen in the opposite valve, and is sometimes absent. Type *Orthis pepina*, Hall. It probably includes *Streptorhynchus primordiale*, Whitfield, *Orthisina grandava* and *Orthis laurentina*, Billings.

CAMARELLA benensis, and *C. owatonnaensis*, Sardeson, 1892, Bull. Minn. Acad. Nat. Sci., vol. 3, p. 328, Trenton Gr.

minor, Walcott, 1890, 10th Ann. Rep. U. S. Geo. Sur. p. 614, Up. Taconic.

CHONETES Manitobensis, Whiteaves, 1892, Cont. to Can. Pal., p. 281, Devonian.

subquadrata, Nettleroth, 1889, Kentucky Foss. Shells, p. 67, Up. Held Gr.

tunida, Herrick, 1888, Bull. Denison Univ., vol. 3, p. 36, Waverly Gr.

complanata, *dawsoni*, *reversa*, refer to *Chonostrophia*.

CHONOPECTUS, Hall, 1892, Pal. N. Y., vol. 8, p. 312. [Ety. *chonos*, a cup; *pektos*, combed.] Shell like *Chonetes*, the cardinal margin of the pedicel-valve bearing a row of erect spines; beak compressed, leaving a flattened area or cicatrix from attachment in early growth; surface ornamented with a double series of concentric lines or wrinkles, having the appearance of the engraving on a machine-turned watch-case, and strongest on the umbonal and central part; these wrinkles are crossed by concentric growth-lines, and sometimes by finer radiating lines more or less flexuous. Casts of the pedicel-valve show the impression of a short median septum dividing two broad obcordate flabelliform muscular scars, from the outer margin of which there are radiating vascular scars; impressions of a narrow cardinal area and exceedingly small teeth also occur on

the internal cast. Type *Chonetes fischeri*, Norwood & Pratten.

CHONOSTROPHIA, Hall, 1892, Pal. N. Y., vol. 8, p. 310. [Ety. *chonos*, a cup; *strophe*, turning around.] Shell like a reversed *Chonetes*, concavo-convex, the pedicel-valve being slightly convex about the umbo, but becoming broadly concave over the pallial region; outline and contour like *Leptaena*; valves extremely tenuous and compressed; surface covered with fine, alternating or fasciculate striae. In the pedicel-valve the upper margin of the cardinal area bears a row of hollow spines of the same structure and arrangement as in *Chonetes*. The delthyrium is narrow, and appears to be more or less completely closed. The teeth are quite strong, and rest upon the bottom of the valve; between them arises a low median septum, extending one-third or one half the length of the valve, dividing a subcordate muscular area, the outer margins of which are distinctly elevated. In the brachial valve the crural plates are united to form a bilobed cardinal process. On the inner surface it ends abruptly; internal pallial region finely papillose; shell-substance fibrous, punctate. Type *Chonetes reversa*, Whitfield. To the same genus is referred *Chonetes complanata*, *C. dawsoni*, and *C. helderbergia*, Hall, 1892, Pal. N. Y., vol. 8, p. 353, Low. Held. Gr.

CHRISTIANA, Hall, 1892, Pal. N. Y., vol. 8, p. 298. [Ety. proper name.] Shell resembling *Leptaena*, usually longitudinally elongated, sometimes semielliptical in outline; normally concavo-convex; surface smooth or covered with fine radiating lines, crossed by stronger concentric plications; cardinal area of the pedicel-valve high; delthyrium probably closed by a convex plate; teeth divergent, and from their bases extend the elevated margins of two linguiform muscular scars, traversing the shell almost the entire length; these diductor scars inclose two elongate adductors. In the brachial valve the cardinal process is bipartite, each of the lobes being grooved behind; the crural plates are long and divergent, terminating in elevated extremities or crura. The lower moiety of these plates is produced on each side of an elevated muscular ridge, curving slightly inward on the sides, then outward on approaching the anterior margin of the valve, each branch recurving and passing backward, parallel to the median axis, as far as the base of the cardinal process. The interspaces are divided transversely at about one-third their length from the hinge-line, by a lower ridge. The four areas thus inclosed represent the posterior and anterior scars of the

adductor muscles. Type *Leptaena subquadrata*, Hall.

CLITAMBONITES, Pander, 1830, Beitrage zur Geognosie des russ. Reiches, p. 70. [Ety. *klitos*, a sloping place; *ambon*, any rising; *lithos*, stone.] Shells with a sub-semicircular marginal outline; convex or subpyramidal; hinge-line straight, and forming the greatest diameter of the shell; pedicel-valve elevated; cardinal area high, vertical, or sometimes incurved and crossed by a broad delthyrium, with a perforate deltidium; dental lamellæ strongly developed, converging and uniting in the median line; median septum about half the length of the valve; muscular impressions obscure; cardinal area developed in the brachial valve, delthyrium filled with a callosity; dental sockets large; crural plates low; thickened transverse area in the umbonal region; surface striate; shell-substance impunctate. Type *Pronites adscendens*, Pander. It includes *Orthisina vernuli*, Eichwald, and *Hemipronites americanus*, Whitfield.

CONOTRETA, Walcott, 1890, Advance Sheets Biological Soc. Washington. [Ety. *konos*, cone; *treto*s, perforated.] Structure calcareo corneous. Five narrow ridges radiate from the apex toward the front, on the internal side of the dorsal or conical valve, the central one of which joins the thickened apex, which is supposed to have been perforated by a siphonal tube. In *Acrotreta* there is an elongated muscular scar extending from each side of the siphonal tube obliquely forward. Type *C. rusti*, which is described at the same place from the Trenton Gr.

CRANIA *agaricina*, *C. pulchella*, Hall, 1892, Pal. N. Y., vol. 8, p. 180, Low. Held. Gr., and *C. granosa* and *C. favincola* at same place, Ham. Gr.

blairi, S. A. Miller, 1892, Advance Sheets 18th Rep. Geol. Surv. Ind., p. 56, Chouteau limestone, and *C. greenii* from Up. Held. Gr.

columbiana, Walcott, 1888, Proc. U. S. Nat. Mus. p. 441, Up. Taconic. Not defined so as to be recognized.

halli, Sardeson, 1892, Bull. Minn. Acad. Nat. Sci., vol. 3, p. 328, Trenton Gr.

radicans, see *Strophalosia radicans*.

CRANIELLA (Ehlers, 1888, Bull. de la Soc. d'Etudes Scientif. d'Angers, p. 37. [Ety. diminutive of *Crania*.] Shell somewhat irregular; outline subcircular or sub-quadrangular; ventral valve thin, adhering by its entire surface; dorsal valve conoidal, more or less elevated; apex subcentral, posterior; interior of the dorsal valve without a well-defined border; impressions of the adductors large, distinct, four in number, of which the posterior two are quite distant, the two subcentrals smaller, closely approximate or even confluent; from near each

- of the posterior impressions starts a broad vascular sinus, strongly sinuous near its point of departure, narrowing gradually in following the contour of the valve, emitting from its marginal side dichotomizing secondary branches. Type *C. medianensis*, Oehlert. It probably includes *Crania hamiltonia*, Hall, and *C. greenii*, S. A. Miller.
- ulrichi*, Hall, 1892, Pal. N. Y., vol. 8, p. 181, Trenton Gr.
- CRYPTONELLA** *ovalis*, S. A. Miller, 1891, Advance Sheets 17th Rep. Geo. Sur. Ind., p. 76, Ham. Gr.
- traversensis*, Winchell, 1866, (Terebratula *traversensis*.) Rep. Low. Penin. Mich., p. 95, Ham. Gr.
- Derbya*, Waagen, 1884, Palæontologia Indica, Ser. 13, vol. 1, pp. 576, 591 to 607. [Ety. proper name.] This genus, according to Hall, is distinguished from *Streptorhynchus* by the presence of a median septum in the pedicel valve. He notes no other generic difference. Type *D. regularis*, Waagen. Hall refers to this genus *Orthis keokuk*, Hall, *Orthis robusta*, Hall, *Hemipronites* (*Streptorhynchus*) *crassus*, Meek & Hayden, and regards *Hemipronites lasallensis* and *H. richmondi*, McChesney, as synonyms for *H. crassus*. I consider *Orthis robusta*, Hall, more closely related to *Hemipronites crassus*, Meek, than either *H. lasallensis* or *H. richmondi*, McChesney, and if one is to be retained as a species all three should be, and in no event is either one of them congeneric with *Orthis keokuk*. Hence, I see no propriety in the use of the word *Derbya* as applied to American fossils, and as I have seen no typical specimens belonging to the genus, I express no opinion as to its value. Hall, however, describes *Derbya broadheadi*, *D. bennettii*, *D. cymbula*, *D. affinis*, and *D. biloba*, from the Up. Coal Meas., Pal. N. Y., vol. 8, pp. 347 to 350, and on p. 346 *D. ruginosa*, from the Keokuk Gr., and *D. costatula* from the Kaskaskia Gr. All of these may be referred to *Streptorhynchus*, and it is not too much to say that Meek would have classed all of them as synonyms for *Streptorhynchus crassum*.
- DISCINA** *concordensis*, Sardeson, 1892, Bull. Minn. Acad. Nat. Sci., vol. 3, p. 328, Trenton Gr.
- keokuk*, Gurley, 1884, New Carb. Foss., p. 6, Keokuk Gr.
- sampsoni*, S. A. Miller, 1891, Advance Sheets 17th Rep. Geo. Sur. Ind., p. 80, Chouteau limestone.
- DISCONOPSIS**, Matthew, 1892, Pal. N. Y., vol. 8, p. 105. [Ety. from resemblance to *Discina*.] Shell subcircular, depressed conical; apex excentric; apex of the pedicel-valve truncated, with a circular aperture; interior having a pair of diverging furrows from the beak, that converge toward the anterior margin, and inclose a thickened area, which, in the subumbonal region, is apparently free and projects like a shelf, from beneath which the foramen probably opened; shell substance tenuous, apparently corneous; surface marked concentrically, and also with radiating striae. Type *Acrotreta gulielni*, Matthew.
- EATONIA** *variabilis*, Whiteaves, 1891, Cont. to Can. Pal., vol. 1, p. 233, Devonian.
- HALLINA**, Winchell & Schuchert, 1892, Am. Geo., vol. 9, p. 291. [Ety. proper name.] Shells small, articulate, rostrate, biconvex, semiplicate; pedicel opening bounded laterally by incomplete deltidial plates; calcified brachial supports long and much like *Waldheimia*. Type *H. saffordi*, described at the same place with *nicolletti*, from Trenton Gr. Neither one defined so as to be recognized.
- Koninekina americana*, Swallow, may be stricken from the list as it is not a *Koninekina*, and is too poorly defined to be recognized.
- KUTORGINA** *labradorica* var. *swantonensis*, Walcott, 1889, Proc. Nat. Mus., vol. 12, p. 36, Up. Taconic.
- LEPTÆNA** *charlotte*, Winchell & Schuchert, 1892, Am. Geo., vol. 9, p. 288, Trenton Gr., and *Plectambonites gibbosus*, from Galena Gr. Not defined so as to be recognized.
- minnesotensis*, Sardeson, 1892, Bull. Minn. Acad. Nat. Sci., vol. 3, p. 329, Trenton Gr., and *præciosa*, *recedens* and *saxea*, Hud. Riv. Gr.
- LEPTENISCA**, Beecher, 1890, Am. Jour. Sci. and Arts. Ser. 3, vol. 40, p. 239. [Ety. diminutive of *Leptæna*.] Shell concavo-convex, attached to foreign objects by calcareous cementation of the ventral beak; valves articulated with teeth and sockets; dorsal valve concave; interior with broad spiral impression on each side of the median line, making a single volution; adductor impressions small; cardinal line narrow, bearing in the center two prominent, bilobed, cardinal processes, separated to admit the vertical septum in the opposite beak; ventral valve convex, area elongate, triangular; fissure covered with a pedicel sheath; cardinal muscular scar supported on or limited by two elevated lamellæ; cavity of beak divided by a vertical septum, on each side of which, in the anterior half, is a small, adductor scar; shell structure punctate. Type *L. concava*.
- adnascens* and *L. tangens*, Hall, 1892, Pal. N. Y., vol. 8, p. 352, Low. Held Gr.
- concava*, Hall, 1857, (*Leptæna concava*.) 10th Rep. N. Y. St. Nat. Hist., p. 47, and Pal. N. Y., vol. 3, p. 197, Low. Held. Gr.
- LEPTELLA**, Hall, 1892, Pal. N. Y., vol. 8, p. 293. [Ety. *leptos*, thin.] Shell small, concavo-convex, semicircular or semi-

- elliptical; hinge-line straight; pedicel-valve evenly convex; cardinal area moderately high, delthyrium nearly covered by a convex plate; teeth inconspicuous; brachial valve slightly concave; cardinal area high, delthyrium filled with the cardinal process which is divided behind by a median groove; on the cardinal margin this process is double but less conspicuous than the crural plates, which are arched and highly elevated above the hinge-line; they are short, terminate abruptly, and inclose deep sockets; visceral area flattened or concave; its anterior margin forming a double visceral area is divided by a broad median ridge, and its surface covered with five sharp radiating lines, which end at the line of deflection. Type *Leptaena sordida*, Billings.
- LINDSTROMELLA, Hall, 1892, Pal. N. Y., vol. 8, p. 134. [Ety. proper name.] Shells with outline contour and pedicel characters as in Orbiculoidea; brachial valve with a faint median septum and two strong approximating ridges, beginning behind a transverse line passing through the apex, and rapidly converging to meet the median septum; anterior adductor scars lying between these ridges and the median septum; a circular scar at the posterior extremity of each ridge. Type *L. aspidium*, p. 178, Ham. Gr.
- LINGULA atra, Herrick, 1888, Bull. Denison Univ., vol. 4, p. 16, Waverly Gr.
- deflecta*, Winchell & Schuchert, 1892, Am. Geo., vol. 9, p. 284, Galena Gr. Not defined so as to be recognized.
- exilis*, see Lingulodiscina exilis.
- gambiensis*, Herrick, 1888, Bull. Denison Univ., vol. 4, p. 17, Waverly Gr.
- gorbyi*, S. A. Miller, 1892, Advance Sheets 18th Rep. Geo. Sur. Ind., p. 55, Chouteau limestone.
- macconnelli*, Walcott, 1888, Proc. U. S. Nat. Mus., p. 441, Up. Taconic. Not properly defined.
- meeki*, Herrick, 1888, Bull. Denison Univ., vol. 4, p. 18, Waverly Gr.
- norwoodi*, see Lingulops norwoodi.
- parrishi*, S. A. Miller, 1892, Advance Sheets 18th Rep. Geo. Sur. Ind., p. 53, Up. Coal Meas.
- riciniiformis* var. *galenensis*, Winchell & Schuchert, 1892, Am. Geo., vol. 9, p. 284, Galena Gr. Not defined so as to be recognized.
- sedaliensis*, S. A. Miller, 1892, Advance Sheets 18th Rep. Geo. Sur. Ind., p. 54, Chouteau limestone.
- subspatulata*, refer to Barroisella subspatulata.
- tighti*, Herrick, 1887, Bull. Denison Univ., vol. 2, p. 43, Coal Meas.
- triangulata*, Nettleforth, 1889, Ky. Foss. Shells, p. 34, Up. Held. Gr.
- waverlyensis*, Herrick, 1888, Bull. Denison Univ., vol. 4, p. 18, Waverly Gr.
- LINGULELASMA *galenensis*, Winchell & Schuchert, 1892, Am. Geo., vol. 9, p. 285, Galena Gr. Not defined so as to be recognized. Ulrich, Schuchert and others persist in using the word Lingulasma, which has no more meaning than Lasma or Linguma would have. I spelled the word Lingulelasma, as it should have been coined, supposing the misspelling was accidental; but, probably, Mr. Ulrich's spelling should be recognized, and if so, then the word should be stricken from science, as a meaningless compound, under rules on page 98.
- LINGULODISCINA, Whitfield, 1890, Bull. Am. Mus. Nat. Hist., p. 121. [Ety. *Lingula* and *Discina*.] Upper valve linguloid in character, having a terminal beak, the accretions of growth being along the lateral and basal margins; lower valve having its growth-lines nearly equal on all sides of the initial point and perforated on the cardinal side by a byssal slit as in *Discina*; shell structure as in *Lingula* and *Discina*. Type *L. exilis*, *exilis*, Hall, 1860, (*Lingula exilis*), 13th Rep. N. Y. St. Mus. Nat. Hist., p. 77, and Pal. N. Y., vol. 4, p. 7, Ham. Gr.
- LINGULOPS *granti*, Hall, 1892, Pal. N. Y., vol. 8, p. 173, Niagara Gr.
- norwoodi*, instead of *Lingula norwoodi*.
- MIMULUS, Barrande, 1879, Systeme Silurien du Centre de la Boheme, vol. 5, p. 109. [Ety. *mimulus*, a mime, an imitator.] *Spirifera* (?) *waldronensis*, Miller & Dyer, was referred to *Triplesia* by Hall, without a knowledge of the interior, and he now refers it to *Mimulus*, though the internal characters of that genus are unknown.
- MONOMERELLA *egani*, M. *greenii*, M. *kingi*, M. *ortoni*, Hall, 1892, Pal. N. Y., vol. 8, pp. 174, 175, Niagara Gr.
- NEWBERRIA, Whiteaves, 1891, Cont. to Can. Pal., vol. 1, p. 236. [Ety. proper name.] Shells elongate-ovoid, having the general contour and external aspect of *Rensselæria* and *Amphigenia*, but without the strongly radiate striate surface of the former genus. The convexity of the valves is greatest in the umbonal region, and the surface is distinctly flattened over the lateral slopes, leaving the median portion of the valves very prominent; the pedicel valve has the rostrum produced and incurved; the apex truncated by a circular foramen; deltidial plates not determined; the teeth are comparatively small, projecting forward and gently upward, free at their extremities, and supported by narrow dental plates which join the interior of the valve above the middle of its depth, and are continued forward as slender ridges upon the inner surface, which gradually merge into the shell. In the bottom of the rostral and umbonal cavity there is a broad, scarcely defined,

- muscular area, from which radiate a series of vascular ridges and depressions; the strongly marked pair of adductors are situated posteriorly, just within this muscular area; lying in front of these is a single (rarely divided) elongate adductor impression which often extends forward to the center of the shell; on each side of the muscular impressions is a thickened triangular area, very narrow at its origin in the umbonal region, widening anteriorly and produced into two divergent furrows (four in all), which extend over the pallial region, in some instances almost to the anterior margin. In the brachial valve there are two short, divergent, crural plates, which are not united at their bases to form a hinge-plate, as in *Rensseleria*; a low median ridge arises between them, passing for a short distance along the bottom of the valve, separating the obovate, narrowly flabelliform muscular scars of the adductor muscles. These scars are characterized by the strong striation of their surfaces; surface smooth, or with obscure radiating striæ; distinguished from *Rensseleria*, which has strong radiating striæ on the surface, and preserves two broad, strong, dental plates on the interior of the pedicel-valve, which reach nearly to the bottom of the rostral and post umbonal cavity, leaving a narrow space for the muscular area, quite unlike that of the corresponding valve of *Newberria*. It is from this narrow cavity, produced by the encroachment of these strong dental plates, that we have the narrow rostral casts of *Rensseleria*. The thickened strong hinge-plate, which supports the crura in the brachial valve of *Rensseleria*, does not exist in *Newberria*; the spoon-shaped process found in *Amphigenia* does not exist in *Newberria*. Type *N. johanni*.
- condoni*, McChesney, 1867, (*Rensseleria condoni*.) Trans. Chi. Acad. Sci., vol. 1, p. 36, Oriskany Gr.
- claypolei*, Hall, 1891, Advance Sheets 10th Ann. Rep. N. Y. St. Geo., Ham. Gr.
- johanni*, Hall, 1867, (*Rensseleria johanni*.) Pal. N. Y., vol. 4, p. 385, Up. Held. Gr.
- levis*, Meek, 1868, (*Rensseleria levis*.) Trans. Chi. Acad. Sci., p. 108, Devonian.
- missouriensis*, Swallow, 1891, Advance Sheets 10th Ann. Rep. N. Y. St. Geo., Ham. Gr.
- NUCLEOSPIRA indianensis*, S. A. Miller, 1891, Advance Sheets 17th Rep. Geo. Sur. Ind., p. 79, Ham. Gr.
- OBOLELLA misera* and *O. pretiosa*, refer to the genus *Linnarsonia*.
- OEHLERTELLA*, Hall, 1892, Pal. N. Y., vol. 8, p. 132. A proposed subgeneric name to include *Discina pleurites*.
- ORBICULOLIDEA herzeri*, Cuyahoga Shales, *O. numulus*, Low. Held. Gr., and *O. ovalis*, Trenton Gr., Hall, 1892, Pal. N. Y., vol. 8, pp. 177, 178.
- ORTHUS arcuaria*, Hud. Riv. Gr.; *O. holstoni*, *O. loricula*, *O. saffordi*, Trenton Gr.; *O. oweni*, Keokuk Gr.; *O. senecta*, Clinton Gr., and *O. superstes*, Chemung Gr., Hall, 1892, Pal. N. Y., vol. 8, pp. 340 to 342.
- benedicti*, S. A. Miller, Advance Sheets 17th Rep. Geo. Sur. Ind., p. 78, Niagara Gr.
- germana*, Winchell & Schuchert, 1892, Am. Geo., vol. 9, p. 290, Galena Gr.; *meetsi*, Trenton Gr.; *proavita*, Hud. Riv. Gr. Not defined so as to be recognized.
- goodwini*, Nettleroth, 1889, Kentucky Foss. Shells, p. 39, Up. Held. or Ham. Gr.
- inaequalis*, see *Streptorhynchus inaequale*.
- linneyi*, Nettleroth, 1889, Kentucky Foss. Shells, p. 41, Hud. Riv. Gr.
- manitobensis*, Whiteaves, 1892, Cont. to Can. Pal., p. 283, Devonian.
- missouriensis*, Swallow, is the same described afterward as *O. theimii*.
- carpulenta*, macrior, rosgata, tersus, minnesotensis, petrae, Sardeson, 1892, Bull. Minn. Acad. Nat. Sci., vol. 3, pp. 330, 332, Trenton & Hud. Riv. Gr. The first four seem to be synonyms for *O. testudinaria*, but possibly they are not.
- Orthisina alberta*, Walcott, 1888, Proc. U. S. Nat. Mus., p. 442, Up. Taconic. Not properly defined.
- Paterina* is a generic name proposed for such shells as *Kutorgina labradorica*, without any distinct generic characters being pointed out. See Am. Jour. Sci. and Arts, Ser. 3, vol. 41, p. 343.
- PENTAMERELLA thusnelda*, Nettleroth, 1889, Kentucky Foss. Shells, p. 51, Up. Held. Gr.
- PENTAMERUS colletti*, S. A. Miller, 1891, Advance Sheets 17th Rep. Geo. Sur. Ind., p. 77, Waterlime Gr.
- complanatus*, Nettleroth, 1889, Kentucky Foss. Shells, p. 53, Niagara Gr.
- decussatus*, Whiteaves, 1891, Can. Record Sci., p. 295, Up. Sil.
- globulosus*, Nettleroth, 1889, Kentucky Foss. Shells, p. 54, Niagara Gr.
- knotti*, Nettleroth, 1889, Kentucky Foss. Shells, p. 56, Niagara Gr.
- unicipitatus*, Nettleroth, 1889, Kentucky Foss. Shells, p. 63, Niagara Gr.
- PHOLIDIPS calceola*, *P. patina*, Hall, 1892, Pal. N. Y., vol. 8, p. 182, Corniferous limestone.
- POLYTOECHIA*, Hall, 1892, Pal. N. Y., vol. 8, p. 239 [Ety. *polus*, many; *toichos*, the wall of a house.] Shell small, subtriangular in contour; hinge-line straight; pedicel-valve with a high, nearly vertical cardinal area, obliquely striated; delthyrium covered with a convex plate; dental lamellæ widely separated, descend for a distance vertically, and then bend inward to the median line,

- forming with the deltidium a subrostral vault; the inner spoon-shaped plate, spondylium, is supported by a stout median septum and two smaller lateral septa, which meet it at the lines of angulation; the umbonal cavity is divided into five chambers; brachial valve shallow, depressed-convex; cardinal area narrow; delthyrium broad; dental sockets widely separated; crural plates narrow and nearly parallel to the hinge-line; cardinal process simple, linear, prominent, and at its union with the crural plates there is a subtriangular thickening supported by a median septum; surface striated; no fold or sinus. Type *P. apicalis*, Whitfield, described at the same place from the Calciferous Gr.
- PRODUCTELLA** *minneapolis*, Sardeson, 1892, Bull. Minn. Acad. Nat. Sci., vol. 3, p. 332, Trenton Gr. It does not belong to this genus.
- pyxidata* is from the Kinderhook Gr. *semiglobosa*, Nettleroth, 1889, Kentucky Foss. Shells, p. 70, Up. Held. Gr.
- PRODUCTUS** *blairi*, S. A. Miller, 1891, Advance Sheets 17th Rep. Geo. Sur. Ind., p. 79, Chouteau limestone.
- nodocostatus*, *P. raricostatus* and *P. rushvillensis*, Herrick, 1888, Bull. Denison Univ., vol. 4, p. 19 to 23, Waverly Gr. *pileiformis*, McChesney, 1859, New Pal. Foss., p. 40, Kaskaskia Gr.
- PSEUDOCRANIA** *anomala*, Hall says, is a misnomer, that the shell described is a streptorhynchoid, whatever that means.
- RENSELLERIA** *condoni*, R. johanni and R. *levis*, refer to *Newberria*.
- RETZIA** *ashlandensis*, Herrick, 1888, (*Rhynchospira ashlandensis*.) Bull. Denison Univ., vol. 3, p. 25, Waverly Gr. *circularis*, *R. plicata* and *R. triangularis*, S. A. Miller, 1892, Advance Sheets 18th Rep. Geo. Sur. Ind., p. 61, Chouteau limestone.
- sobrina*, Beecher & Clark, 1839, Mem. N. Y. St. Mus., p. 61, Niagara Gr.
- RHINOBOLUS**, (misspelled *Rhynobolus*.) Hall has shown, in Pal. N. Y., vol. 8, p. 44, why this genus is distinct from *Trimerella*, and that it should be restored with *R. galtensis* as the type, and he defined *R. davidsoni* from the Niagara Gr.
- RHYNCHONELLA** *alleghania*, Williams 1887, Bull. No. 41, U. S. Geo. Sur., p. 87, Waverly Gr.
- belliformis*, *R. louisvillensis*, *R. rugicosta*, *R. saffordi* var. *depressa*, *R. tenuistriata*, Nettleroth, 1889, Kentucky Foss. Shells, pp. 73 to 82; *louisvillensis* and *tenuistriata* from the Up. Held. Gr., the others from the Niagara Gr.
- colletti*, S. A. Miller, 1892, Advance Sheets 18th Rep. Geo. Sur. Ind., p. 57, Niagara Gr., and *R. kokomoensis* from the Waterlime Gr.
- levis*, *R. medialis*, *R. striata*, Simpson, 1889, Trans. Am. Phil. Soc., pp. 443, 444; *levis* from the Clinton Gr., the others from the Waverly Gr.
- minnesotensis* and *sancta*, Sardeson, 1892, Minn. Acad. Nat. Sci., vol. 3, p. 333, Trenton Gr.
- Rhynchospira ashlandensis*, see *Retzia ashlandensis*.
- ROEMERELLA**, Hall, 1892, Pal. N. Y., vol. 8, p. 137. Proposed as a subgenus to include *Discina grandis*.
- SKENIDIUM**, (should be spelled *Scenidium*.) *anthonense*, Sardeson, 1892, Bull. Minn. Acad. Nat. Sci., vol. 3, p. 333, Trenton Gr.
- SCHIZOCRANIA**, *helderbergia*, Low. Held. Gr. *S. schucherti*, Hud. Riv. Gr., Hall, 1892, Pal. N. Y. vol. 8, p. 179.
- SIPHONOTRETA** *minnesotensis*. Hall, 1892, Pal. N. Y., vol. 8, p. 177, Trenton Gr.
- SPIRIFERA** *bynesi*, *S. davisii*, *S. dubia*, *S. foggi*, *S. hobbsi*, *S. knappana*, *S. macconathi*, Nettleroth, 1889, Kentucky Foss. Shells, pp. 109 to 122; *foggi* from the Niagara Gr., the others from the Up. Held. Gr. *capax* is from the Kinderhook Gr., and is not a synonym for *S. parryana*.
- carteri* was so poorly defined that it could not be recognized, and it is now claimed by some that it is the same as *Syringothyris typus*. The name should be dropped from the list.
- deltoides*, *S. tenuispinatus*, Herrick, 1888, Bull. Denison Univ., vol. 4, p. 27, Waverly Gr.
- disjuncta* var. *occidentalis*, Whiteaves, 1891, Cont. to Can. Pal., vol. 1, p. 222, Devonian.
- subventricosa*, McChesney, 1860, New Pal. Foss., p. 44, 1865, pl. 1, fig. 4, Coal Meas.
- texta*, see *Syringothyris texta*.
- winchelli*, Herrick, 1888, Bull. Denison Univ., vol. 3, p. 46, Waverly Gr.
- SPIRIFERINA** *depressa*, Herrick, 1888, Bull. Denison Univ., vol. 3, p. 47, Waverly Gr.
- STREPTORHYNCHUS** *inæquale*, Hall, 1858, (*Orthis inæqualis*.) Geo. Iowa, p. 490, Kinderhook Gr.
- subsulcatum*, Sardeson, 1892, Bull. Minn. Acad. Nat. Sci., vol. 3, p. 335, Trenton Gr.; *desideratum*, (*Orthothetes desideratus*), Hall, 1892, Pal. N. Y., vol. 8, p. 345, Waverly Gr., and *S. ulrichi*, p. 351, Kaskaskia Gr.
- STRICKLANDINIA** *louisvillensis*, Nettleroth, 1889, Kentucky Foss. Shells, p. 65, Niagara Gr.
- subquadrata*, Herrick. Not properly defined.
- STRINGOCEPHALUS** *burtoni*, DeFrance, 1827, Dict. des Sci. Naturelles, vol. 51, p. 102, and 1891, Cont. to Can. Pal., vol. 1, p. 235, Devonian.
- STROPHALOSTA** *keokuk*, Beecher, 1890, Am. Jour. Sci. and Arts, Ser. 3, vol. 40, p. 244, Keokuk Gr.
- radicans*, Winchell, 1866, (*Crania radicans*.) Rep. Low. Penin. Mich., p. 92, Ham. Gr.

- rockfordensis, Hall, 1892, Pal. N. Y., vol. 8, p. 353, Up. Devonian.
- scintilla, Beecher, 1890, Am. Jour. Sci. and Arts, Ser. 3, vol. 40, p. 243, Chouteau limestone.
- spondyliiformis, White & St. John, 1868, (Aulosteges spondyliiformis), Trans. Chi. Acad. Sci., p. 118, Coal Meas.
- STROPHODONTA, instead of Strophodonta. [Ety. *stropheus*, the socket in which the door moves; *odous*, tooth.]
- STROPHOMENA acanthoptera, Whiteaves, 1891, Can. Record Sci., p. 294, Up. Sil.
- conradi, S. winchelli, Hall, 1892, Pal. N. Y., vol. 8, p. 344, Trenton Gr.
- emaciata, scotfieldi, septota, Winchell & Schuchert, 1892, Am. Geo., vol. 9, pp. 285, 287, Trenton Gr., and *planodorsata*, Hud. Riv. Gr. Not properly defined.
- halli, inquassa, Sardeson, 1892, Bull. Minn. Acad. Nat. Sci., vol. 3, p. 334, Trenton Gr.
- SYRINGOTHYRIS randalli, Simpson, 1889, Trans. Am. Phil. Soc., p. 441, Chemung Gr.
- texta, Hall, 1857, (Spirifer textus), 10th Rep. N. Y. St. Mus. Nat. Hist., p. 169, Waverly Gr.
- TEREBRATULA gorbyi, S. A. Miller, 1891, Advance Sheets 17th Rep. Geo. Sur. Ind., p. 77, Keokuk Gr.
- inconstans, Herrick, 1888, Bull. Denison Univ., vol. 4, p. 24, Waverly Gr.
- inornata is from the Coal Meas., and described on p. 48.
- occidentalis, S. A. Miller, 1892, 18th Rep. Geo. Sur. Ind., p. 59, Chouteau limestone.
- traversensis*, see *Cryptonella traversensis*.
- TREMATOSPIRA helena, Nettleroth, 1889, Kentucky Foss. Shells, p. 137, Niagara Gr.
- TRIPLESIA, or *Triplasia* as it should be spelled, can not be changed into *Triplicia* as suggested by Hall in 1892, Pal. N. Y., vol. 8, p. 269. In that event *Dicraniscus* would have priority. But *Triplasia* among the insects does not interfere with *Triplasia* among the fossil brachiopods.
- ZYGOSPIRA aquila, Sardeson, 1892, Bull. Minn. Acad. Nat. Sci., vol. 3, p. 335, Trenton Gr.
- deflecta, Hall, 1847, (*Atrypa deflecta*), Pal. N. Y., vol. 1, p. 140, Trenton Gr.
- kentuckiensis, Nettleroth, 1889, Kentucky Foss. Shells, p. 137, Hud. Riv. Gr.
- uphami*, Winchell & Schuchert, 1892, Am. Geo., vol. 9, p. 291, Galena Gr.

SUBKINGDOM MOLLUSCA.

CLASS PTEROPODA.

- COLEOLOIDES, Walcott, 1889, Proc. U. S. Nat. Mus., vol. 12, p. 37. [Ety. *Coleolus*, a genus; *oides*, like.] Shell slender, elongate, cylindrical, straight or slightly curved, apparently thin; surface marked by very fine, slightly oblique, longitudinal striae. Type *C. typicalis*, described at the same place from the Up. Taconic. A poor definition without illustration.
- CONULARIA, above the septum, is often broken off, and it has been suggested that it may have fallen off during the life of the animal; hence the shell is sometimes called deciduous, from *decido*, I fall off.
- gracilis*, Herrick, 1888, Bull. Denison Univ., vol. 4, p. 48, pl. 8, fig. 2; vol. 3, pl. 6, fig. 13, Waverly Gr. The name was preoccupied by Hall in 1847. As the species appears to be distinct from all others, I now propose the specific name *herricki*. The species will then be called *C. herricki*, after Prof. C. L. Herrick.
- intertexta, S. A. Miller, 1892, Advance Sheets 18th Rep. Geo. Sur. Ind., p. 63, Keokuk Gr.
- salinensis, Whiteaves, 1891, Cont. to Can. Pal., vol. 1, p. 244, Devonian.
- sampsoni, S. A. Miller, 1891, Advance Sheets 17th Rep. Geo. Sur. Ind., p. 80, Chouteau limestone.
- HYOLITHES lanceolatus, S. A. Miller, 1892, Advance Sheets 18th Rep. Geo. Sur. Ind., p. 63, Chouteau limestone.
- similis*, Walcott, 1889, Proc. U. S. Nat. Mus., vol. 12, p. 38, Up. Taconic. Not illustrated.
- terranovicus*, Walcott, 1889, Proc. U. S. Nat. Mus. vol. 12, p. 37, Up. Taconic. Not illustrated.

CLASS GASTROPODA.

THE better authors use *Gastropoda*, and I prefer it to *Gasteropoda*. The masticatory apparatus or chitinous band, bearing minute teeth and forming a rasp-like ribbon, is called the odontophore, (*odous*, tooth; *phero*, I carry.) When the aperture is round or entire, the shell is called holostomatous, (*holos*, whole; *stoma*, mouth;) but when the aperture possesses a notch, more or less prolonged, for the respiratory siphon, or forming a trough-like extension for the skirt of the mantle, as in *Fusispira*, the shell is called siphonostomatous, (*siphon*, a tube; *stoma*, mouth.) The margin of the aperture is sometimes called the peristome, (*peri*, around; *stoma*, mouth), or peritreme, (*peri*, around; *trema*, an opening.) The notch separating the outer lip from the first whorl is called the posterior canal, and the notch separating it from the end of the columella is the anterior canal. When the columella is solid, it is called imperforate; and when hollow, perforated. The shells are sometimes composed of aragonite; at other times there is an inner layer of aragonite and an outer layer of calcite; and, especially in the younger shells, there is a horny epidermis which may disappear with age. It is said that aragonite is much more readily displaced in fossilization than calcite, which may account for the casts of *Murchisonia* associated with the shells of *Cyclonema*, in the same Lower Silurian strata, and other like phenomena in other genera and species of shells.

The new genus *Helenia* is supposed to belong to the Dentalidæ; *Fusispira* should be referred to the Subulitidæ; *Metoptoma* and *Palæacmæa* to the Patellidæ.

- ACLISINA* bellilineata, S. A. Miller, 1891, 17th Rep. Geo. Sur. Ind., p. 85, Chouteau limestone.
swallovana, on p. 395, is magnified three and a half diameters.
- BELLEROPHON* gorbyi, S. A. Miller, 1891, 17th Rep. Geo. Sur. Ind., p. 84, Hud. Riv. Gr. incomptus, B. nodocostatus, B. ourayensis, B. rugopleurus, B. tenuilineatus, Gurley, 1884, New. Carb. Foss. Bull. No. 2, pp. 8 to 11, Coal Meas.
subcordiformis, Herrick, 1887, Bull. Denison Univ., vol. 2, p. 18, Subcarboniferous.
- CALLONEMA* clarki, Nettleroth, 1889, Kentucky Foss. Shells, p. 175, Up. Held. Gr.
- CARINAROPSIS* deleta and phalera, Sardeson, 1892, Bull. Minn. Acad. Nat. Sci., vol. 3, p. 335, Trenton Gr.
- CONCHOPELTIS* obtusa, Sardeson, 1892, Bull. Minn. Acad. Nat. Sci., vol. 3, p. 336, Trenton Gr.
- DENTALIUM* granvillense, Herrick, 1888, Bull. Denison Univ., vol. 3, p. 92, Waverly Gr.
- ECCYLIOMPHALUS* perkinsi, Whitfield, 1890, Bull. Am. Mus. Nat. Hist., vol. 3, p. 30, Calciferous Gr.
triangulus, Whitfield, 1890, Bull. Am. Mus. Nat. Hist., vol. 3, p. 29, Calciferous Gr.
- EUOMPHALUS* comes, Hall, syn. for *Eccyliomphalus laxus*.
flexistriatus and E. maskusi, Whiteaves, 1891, Cont. to Can. Pal., vol. 1, pp. 242, 243, Devonian.
manitobensis, Whiteaves, 1890, Trans. Roy. Soc. Can., vol. 8, p. 100, Devonian.
sampsoni, Nettleroth, 1889, Kentucky Foss. Shells, p. 182, Up. Held. Gr.
- FLEMINGIA*, DeKoninck, 1881, Annales du Musée Royal D'Histoire Naturelle de Belgique, tome 6, p. 93. [Ety. proper name.] Shell conical, spire acute, spiral whorls nearly flat externally; circumference more or less angular; aperture often depressed, and angular at the outer margin; peristome not continuous, external border oblique, slender, and sharp; columella slender, slightly twisted over, and giving place to the formation of an umbilical fossette more or less large and imperforate; shell thin; surface smooth or covered with irregular striae, obliquely crossed with more distant lines. Type *F. prisca*. This genus is nearly related to *Eotrochus*.
carbonaria, Meek & Worthen, 1866, (*Trochita* (?) carbonaria), Proc. Acad. Nat. Sci., p. 270, Kaskaskia Gr. This species is figured and described by DeKoninck as

a *Flemingia*, and yet it much resembles an *Eotrochus*.

(?) *stultus*, Herrick, 1888, Bull. Denison Univ., vol. 4, p. 45, Waverly Gr. This species may belong to *Eotrochus*.

FUSISPIRA (?) *spicula*, Sardeson, 1892, Bull. Minn. Acad. Nat. Sci., vol. 3, p. 336, Trenton Gr.

HELENIA, Walcott, 1889, Proc. U. S. Nat. Mus., vol. 12, p. 39. [Ety. proper name.] Shell an elongate, narrow, flattened, curved tube; transverse section and aperture elliptical; surface marked by transverse, concentric, imbricating lines of growth. Type *H. bella*, which is described at the same place from the Up. Taconic, without illustration.

HELICOTOMA similis, Whitfield, 1890, Bull. Am. Mus. Nat. Hist., vol. 3, p. 31, Calciferous Gr.

HOLOPEA cassina is from the Calciferous Gr. *hubbardi*, S. A. Miller, 1892, Advance Sheets 18th Rep. Geo. Sur. Ind., p. 64, Hud. Riv. Gr.



FIG. 1255.—*Holopea hubbardi*.

perundosa, Sardeson, 1892, Bull. Minn. Acad. Nat. Sci., vol. 3, p. 336, Trenton Gr.

LEPETOPSIS parrishi, Gurley, 1884, New Carb. Foss. p. 7, Up. Coal Meas.

MACLUREA manitobensis, Whiteaves, 1889, Trans. Roy. Soc. Can., p. 75, Trenton Gr.

Macrochilus carinatum, see *Macrochilina carinata*.

MACROCHILINA blairi, S. A. Miller, 1891, 17th Rep. Geo. Sur. Ind., p. 84, Chouteau limestone.

carinatum, Nettleroth. The name was preoccupied. See *M. Nettlerothana*. *nettlerothana*, n. sp. Proposed instead of *M. carinatum* of Nettleroth, in Kentucky Foss. Shells, p. 180, Up. Held. Gr., which name was preoccupied.

METOPTOMA. Type *M. pileus*.

explanata, Sardeson, 1892, Bull. Minn. Acad. Nat. Sci., vol. 3, p. 336, Trenton Gr.

MURCHISONIA archiacana and *M. dowlingi*, Whiteaves, 1892, Cont. to Can. Pal., p. 315, Devonian.

hammelli, S. A. Miller, 1892, Advance Sheets 18th Rep. Geo. Sur. Ind., p. 65, Hud. Riv. Gr.

obelisca is from the Calciferous Gr.

NATICOPSIS remex is from the Coal Meas.

PALEACMÆA cingulata, Whiteaves, 1892, Cont. to Can. Pal., p. 311, Devonian.

PLATYCERAS boonvillense, S. A. Miller, Advance Sheets 17th Rep. Geo. Sur. Ind. p. 82, Keokuk Gr.

compressum, Nettleroth, 1889, Kentucky, Foss. Shells, p. 162, Up. Held. Gr.

cyrtolites is from the Burlington Group. *milleri*, Nettleroth, 1889, Kentucky Foss. Shells, p. 165, Up. Held. Gr.

missouriense, S. A. Miller, 1891, Advance Sheets 17th Rep. Geo. Sur. Ind., p. 82, Burlington Gr.

nasutum, S. A. Miller, 1891, Advance Sheets 17th Rep. Geo. Sur. Ind., p. 82, Chouteau limestone.

pettitsense, S. A. Miller, 1891, Advance Sheets 17th Rep. Geo. Sur. Ind., p. 81, Burlington Gr.

romingeri, Walcott, 1888, Proc. U. S. Nat. Mus., p. 442, Up. Taconic. Not illustrated.

PLATYSTOMA broadheadi, S. A. Miller, 1891, Advance Sheets 17th Rep. Geo. Sur. Ind., p. 86, Chouteau limestone.

PLEUROTOMARIA arabella, Nettleroth. The name was preoccupied. See *P. nettlerothana*.

clivosa, Sardeson, 1892, Bull. Minn. Acad. Nat. Sci., vol. 3, p. 337, Trenton Gr.

difficilis, Whitfield, 1890, Bull. Am. Mus. Nat. Hist., vol. 3, p. 33, Calciferous Gr.

goniostoma, Whiteaves, 1890, Trans. Roy. Soc. Can., vol. 8, p. 99, Devonian.

harii, S. A. Miller, 1891, Advance Sheets 17th Rep. Geo. Sur. Ind., p. 83, Up. Coal Meas.

infranodosa, Whiteaves, 1892, Cont. to Can. Pal., p. 313, Devonian.

nettlerothana, n. sp. Proposed instead of *P. arabella*, of Nettleroth, in Kentucky Foss. Shells, p. 171, which name was preoccupied, Up. Held. Gr.

proctori, Nettleroth, 1889, Kentucky Foss. Shells, p. 173, Up. Held. Gr.

sedaliensis, S. A. Miller, 1891, 17th Rep. Geo. Sur. Ind., p. 83, Chouteau limestone.

strigillata, Herrick, 1888, Bull. Denison Univ., vol. 3, p. 86, Waverly Gr.

PORCELLIA manitobensis, Whiteaves, 1892, Cont. to Can. Pal., p. 318, Devonian.

RAPHISTOMA tyrrelli, Whiteaves, 1892, Cont. to Can. Pal., p. 314, Devonian.

STRAPAROLLUS blairi, S. A. Miller, 1891, Advance Sheets 17th Rep. Geo. Sur. Ind., p. 86, Chouteau limestone.

SUBULITES was described by Emmons, 1842, Geo. Sur. 2d Dist. N. Y., p. 392.

benedicti, S. A. Miller, 1891, 17th Rep. Geo. Sur. Ind., p. 84, Niagara Gr.

TRYBLIDIUM conicum is from the Chazy Gr. *exsertum*, *validum*, Sardeson, 1892, Bull. Minn. Acad. Nat. Sci., vol. 3, p. 337, Trenton Gr.

indianense, S. A. Miller, Advance Sheets 17th Rep. Geo. Sur. Ind., p. 85, Hud. Riv. Gr.

madisonense, S. A. Miller, 1892, Advance Sheets 18th Rep. Geo. Sur. Ind., p. 64, Hud. Riv. Gr.

CLASS CEPHALOPODA.

THE living animals of this Class are carnivorous, but it is too strong a presumption to conclude that all fossil Cephalopoda were carnivorous. The evidence does not warrant the presumption. The mouth of the shell or aperture may be round, elliptical, lunate, T-shaped, or of almost any other form, and the shell may gradually expand to the aperture, be contracted behind the aperture, or more or less contracted to the aperture. The ventral side may be indicated by the shape of the aperture, either by an emargination or a sinus, but the position of the siphuncle does not always indicate it; for in *Orthoceras* the siphuncle may be central, or in the growth of the shell it may cross the central line. The external shell is generally destroyed and for this reason it has been supposed to have been composed of aragonite rather than calcite; but the fact that the shell often appears as if run together in fossilization does not indicate such a distinction.

ACTINOCERAS hindii, Whiteaves, 1890, Trans. Roy. Soc. Can., vol. 8, p. 101, Devonian.

ASCOCERAS indianense, Newell, 1888, Proc. Bost. Soc. Nat. Hist., vol. 23, p. 484, Niagara Gr.

APSIDOCERAS, Hyatt, 1883, Proc. Bost. Soc. Nat. Hist., vol. 22, p. 289. [Ety. *apsis*, the fellow of a wheel; *keras*, horn.] Loosely coiled, smooth, costated, or tuberculated gyroceran shells, with flattened abdomens. The whorls in section are triangular, the dorsum forming the internal apex of the outline; siphons near the venter and nummuloidal. The sutures have broad ventral lobes, saddles at the lateral angles, broad lobes on the sides and dorsal saddles; there is frequently a line of heavy tubercles on each of the lateral angles of the whorls; they are all large shells, and the abdomen is frequently hollow or fluted along the center. Type *A. magnificum*.

insigne, Whiteaves, 1889, Trans. Roy. Soc. Can., p. 82, Trenton Gr.

magnificum, Billings, 1857, (*Gyroceras magnificum*,) Rep. of Progr. Geo. Sur. Can., p. 307, Hud. Riv. Gr.

Asymploceras newloni, see *Solenochilus newloni*.

CYRTOCERAS boycii is from the Chazy Gr. *dardanum* and *fosteri* are illustrated on pl. 16 in 20th Rep. N. Y. St. Mus. Nat. Hist.

hertzeri, refer to *Hexamoceras hertzeri*.

howardi, Niagara Gr., and *C. thompsoni*, Hud. Riv. Gr., S. A. Miller, Advance Sheets 18th Rep. Geo. Sur. Ind., p. 69.

indianense, S. A. Miller, 1891, Advance

Sheets 17th Rep. Geo. Sur. Ind., p. 88, Niagara Gr.

manitobense, Whiteaves, 1889, Trans. Roy. Soc. Can., p. 80, Trenton Gr.

nashvillense, S. A. Miller, 1891, Advance Sheets 17th Rep. Geo. Sur. Ind., p. 87, Niagara Gr.

occidentale, Whiteaves, 1890, Trans. Roy. Soc. Can., vol. 8, p. 103, Devonian.

saffordi, S. A. Miller, 1891, Advance Sheets 17th Rep. Geo. Sur. Ind., p. 88, Hud. Riv. Gr.

Discites was preoccupied in 1768 by Walch, and again used by Schlotheim in 1820, before DeHaan used it in 1825 or McCoy in 1844. Hyatt in 1883, Proc. Bost. Soc. Nat. Hist., vol. 22, p. 292, proposed *Discitoceras* for the shells included in McCoy's genus. All the species therefore under the name *Discites* in this work should be referred to *Discitoceras*.

DOMATOCERAS, Hyatt, 1891, 2d Ann. Rep. Geo. Sur. Texas, p. 342. The generic characters can not be determined from the definition. *D. umbilicatum* is defined at the same place from the Coal Meas. as the type.

ENDOCERAS crassisiphonatum, Whiteaves, 1891, Trans. Roy. Soc. Can., vol. 9, p. 79, Trenton Gr.

ENDOLOBUS gibbosus, Hyatt, 1891, 2d Ann. Rep. Geo. Sur. Texas, p. 353, Coal Meas.

EPHIPPIOCERAS, Hyatt, 1883, Proc. Bost. Soc. Nat. Hist., vol. 22, p. 290. [Ety. *ephippion*, a saddle; *keras*, horn.] Generic definition very obscure. Type *E. ferratum*, described by Cox as *Nautilus ferratus*; and to the same genus *Nautilus divisus* should be referred if the

- description is such as to establish it, for the species do not properly belong to *Nautilus*.
- Gastrioceras compressum*, see *Goniatites compressus*.
- GOMPHOCERAS** *angustum*, Newell, 1888, Proc. Bost. Soc. Nat. Hist., vol. 23, p. 475, Niagara Gr.
- clarki, S. A. Miller, 1891, Advance Sheets 17th Rep. Geo. Sur. Ind., p. 88, St. Louis Gr.
- hertzeri, see *Hexamoceras hertzeri*.
- lineare, Newell, 1888, Proc. Bost. Soc. Nat. Hist., vol. 23, p. 473, Niagara Gr.
- manitobense, Whiteaves, 1890, Trans. Roy. Soc. Can., vol. 8, p. 102, Devonian.
- parvulum, Whiteaves, 1891, Can. Rec. of Sci., p. 298, Up. Sil.
- projectum, Newell, 1888, Proc. Bost. Soc. Nat. Hist., vol. 23, p. 476, Niagara Gr.
- wabashense, Newell, 1888, Proc. Bost. Soc. Nat. Hist., vol. 23, p. 470, Niagara Gr.
- GONIATITES** *baylorensis*, White, 1891, Bull. U. S. Geo. Sur. No. 77, p. 19, Permian Gr.
- brownensis, 1891, S. A. Miller, Advance Sheets 17th Rep. Geo. Sur. Ind., p. 90, Waverly Gr.
- compressus, Hyatt, 1891, (*Gastrioceras compressum*), 2d An. Rep. Geo. Sur. Texas, p. 355, Coal Meas.
- gorbyi, S. A. Miller, 1891, Advance Sheets 17th Rep. Geo. Sur. Ind., p. 90, Chouteau limestone.
- greenii, S. A. Miller, 1892, Advance Sheets 18th Rep. Geo. Sur. Ind., p. 76, Knobstone Gr.
- indianensis, S. A. Miller, 1891, Advance Sheets 17th Rep. Geo. Sur. Ind., p. 90, Waverly Gr.
- leviculus, Miller & Faber, 1892, Jour. Cin. Soc. Nat. Hist., vol. 14, p. 167, St. Louis Gr.
- limatus, Miller & Faber, 1892, Jour. Cin. Soc. Nat. Hist., vol. 14, p. 166, St. Louis Gr.
- missouriensis, Miller & Faber, 1892, Jour. Cin. Soc. Nat. Hist., vol. 14, p. 164, Up. Coal Meas.
- occidentalis, Miller & Faber, 1892, Jour. Cin. Soc. Nat. Hist., vol. 14, p. 166, Coal Meas.
- sciotoensis, Miller & Faber, 1892, Jour. Cin. Soc. Nat. Hist., vol. 14, p. 165, Waverly Gr.
- GONIOCERAS** *lambi*, Whiteaves, 1891, Trans. Roy. Soc. Can., vol. 9, p. 86, Trenton Gr.
- GYRO CERAS** *canadense*, G. filicinctum, G. submammillatum, Whiteaves, 1890, Trans. Roy. Soc. Can., vol. 8, pp. 106, 107, Devonian.
- magnificum*, refer to *Apsidoceras magnificum*.
- HEXAMOCERAS**, Hyatt, 1883, Proc. Bost. Soc. Nat. Hist., vol. 22, p. 278. [Ety. *hex*, six; *meros*, part; *keras*, horn.] This genus is distinguished from *Gomphoceras* only by the aperture. In *Gomphoceras* there is only one lateral branch on each side of a longer median aperture, which gives the mouth a T-shape; in *Hexamoceras* there are three branches on each side of the median aperture, increasing in length toward the summit. Type *H. panderi*.
- cacabiforme, Newell, 1888, Proc. Bost. Soc. Nat. Hist., vol. 23, p. 481, Niagara Gr.
- delphicolum, Newell, 1888, Proc. Bost. Soc. Nat. Hist., vol. 23, p. 479, Niagara Gr.
- hertzeri, Hall & Whitfield, 1875, (*Cyrtoceras hertzeri*), Ohio Pal., vol. 2, p. 150, Niagara Gr.
- HOMALOCERAS**, Whiteaves, 1890, Trans. Roy. Soc. Can., vol. 8, p. 104. [Ety. *homalos*, level; *keras*, horn.] Shell consisting of a slender tube, which is broadly and strongly arcuate, curved in the same plane, and much flattened laterally, its venter or outer border being very narrow, truncated, and depressed in the center; sutural line consisting of two very narrow saddles, with an equally narrow sinus between them on the venter, a broadly concave sinus or lobe on each of the sides, and a rather narrow saddle on the dorsum; siphuncle cylindrical, exogastric, and placed near the venter or outer and convex margin; body-chamber long, occupying about one-third of the entire length. Type *H. planatum*, which is described at the same place from the Devonian.
- LITUITES** *eatoni*, *L. eatoni* var. *cassinensis*, *L. internistriatus*, *L. seelyi*, are from the Califerous.
- magnificum*, refer to *Apsidoceras magnificum*.
- MEDLICOTTIA**, Waagen, 1879, Pal. Indica, Ser. 13, pp. 39, 83. [Ety. proper name.] Shell discoid and volutions deeply embracing; lobes divided by single linguiform marginal saddles, or trifoliate or divided saddles; ventral lobes deep and undivided; the first pair of saddles are narrow, long, and the margins cut by several lobes and saddles growing progressively longer internally; numerous auxiliary lobes are generated from the marginal divisions in the outlines of the first pair of saddles, and from the division of large magnosellarian saddles near the umbilicus. Type *M. primis*.
- copei, White, 1889, Am. Nat., vol. 23, p. 117, and Bull. U. S. Geo. Sur., No. 77, Permian Gr.
- METACOCERAS** Hyatt, 1883, Proc. Bost. Soc. Nat. Hist., vol. 22, p. 268. Nautiloid shells, with a wide umbilicus perforated in the middle; volutions subquadrangular, bearing nodes on the dorso-lateral sides, slightly embracing; siphuncle eccentric on the dorsal side. Type *M. sangamonense*.
- cavatiforme, *M. dubium*, *M. hayi*, *M. inconspicuum*, *M. walcotti*, Hyatt, 1891,

2d Ann. Rep. Geo. Sur. Texas, pp. 334 to 340, Coal Meas.
 planorbiforme, Meek & Worthen, 1860, Proc. Acad. Nat. Sci. Phil., p. 469, and Geo. Sur. Ill., vol. 2, p. 386, (Nautilus planorbiformis,) Upper Coal Meas.

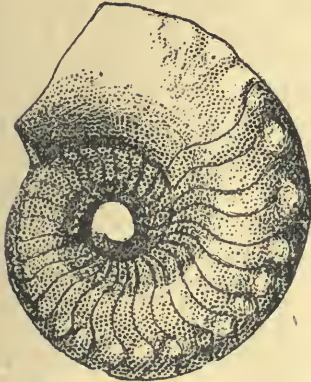


FIG. 1256.—*Metacoceras cavatiforme*.

sangamonense, Meek & Worthen, 1860, (Nautilus sangamonensis,) Proc. Acad. Nat. Sci. Phil., p. 470, and Geo. Sur. Ill., vol. 2, p. 386, Up. Coal Meas.
 NAUTILUS bisulcatus, Herrick, 1888, Bull. Denison Univ., vol. 3, p. 20, Waverly Gr.
forbesanus, refer to *Temnochilus forbesanum*.
kelloggi is from the Calciferous.
parallelus is Beecher's species.
planorbiformis, see *Metacoceras planorbiforme*.
quadrangularis, McChesney, should be *quadrangulus*. It is now referred to the genus *Tainoceras*, and is therefore *T. quadrangulum*.
sangamonensis, see *Metacoceras sangamonense*.
toddi, S. A. Miller, 1892, Advance Sheets 18th Rep. Geo. Sur. Ind., p. 72, Up. Coal Meas.
 ONCOCERAS *gibbosum*, Whiteaves, see *O. whiteavesi*.
magnum, Whiteaves, 1889, Trans. Roy. Soc. Can., p. 79, Trenton (?) Gr.
whiteavesi, n. sp. Trenton (?) Gr. Proposed instead of *O. gibbosum*, Whiteaves, in Trans. Roy. Soc. Can., 1889, p. 80, which name was preoccupied.
 ORTHOCERAS *brainerdi* is from the Calciferous.
canadense, Whiteaves, 1891, (Sactoceras canadense,) Trans. Roy. Soc. Can., vol. 9, p. 85, Trenton Gr.
colletti, Up. Coal Meas., *O. franklinense*, Niagara Gr., and *O. gorbyi*, Hud. Riv. Gr., S. A. Miller, 1892, Advance Sheets 18th Rep. Geo. Sur. Ind., pp. 65 to 68.
harii, S. A. Miller, 1891, Advance Sheets 17th Rep. Geo. Sur. Ind., p. 87, Up. Coal Meas.

obstructum, Newell, 1888, Proc. Bost. Soc. Nat. Hist., vol. 23, p. 467, Niagara Gr.
selkirkense, Whiteaves, 1891, Trans. Roy. Soc. Can., vol. 9, p. 82, Trenton Gr.
semiplanatum, Whiteaves, 1891, Trans. Roy. Soc. Can., vol. 9, p. 81, Trenton Gr.
tyrrelli, Whiteaves, 1890, Trans. Roy. Soc. Can., vol. 8, p. 100, Devonian.
winnepegense, Whiteaves, 1891, Trans. Roy. Soc. Can., vol. 9, p. 82, Trenton Gr.
Phacoceras, Hyatt, 1883, Proc. Bost. Soc. Nat. Hist., vol. 22, p. 292. [Ety. *phakos*, a lentil; *keras*, horn.] The characters ascribed to it do not distinguish it from *Discitoceras*. Type *P. oxystomum*. In 1891 the same author described *P. dumbli* from the Coal Meas. in 2d Ann. Rep. Geo. Sur. Texas, p. 347.
 PHRAGMOCERAS *missouriense*, S. A. Miller, 1891, Advance Sheets 17th Rep. Geo. Sur. Ind., p. 89, Chouteau limestone.
 POPANOCERAS, Hyatt, 1883, Proc. Bost. Soc. Nat. Hist., vol. 22, p. 337. [Ety. *popaon*, a round, flat cake; *keras*, horn.] Volutions involute, compressed and costate, or marked by furrows; the lobes and saddles are numerous and club-shaped; the ventral lobes are divided by prominent narrow, siphonal saddles, carrying small funnel lobes. Three or more pairs of lobes are divided by marginal saddles, either single or double, the terminations of the lobes being either bifid or trifid. Type *P. kinganum*.
walcotti, White, 1889, Am. Nat., vol. 23, p. 117, and Bull. U. S. Geo. Sur., No. 77, p. 21, Permian Gr.
 POTERICERAS, McCoy, 1854, British Pal. Foss. p. 321. [Ety. *poterion*, a cup; *keras*, horn.] Shell short, fusiform; section circular; mouth contracted; septa simple; siphon subcentral, moniliform; distinguished from *Gomphoceras* and allied genera by having an entire and simple aperture. Type *P. elipticum*.
apertum and *P. nobile*, Whiteaves, 1889, Trans. Roy. Soc. Can., vol. 8, pp. 77, 78, Trenton (?) Gr.
gracile, Whiteaves, 1891, Trans. Roy. Soc. Can., vol. 9, p. 87, Trenton Gr.
missouriense, S. A. Miller, 1892, Advance Sheets 18th Rep. Geo. Sur. Ind., p. 70, Chouteau limestone.
Ptychites cumminsi, see *Waagenoceras cumminsi*.
Sactoceras canadense, see *Orthoceras canadense*.
 SOLENOCHILUS *blairi*, S. A. Miller, 1892, Advance Sheets 18th Rep. Geo. Sur. Ind., p. 75, Chouteau limestone.
newloni, Hyatt, 1891, (Asymptoceras newloni,) 2d Ann. Rep. Geo. Sur. Texas, p. 346, Coal Meas.
rockfordense, S. A. Miller, 1891, Advance

- Sheets 17th Rep. Geo. Sur. Ind., p. 89, Waverly Gr.
- STREPTODISCUS**, S. A. Miller, 1892, Advance Sheets 18th Rep. Geo. Sur. Ind., p. 71. [Ety. *streptos*, twisted; *diskos*, quoit.] Proposed instead of *Trematodiscus* of Meek & Worthen, which was preoccupied. Type *S. stygialis*.
- indianensis*, S. A. Miller, 1892, Advance Sheets 18th Rep. Geo. Sur. Ind., p. 71, Keokuk Gr.
- ohioensis*, Miller & Faber, (*Trematodiscus ohioensis*), 1892, Jour. Cin. Soc. Nat. Hist., vol. 14, p. 168, Waverly Gr.
- TEMNOCHILUS conchiferum** T. crassum, and *T. depressum*, Hyatt, 1891, 2d Ann. Rep. Geo. Sur. Texas, pp. 329 to 333, Coal Meas.
- forbesanum* instead of *Nautilus forbesanus*, on p. 444.
- TETRAGONOCERAS**, Whiteaves, 1890, Trans. Roy. Soc. Can., vol. 8, p. 105. [Ety. *tetra*, four; *gonia*, angle; *keras*, horn.] Shell subspiral, recurved, coiled loosely on the same plane, making a lax volution toward the apex, but nearly straight anteriorly; transverse section quadrangular; siphuncle cylindrical, exogastric, marginal, and placed in the middle of the venter. Type *T. gracile*, which is described at the same place from the Devonian.
- Trematodiscus*, see *Streptodiscus*.
- TROCHOCERAS maccharlesi**, Whiteaves, 1889, Trans. Roy. Soc. Can., p. 81, Trenton (?) Gr.
- WAAGENOCERAS**, Gemmellaro, 1888, Gior. Sci. Nat. Ed. Econ., vol. 19, p. 11. [Ety. proper name; *keras*, horn.] Shell discoidal; volutions embracing and bearing transverse constrictions; septa numerous and complex. Type *W. stachelcumminsi*, White, 1889, Am. Nat., vol. 23, p. 117, and Bull. U. S. Geo. Sur., No. 77, p. 20 Permian Gr.
- TAINOCERAS**, Hyatt, 1883, Proc. Bost. Soc. Nat. Hist., vol. 22, p. 269. [Ety. *tainia*, a head-band; *keras*, horn.] Whorls discoidal; section quadrate; two lateral rows of tubercles, and two rows on the outer side in the later stages of growth; siphon above the center; sutures have ventral, lateral, and dorsal lobes, but no annular lobes. Type *T. quadrangulum*. It is very much like *Metacoceras*, if not a synonym.
- cavatum*, Hyatt, 1891, 2d Ann. Rep. Geo. Sur. Texas, p. 341, Coal Meas.

LAMELLIBRANCHIATA.

THIS Class has gradually improved in the Geological ages, and is now in the maximum of its development. The lobes of the animal are right and left, and unite along the dorsal or hinge-line of the shell, and extend laterally in the form of mantles to the pallial line. The depth of the pallial sinus indicates the size of the siphonal muscles. The shell opens along the ventral side. The external hinge ligament consists of horny fibres that are found preserved, sometimes, almost as well as the shell, in Lower Silurian rocks. Some shells have an internal ligament or cartilage between the hinges of the two valves, located in pits or cartilage furrows on the faces of the hinge. The anterior adductor is in front of the mouth, and the posterior adductor behind the umbo, near the termination of the intestine. Sometimes scars are left by the pedal muscles used for projecting and retracting the foot. When there are no teeth or crenulations on the hinge, the shell is edentulous. The teeth beneath the umbo are the cardinal teeth, and those anterior or posterior to the umbo are lateral teeth. Some shells are composed of aragonite, others of calcite, and others have an outer layer of calcite and an inner one of aragonite, and generally there is an epidermis or outer horny coating. The outer calcite layer is secreted at the margin of the mantle or circumference of the shell and is prismatic, while the inner layers of aragonite are secreted in the form of laminae by the sides of the mantle.

The families Unionidæ and Ostreidæ, I think, are not palæozoic. Anthracosia, Priscoanaia, and Cardinia might be referred to the Cardiniidæ; Clinopistha and Solenomya to the Solenomyidæ.

- ALLORISMA convexum and *A. cooperi*, Herrick, 1888, Bull. Denison Univ., vol. 3, pp. 72, 74, and *A. consanguinatum*, *A. cuyahoga*, vol. 4, pp. 28, 29, Waverly Gr.
- ANODONTOPSIS affinis, Whiteaves, 1892, Cont. to Can. Pal., p. 303, Devonian.
- Arca ornata*, Herrick, 1888, Bull. Denison Univ., vol. 3, p. 83, Waverly Gr.
- AVICULA *circulus*, refer to *Pernopecten circulus*.
- ohioensis, Herrick, 1887, (*Gervillia ohioensis*.) Bull. Denison Univ., vol. 2, p. 36, Coal Meas.
- recta, Herrick, 1888, Bull. Denison Univ., vol. 4, p. 115, Waverly Gr.
- subspatulata, Herrick, 1888, Bull. Denison Univ., vol. 4, p. 30, Waverly Gr.
- AVICULOPECTEN *cooperi*, *A. granvillensis*, and *A. perelongatus*, Herrick, 1888, Bull. Denison Univ., vol. 3, p. 50, Waverly Gr.
- scalaris and *sozer*, Herrick, 1887, Bull. Denison Univ., vol. 2, pp. 26, 27, Coal Meas.
- sculptilis, S. A. Miller, 1891, Advance Sheets 17th Rep. Geo. Sur. Ind., p. 92, Coal Meas.
- Carbonarca occidentalis*, refer to *Edmondia occidentalis*.
- CARDIOPSIS *tenuicostata*, Whiteaves, 1892, Cont. to Can. Pal., p. 307, Devonian.
- CLIDOPHORUS *consuetus*, Ulrich, 1892, 19th Rep. Geo. Sur. Minn., p. 223, Galena Gr.
- CLINOPYSTHA *striata*, Nettleroth, 1889, Kentucky Foss. Shells, p. 200, Up. Held. Gr.

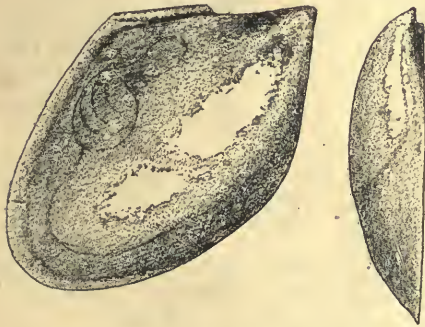


FIG. 1237.—*Clionychia rhomboidea*. Lateral and anterior views of a cast of a right valve.

- CLIONYCHIA, Ulrich, 1892, Am. Geo., vol. 10, p. 97. [Ety. *kleio*, I close; *onyx*, a claw.] Distinguished from *Ambonychia* by the absence of radiating plications or striæ, the absence of a byssal opening in the anterior end, the less central position of the muscular scars, and by the absence of distinct hinge-teeth. Type *Ambonychia lamellosa*, Hall, and including *A. erecta*, *A. attenuata*, *A. mytiloides*, *A. undata*, and *A. amygdalina*, and

- also *C. rhomboidea*, described at the same place from the Trenton Gr.
- CONOCARDIUM *alternistriatum*, Herrick, 1888, Bull. Denison Univ., vol. 4, p. 42, Waverly Gr.
- elrodi, S. A. Miller, 1891, Advance Sheets 17th Rep. Geo. Sur. Ind., p. 95, Niagara Gr.
- exiguum and *C. parvulum* S. A. Miller, 1891, Advance Sheets 17th Rep. Geo. Sur. Ind., p. 94, Ham. Gr.
- indianense, S. A. Miller, 1891, Advance Sheets 17th Rep. Geo. Sur. Ind., p. 94, Keokuk Gr.
- CRENIPECTEN *foerstii*, Herrick, 1887, Bull. Denison Univ., vol. 2, p. 28, Coal Meas.
- senilis and *C. subcardiformis*, Herrick, 1888, Bull. Denison Univ., vol. 3, pp. 53, 54, Waverly Gr.
- CYPRICARDELLA *gorbyi*, S. A. Miller, 1891, Advance Sheets 17th Rep. Geo. Sur. Ind., p. 92, Keokuk Gr.
- producta, Whiteaves 1892, Cont. to Can. Pal., p. 309, Devonian.
- CYPRICARDINIA *scitula*, Herrick, 1888, Bull. Denison Univ., vol. 4, p. 38, Waverly Gr.
- CYPRICARDITES *halli*, Nettleroth, 1889, Kentucky Foss. Shells, p. 206, Hud. Riv. Gr.
- cingulata, *C. germanus*, *C. glabellus*, *C. naus*, *C. obtusiformis*, *C. sardesoni*, *C. tenellus*, Ulrich, 1892, 19th Rep. Geo. Sur. Minn., pp. 231 to 239, Trenton Gr.
- hindi* and *C. sterlingensis* refer to *Whitella hindi* and *Whitella sterlingensis*.
- luculentus, *minnésotensis*, *triangularis*, *vicinus*, Sardeson, 1892, Bull. Minn. Acad. Nat. Sci., vol. 3, p. 338, Trenton and Hud. Riv. Gr.
- modestus, *C. oviformis*, *C. terminalis*, Ulrich, 1892, Am. Geo., vol. 10, pp. 98 to 100, Trenton Gr.
- Cyrtodonta hindi*, see *Whitella hindi*.
- huronensis*, see *Cypricardites huronensis*.
- Dolabra sterlingensis*, see *Whitella sterlingensis*.
- EDMONDIA *occidentalis*, Swallow, 1860, (*Cardinia occidentalis*.) Trans. St. Louis Acad. Sci., vol. 1, p. 655, Chouteau limestone.
- sulcifera, Herrick, 1888, Bull. Denison Univ., vol. 4, p. 30, Waverly Gr.
- Entolium attenuatum*, Herrick, see *Pernopecten attenuatus*.
- Gervillia ohioensis*, see *Avicula ohioensis*.
- GLOSSITES *manitobensis*, Whiteaves, 1892, Cont. to Can. Pal., p. 310, Devonian.
- GLYPTODESMA *cancellatum*, Nettleroth, 1889, Kentucky Foss. Shells, p. 227, Up. Held. Gr.
- GONIODON, Herrick, 1888, Bull. Denison Univ., vol. 3, p. 84. [Ety. *gonia*, an angle; *odus*, tooth.] Shell equivalve, very inequilateral, gibbous, not gaping; resembling *Palaoneilo*, but the hinge is continuous, slightly flexed be-

neath the beaks, without true teeth (?); but the hinge margin of both valves zigzagged by sharp incisions, into which corresponding projections of the opposite valve fit closely; the series of denticulations thus formed is continuous, but the size of the excisions diminishes before and behind the beaks; posterior adductor scar nearly terminal. Type *G. ohioensis*, which is described at the same place from the Waverly Gr.

GRAMMYSIA blairi, S. A. Miller, 1891, Advance Sheets 17th Rep. Geo. Sur. Ind., p. 93, Chouteau limestone.

famelica, Herrick, 1888, Bull. Denison Univ., vol. 4, p. 35, Waverly Gr.

herricki, n. sp. Proposed instead of *G. ovata*, Herrick, in Bull. Denison Univ., vol. 4, p. 35, pl. 3, fig. 12, Up. Subcarboniferous.

ovata, Herrick, was preoccupied, see *G. herricki*.

compressed, with a sulcus extending toward the basal margin. Type *I. truncata*, which with *I. elongata* is described at the same place from the Hud. Riv. Gr.

ovalis, Ulrich, 1892, 19th Rep. Geo. Sur. Minn., p. 242, Hud. Riv. Gr.

LIOPTERIA halli, *L. nasuta*, *L. newberryi*, and *L. ortoni*, Herrick, 1888, Bull. Denison Univ., vol. 3, pp. 60, 61, and vol. 4, pp. 29, 114, Waverly Gr., except the last, which is from the Keokuk Gr.

LEPTODESMA scutella, Herrick, 1888, Bull. Denison Univ., vol. 3, p. 59, Waverly Gr.

LIMOPTERA, the type is *L. macroptera*.

LYRIOPECTEN nodocostatus, Herrick, 1888, Bull. Denison Univ., vol. 4, p. 32, Waverly Gr.

MACRODON newarkensis, *M. striatocostatus*, Herrick, 1888, Bull. Denison Univ., vol. 4, pp. 36, 37, and *M. triangularis*, vol. 3, p. 74, Waverly Gr. *pygmaeus*, Whiteaves, 1892, Cont. to Can. Pal., p. 299, Devonian.

MATHERIA rugosa, Ulrich, 1892, 19th Rep. Geo. Sur. Minn., p. 241, Trenton Gr.

MEGALODON, Sowerby, 1827, Genera of Recent and Foss. Shells. [Ety. *me-gas*, large; *odus*, tooth.] Shell oblong, smooth or keeled; ligament external; hinge teeth 1 x 2, thick; one posterior lateral tooth; anterior adductor impression deep, with a raised margin and a small pedal scar behind it; beaks subspiral. Type *M. cucullatus*.

subovatus, Whiteaves, 1890, Trans. Roy. Soc. Can., vol. 8, p. 97, Devonian.

Modiola waverlyensis, see *Mytilops waverlyensis*.

MODIOLOPSIS alata, *M. angustata*, *M. milleri*, *M. parva*, *M. simulatrix*, *M. subparallela*, Ulrich, 1890, Am. Geo., vol. 5, pp. 274 to 283, Hud. Riv. Gr.; and *M. oviformis*, from the Trenton Gr.; and *M. oblonga*, *M. pulchella*, and *M. subtruncata*, from the Utica Slate.

charlestownensis, Nettleroth, 1889, Kentucky Foss. Shells, p. 218, Up. Held. Gr.

concava, *M. similis*, Ulrich, 1892, 19th Rep. Geo. Sur. Minn., pp. 225, 227, Trenton Gr., and *M. subelliptica*, p. 226, Galena Gr.

dychei, S. A. Miller, 1892, Advance Sheets 18th Rep. Geo. Sur. Ind., p. 77, Hud. Riv. Gr.

MODIOMORPHA attenuata, Whiteaves, 1890, Trans. Roy. Soc. Can., vol. 8, p. 96, Devonian, *M. compressa*, *M. tumida*, and



FIG. 1258.—*Ischyrodonta truncata*. *a*, Outline view of a left valve; *b*, internal view of same; *c*, *d*, and *e*, three views of a cast.

ISCHYRODONTA, Ulrich, 1890, Am. Geo., vol. 6, p. 173. [Ety. *ischyros*, strong; *odus*, tooth.] Short or elongated, thick bivalve shells, having small subterminal beaks, with the hinge straight or slightly arcuate and extended posteriorly; hinge-plate wide and strong, without posterior lateral teeth, but with a strong cardinal tooth in the left valve, and two nearly as strong in the right; just in front of them a pair of subcircular, large and deep anterior muscular impressions, and between these and the teeth another very small pair; posterior scar large, but faintly marked, ovate, situated in the postero-cardinal region; pallial-line simple; ligament probably internal; in casts the beaks are prominent,

- M. parvula*, 1892, Cont. to Can. Pal., p. 296, Devonian.
Monotis is not an American palaeozoic genus.
MYALINA trigonalis, Whiteaves, 1892, Cont. to Can. Pal., p. 294, Devonian.
MYTILARCA inflata, Whiteaves, 1892, Cont. to Can. Pal. p. 293, Devonian.
MYTILOPS waverlyensis, Herrick, 1888, (*Modiola waverlyensis*.) Bull. Denison Univ., vol. 3, p. 63, Waverly Gr.
NUCULA herzeri, Nettleroth, 1889, Kentucky Foss. Shells, p. 221, Up. Held. Gr.
manitobensis, Whiteaves, 1892, Cont. to Can. Pal., p. 301, Devonian.
NUCLANA similis, and *N. spatulata*, Herrick, 1888, Bull. Denison Univ., vol. 3, p. 79, Waverly Gr.
ORDECARDIA, Herrick, 1888, Bull. Denison Univ., vol. 4, p. 41. [Ety. *oraiois*, produced at a fit season; *kardia*, heart.] Shell inequilateral, inequivalve, ventricose, strongly curved, acute, elevated beak, which inclines forward at the apex; hinge-line extended, produced posteriorly, furnished with a thickened ridge or cartilage plate; the beaks are separated from the hinge by a pseudo-area which is elevated, and more or less arched under the beak; surface marked with radiating lines. Type *O. ornata*, which, with *O. cornuta*, is described at the same place from the Waverly Gr.
ORTHODESMA minnesotense, O. saffordi, Ulrich, 1892, 19th Rep. Geo. Sur. Minn., pp. 228, 229, Trenton Gr.
ORTHONOTA corrugata, Whiteaves, 1890, Trans. Roy. Soc. Can., vol. 8, p. 98, Devonian.
Ostrea patercula, Winchell, in the opinion of Whitfield, is from the Cretaceous of New Jersey, which by some accident was mixed with Waverly or Burlington fossils.
PALAEONEILO consimilis, *P. curta*, *P. ignota*, Herrick, 1888, Bull. Denison Univ., vol. 4, pp. 43, 44, Waverly Gr.
Panetka is a Polish or Bohemian word, signifying the same as the Latin *puella*, a little girl. It is not formed according to the rules of nomenclature, and should be discarded.
grandis, Whiteaves, 1891, Can. Rec. Sci., p. 402, Corniferous Gr.
PARACYCLAS elongata, and *P. octerlonii*, Nettleroth, 1889, Kentucky Foss. Shells, pp. 210, 212, Up. Held. Gr.
PERNOPETEN attenuatus, Herrick, 1887, (*Entolium attenuatum*.) Bull. Denison Univ., vol. 2, p. 24, Waverly Gr.
circulus, Shumard, 1885, (*Avicula circulus*.) Geo. Rep. Mo., p. 206, Chouteau limestone.

PLETHOCARDIA, Ulrich, 1892, 19th Rep. Geo. Sur. Minn., p. 243. [Ety. *pletho*, to be full; *kardia*, heart.] Shell thin, oblique, tumid, with the margins closed; beaks large, prominent, spirally enroled, and curving forward; narrow, deep escutcheon posterior to the beaks; bifid cardinal tooth projects forward and downward; single lateral tooth at the posterior extremity of the hinge-line; anterior muscular scar deep at the antero-dorsal angle, margined by a curved ridge extending from the under side of the cardinal tooth. Type *P.*

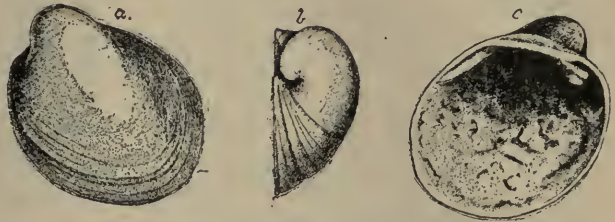


FIG. 1259.—*Plethocardia umbonata*.

- umbonata*, from the Trenton Gr., described at the same place. *P. suberecta* is also described from the Galena Gr.
POSIDONOMYA fragilis, Herrick, 1888, Bull. Denison Univ., vol. 3, p. 39, Waverly Gr.
PROMACRUS missouriensis, Swallow, 1860, (*Solen (?) missouriensis*.) Trans. St. Louis Acad. Sci., vol. 1, p. 655, Chouteau limestone. It is not a *Sanguinolites*.
nasutus, Meek, 1871, (*Sanguinolites nasutus*.) Am. Jour. Conch., vol. 7, Chouteau limestone.
truncatus, Herrick, 1888, Bull. Denison Univ., vol. 3, p. 60, Waverly Gr.
PTERINEA lobata, Whiteaves, 1892, Cont. to Can. Pal., p. 292, Devonian.
PTERINOPECTEN ashlandensis, and *P. cariniferus*, Herrick, 1888, Bull. Denison Univ. vol. 3, p. 58, and vol. 4, p. 33, Waverly Gr.
sedaliensis, S. A. Miller, 1891, Advance Sheets 17th Rep. Geo. Sur. Ind., p. 93, Chouteau limestone.
PTERONITES obliquus, Herrick, 1888, Bull. Denison Univ., vol. 3, p. 58, Waverly Gr.
PTYCHOPTERIA aequalvalvis, Whiteaves, 1891, Cont. to Can. Pal., vol. 1, p. 239, Devonian.
mesocostalis, Williams, 1887, Bull. U. S. Geo. Sur., No. 41, p. 35, Portage Gr.
obsoleta, Simpson, 1889, Trans. Am. Phil. Soc., p. 448, Chemung Gr.
SANGUINOLITES missouriensis and *S. nasutus* refer to *Promacrus*.
senilis, Herrick, 1888, Bull. Denison Univ., vol. 3, p. 66, Waverly Gr.
SCHIZODUS affinis, Herrick, 1887, Bull. Denison Univ., vol. 2, p. 41, Coal Meas.
harii, S. A. Miller, 1891, Advance Sheets

17th Rep. Geo. Sur. Ind., p. 91, Up. Coal Meas.

harlanensis, Herrick, 1888, Bull. Denison Univ., vol. 4, p. 117, Berea Grit.

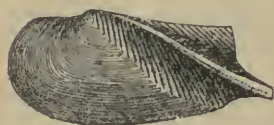


FIG. 1260.—*Technophorus divaricatus*. Left valve natural size and magnified 3 diameters.

and *S. subcircularis*, 1887, vol. 2, pp. 36, 41, 42, Coal Meas.

wheeleri, Swallow, 1862, (*Cypricardia* (?) *wheeleri*,) is in Trans. St. Louis Acad. Sci., vol. 2, p. 96.

SOLENOMYA cuyahogensis, Herrick, 1888, Bull. Denison Univ., vol. 4, p. 115, Waverly Gr., and *S. meekana*, and *S. subradiata*, 1887, vol. 2, p. 30, Coal Meas.

SPATHELLA subelliptica, Whiteaves, 1892, Cont. to Can. Pal., p. 298, Devonian.

STREBLOPTERIA gracilis, *S. media*, *S. squamosa*, Herrick, 1888, Bull. Denison Univ., vol. 3, pp. 56, 57, Waverly Gr.

TECINOPHORUS extenuatus, Ulrich, 1892, 19th Rep. Geo. Sur. Minn. p. 222, Trenton Gr., and *T. divaricatus*, *T. filistriatus*, *T. subacutus*, *T. similis*, Am. Geo., vol. 10, pp. 101 and 102, Trenton Gr.

TELLINOMYA diminuens, and *T. cuneata*, Simpson, 1889, Trans. Am. Phil. Soc., p. 453, Clinton Gr.

compressa, *T. nitida*, *T. planodorsata*, *T. subrotunda*, Ulrich, 1892, 19th Rep. Geo. Sur. Minn., pp. 215 to 219, Trenton Gr.; *T. intermedia*, p. 218, Galena Gr.; and *T. recurva* and *T. similis*, pp. 220, 221, Hud. Riv. Gr.; and *T. longa*, Am. Geo., vol. 10, p. 103, Black Riv. Gr.

candens, *lepida*, Sardeson, 1892, Bull. Minn., Acad. Nat. Sci., vol. 3, p. 339, Trenton Gr.

WHITELLA, Ulrich, 1891, Am. Geo., vol. 6, p. 176. [Ety. proper name.] Shell large, thin, obliquely quadrangular or suboval, equivalve, inequilateral, more or less ventricose, closed all around; beaks prominent, incurved; cardinal line straight or slightly convex, the edges inflected to form a sharply defined es-

cutcheon extending beyond the beaks nearly to the anterior extremity of the shell; area finely striated longitudinally; hinge-line straight, one-half or two-thirds the length of the shell, with four or five oblique teeth in front of the beaks; ligament probably external and internal; two simple adductor impressions, posterior one faint, pallial-line entire; surface concentrically lined. Type *W. obliquata*, described at the same place from the Hud. Riv. Gr.; and *W. compressa* and *W. scofieldi*, from the Trenton Gr.

concentrica, Ulrich, 1892, 19th Rep. Geo. Sur. Minn., p. 247, Trenton Gr.; *W. praecepta*, p. 246, Galena Gr.; and *W. sulcodorsata*, p. 248, Hud. Riv. Gr. *hindi*, Billings, 1862, (*Cyrtodonta hindi*,) Pal. Foss., vol. 1, p. 151, Hud. Riv. Gr. *sterlingensis*, Meek & Worthen, 1866, (*Dolabra sterlingensis*,) Proc. Acad. Nat. Sci., p. 260, and Geo. Sur. Ill., vol. 2, p. 339, Hud. Riv. Gr.

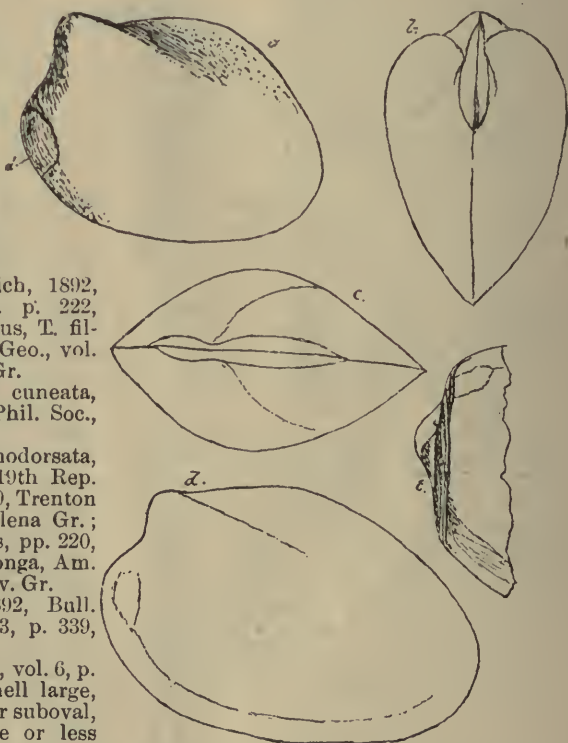


FIG. 1261.—*Whitella obliquata*. *a*, Left side of a cast; *b*, and *c* anterior and cardinal views of a cast; *d*, left side of another cast; *e*, hinge and part of the muscular impressions.

SUBKINGDOM ARTICULATA.

CLASS ANNELIDA.

THE Tubicola are invested in tubes to which they are not muscularly attached, and the paleozoic forms show no muscular scars. The tubes seem to have been composed of calcite, and are generally found attached to some other object at the apex or on one side. The jaws of the Conodonts are minute, glossy black, and chitinous or horny, instead of being composed of calcite. Most of them, probably, belong to the masticatory apparatus of Crustaceans.

ARABELLITES aciculatus, and A. hindei, James, 1884, Jour. Cin. Soc. Nat. Hist., vol. 7, p. 148, Hud. Riv. Gr.

CORNULITES sublacvis, Whiteaves, 1891, Cont. to Can. Pal., vol. 1, p. 210, Devonian.

POLYGNATHUS wilsoni, James, 1884, Jour. Cin. Soc. Nat. Hist., vol. 7, p. 148, Hud. Riv. Gr.

PRIONIODUS dychei, James, 1884, Jour. Cin. Soc. Nat. Hist., vol. 7, p. 147, Hud. Riv. Gr.

SABELLARITES, Dawson, 1890, Quar. Jour.

Geo. Soc., vol. 46, p. 605. [Ety. *Sabellararia*, a genus; *ites*, from *lithos*, stone.] Elongated tubes composed of grains of sand and calcareous organic fragments associated with carbonaceous, flocculent matter, indicating a horny or membranous sheath. Type *S. trentonensis*, which is described at the same place from the Trenton Gr., with *S. phosphaticus* from the Up. Taconic.

SPIROBIS is generally more or less elevated in the last whorl, and the aperture is always turned up.

CLASS CRUSTACEA.

THE integument of the Crustacea (*crusta*, a crust,) is called chitinous; the segments or somites (*soma*, body,) are arranged longitudinally, and united transversely by a membrane. The Cirripedia (*cirrus*, a curl; *pes*, foot,) are attached to submarine objects by the anterior end or metamorphosed head. The articulated cirri are exerted and retracted from an opening at the posterior extremity. The Entomostraca (*entomos*, cut into; *ostrakon*, a shell,) have been defined as follows: Animals aquatic, covered with a shell or carapace of a horny consistency, formed of one or more pieces, in some genera resembling a cuirass or buckler, and in others a bivalve shell, which completely or in great part envelops the body and limbs of the animal. In other genera the animal is inverted with a multivalve carapace, like jointed-plate armor; the branchiæ are attached either to the feet or to the organs of mastication; the limbs are jointed and more or less setiferous. The animals, for the most part, undergo a regular moulting or change of shell as they grow; in some cases this amounts to a species of transformation. The Ostracoda (*ostrakon*, a shell,) have the valves united on the back by a membrane or ligament, and the valves are closed by an adductor muscle, the place of attachment being indicated by a pit, group of spots, or tubercle. Many genera have been recently described, some of them, appar-

ently, not ranking higher than species. The central part of the cephalic shield of the Trilobita (*treis*, three; *lobos*, a lobe,) is called the glabella; the grooves at the sides of it are called axal furrows, the one at the rear the neck furrow; the fixed cheeks are on each side of the glabella, and separated from the free cheeks by the facial suture, though the facial suture is absent in Trinucleus and some other genera; the central part of the thorax is the axis, and the side lobes are the pleuræ; the dividing line is the axal furrow; the segments of the pygidium are auchylosed. The Xiphosura (*xiphos*, a sword; *oura*, a tail,) have a broad, convex buckler, compound, subcentral eyes, and ocelli in front; the mouth has a small labrum and six pairs of appendages; the telson, or terminal segment, is ensiform.

- ACANTHOTELSON magister, Packard, 1886, Mem. Nat. Acad. Sci., vol. 3, p. 127, Carboniferous.
- ACIDASPIIS ortonii, Foerste, 1887, Bull. Denison Univ., vol. 2, p. 90, Niagara Gr. perarmata, Whiteaves, 1891, Can. Rec. Sci., p. 300, Up. Sil.
- ÆCHIMINA, Jones & Holl, 1869, Ann. and Mag. Nat. Hist., Ser. 4, vol. 3, p. 217. [Ety. *aichme*, a sharp point.] Valves thick, straight at the hinge, rounded at the ends, convex at the ventral border, and outdrawn at the surface into a broad-based and sharp-pointed hollow cone, which either involves all the surface or rises from the postero-dorsal or centro-dorsal region. Type *Æ. cuspidata*.
- abnormis*, Ulrich, 1890, Jour. Cin. Soc. Nat. Hist., vol. 13, p. 183, Niagara Gr., and *Æ. marginata*, p. 184, from the Ham. Gr.
- AGNOSTUS desideratus, Walcott, 1889, Proc. U. S. Nat. Mus., vol. 12, p. 39, Up. Taconic.
- latus*, see *Bollia lata*.
- AGRAULOS redpathi, Walcott, 1890, 10th Ann. Rep. U. S. Geo. Sur., p. 654, Up. Taconic.
- AMPYX americanus, Safford & Vogdes, Proc. Acad. Nat. Sci., Trenton Gr.
- ANOMALOCARIS, Whiteaves, 1892, Can. Rec. Sci., vol. 5, p. 205. [Ety. *anomalos*, unlike; *karis*, shrimp.] A phyllocarid crustacean; body from 9 to 13 segments, exclusive of the caudal segment, each bearing a pair of slender, narrowly elongated and acutely pointed, simple and probably branchial appendages of the nature of uropods or foot-gills; posterior terminal segment margined with three pairs of caudal spines, one terminal, the other two lateral. Type *A. canadensis*, described at the same place from rocks of uncertain age, probably Up. Taconic.
- APARCHITES concinnus, Jones, 1858, (Cytheropsis concinna,) Ann. & Mag. Nat. Hist., Ser. 3, vol. 1, p. 249, Black Riv. Gr.
- inornatus*, Ulrich, 1890, Jour. Cin. Soc. Nat. Hist., vol. 13, p. 182, Up. Held. Gr., and *A. oblongus*, p. 137, Hud. Riv. Gr. *mitis*, Jones, 1891, Cont. to Can. Micro-Pal., p. 91, Devonian; and *A. mundulus* and *A. tyrrelli*, p. 62, from the Chazy Gr.
- ARISTOZOE canadensis, Whitfield, 1890, Ann. N. Y. Acad. Sci., p. 505, Trenton Gr.
- ASAPIUS has a lip-plate, labrum, or hypostoma, (*hupo*, under; *stoma*, mouth;) that is wide and deeply forked behind. The jointed limbs and branchial filaments shown in the illustration of the Oxford specimen in the Jour. of the Cin. Soc. of Nat. Hist., as well as the description of them, are largely imaginary, as the specimen does not show the characters.
- ATOPS reticulata, Walcott, 1890, (Conocoryphe reticulata,) 10th Ann. Rep. U. S. Geo. Sur., p. 649, Up. Taconic.
- AVALONIA, Walcott, 1890, 10th Ann. Rep. U. S. Geo. Sur., p. 646. Type *A. manuelensis*, described at the same place from the Up. Taconic.
- BAIRDIA, McCoy, 1846, Synop. Foss. Ireland, p. 164. [Ety. proper name.] Carapace varying from a broadly triangular to a narrow elongate subtriangular form, with extremities more or less acute; surface smooth and setiferous or finely punctate; no central tubercle; lucid spots well marked; margins thin and trenchant; when closed the edges of the right valve lie within those of the left; interior of the marginal borders, except on the dorsal edge, cased with a narrow lamelliform plate, as in Cypris, except that a slight fold or notch is frequently apparent at the angles of the hinge-line; the dorsal edge of the right valve is quite simple, and, in the closed carapace, underlies the dorsal edge of the left valve, which is larger and overlapping; ventral margin incurved. Type *B. curta*.
- anticostiensis*, Jones, 1890, Quar. Jour. Geo. Soc., vol. 46, p. 548, Hud. Riv. Gr.
- cestriensis*, Ulrich, 1890, Jour. Cin. Soc. Nat. Hist., vol. 13, p. 210, Kaskaskia Gr.; and *B. leguminoides*, p. 197, Ham. Gr.
- BARYCHILINA, Ulrich, 1890, Jour. Cin. Soc. Nat. Hist., vol. 13, p. 198. [Ety. *barus*, heavy, thick; *cheilos*, a lip.] Carapace small, subrhomboidal or ovate; valves thick, unequal, the right the larger, overlapping the left except in the pos-

terior half of the more or less convex dorsal side; the edges of the valves in this portion of the back are smooth, and resemble a pair of thick lips; edges of both valves thick and smooth all around, that of the right valve much the heavier; a sharply defined, narrow or rounded umbilical pit; surface striate. Type *B. punctostriata*, which, with *B. punctostriata* var. *curta* and *B. pulchella*, are described at the same place from the Up. Held. or Ham. Gr.

BATHYRELLUS, Whitfield, 1890, Bull. Am. Mus. Nat. Hist., vol. 3, p. 38, Up. Taconic or Calciferous.

BATHYRISCUS dawsoni, Walcott, 1888, Proc. U. S. Nat. Mus., p. 446, Up. Taconic.

Bathyrus seelyi, refer to *Bolbocephalus seelyi*.

BEECHERELLA, Ulrich, 1891, Am. Geol., vol. 8, p. 198. [Ety. proper name.] Carapace small, elongate, boat-shaped to ovate, moderately convex, more or less inequivalve; dorsal margin varying from nearly straight to strongly convex; back sometimes flattened, with a sharply defined carina on one or both valves, giving them a triangular shape in cross sections; in other cases the dorsal slope is convex; antero-dorsal extremity acuminate, often drawn out into a long spine; spine strongest on the right valve, sometimes absent on the left; posterior extremity acuminate or rounded; ventral edge convex or straightened in the middle; hingement simple, dorsal edge of right valve thickened, and in the central part overlapping the left valve. Type *B. carinata*, described at the same place, from the Low. Held. Gr., with *B. cristata*, *B. angulata*, *B. navicula*, *B. ovata*, *B. subtumida*, and *B. subtumida* var. *intermedia*, from the same rocks.

BEYRICHTIA ciliata, refer to *Ctenobolbina ciliata*.

clavigera and *B. clavigera* var. *clavifracta*, Jones, 1891, Cont. to Micro-Pal., p. 65, Chazy Gr.; and *B. quadrifida*, p. 66, Trenton Gr.; and *B. tuberculata* var. *strictispiralis*, p. 77, Up. Sil. Also *B. clarkei*, 1890, Quar. Jour. Geol. Soc., vol. 46, p. 17, Low. Held. Gr.; and *B. diffusa*, p. 546, Anticosti Gr.; and *B. halli*, p. 15, Waterlime Gr.; and *B. hamiltonensis*, p. 19, Ham. Gr.; and *B. kalmadini*, p. 538, Ham. Gr.; and *B. subquadrata*, p. 537, Corniferous Gr.

duryi, refer to *Ctenobolbina duryi*.

lyoni, Ulrich, 1890, Jour. Cin. Soc. Nat. Hist., vol. 13, p. 190, Up. Held. or

Ham. Gr.; also *B. tricollina*, Ham. Gr.; and *B. radiata* var. *cestriensis* and *B. simulatrix*, pp. 204, 205, Kaskaskia Gr. *richardsoni*, refer to *Depranella richardsoni*.

symmetrica, refer to *Bollia symmetrica tuberculata*, Kløden, 1834, (*Battus tuberculatus*.) Verst. d. Mark Brandenburg, p. 115, Up. Sil.

BOLBOCEPHALUS, Whitfield, 1890, Bull. Am. Mus. Nat. Hist., vol. 3, p. 36. [Ety. *bolbos*, bulb; *kephale*, head.] Head large, semicircular, including the movable cheeks; glabella proportionally large, bulbous or subspherical, expanded in front of the eyes, and marked by a single, very indistinct furrow near the posterior; fixed cheeks narrow; eyes large, semicircular, elevated; lateral limbs narrow from front posteriorly; frontal limb linear; facial

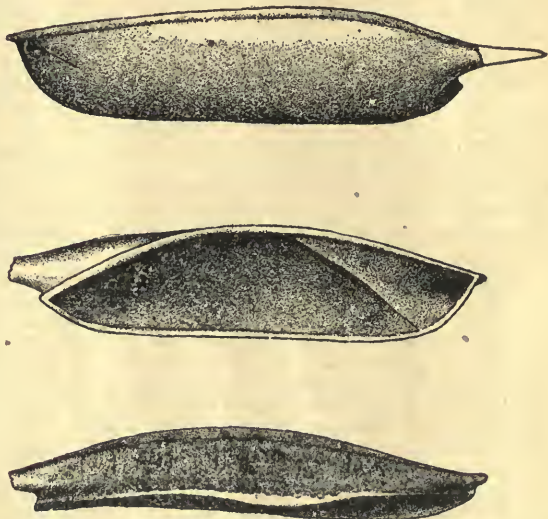


FIG. 1262.—*Beecherella carinata*. Right valve, interior and dorsal views of same. Magnified 20 diameters.

suture cutting the posterior margin within the genal angle behind, and passing closely around the glabellar lobe in front; movable cheeks triangular, marginal, spined; pygidium semicircular, lobed, and transversely furrowed. Type *B. seelyi*.

seelyi, Whitfield, 1886, (*Bathyrus seelyi*.) Bull. Am. Mus. Nat. Hist., vol. 1, p. 339, Calciferous Gr.

truncatus, Whitfield, 1890, Bull. Am. Mus. Nat. Hist., vol. 3, p. 37, Calciferous Gr.

BOLLIA Jones & Holl, 1886, Ann. and Mag. Nat. Hist., ser. 5, vol. 17, p. 360. [Ety. proper name.] Valves oblong, with rounded and nearly equal ends; straight on the back, more or less outcurved on the ventral edge; surface punctate and bearing a lobular elevation on each side

- of a median bay-like sulcus, constituting two irregular, obliquely transverse lobes, which converge downward and meet near the middle of the ventral region by a low, narrow, bent isthmus, sinuous in the adult, but more or less simply curved in the young state. The dorsal portions of this horseshoe lobe project outward; there is a strong semilunar ridge at each end of the valve, parallel with the marginal border, which has a slight outer rim. Type *B. uniflexa*.
- bilobata*, Jones, 1890, Quar. Jour. Geo. Soc., vol. 46, p. 540, Corniferous Gr.; and *B. hindei*, p. 540, Ham. Gr.; and *B. semilunata*, p. 548, Hud. Riv. Gr.
- granitera*, Ulrich, 1890, Jour. Cin. Soc. Nat. Hist., vol. 13, p. 205, St. Louis Gr.; and *B. obesa*, p. 189, Up. Held. or Ham. Gr.; *B. persulcata* and *B. pumila*, pp. 116, 117, Hud. Riv. Gr.
- lata*, Vanuxem, 1842, (*Agnostus latus*), Geo. Rep. N. Y., p. 80, and Pal. N. Y., vol. 2, p. 301, Clinton Gr.
- symmetrica*, Hall, 1852, (*Beyrichia symmetrica*), Pal. N. Y., vol. 2, p. 317, Niagara Gr.
- ungula*, Claypole, 1889, Am. Geo., vol. 4, p. 338, Marcellus limestone.
- BRONTEUS senescens*, Hall, 1892, 8th Ann. Rep. St. Geo. N. Y., Chemung Gr.
- BYTHOCYPRIS*, Brady, 1880, Rep. Ostracoda of the Challenger, p. 45. [Ety. *buthos*, the depth of the sea; *Cypris*, a genus.] Carapace smooth, more or less reniform; left valve much larger than the right, which it overlaps both on the dorsal and ventral margins.
- devonica*, *B. indianensis*, *B. punctulata*, Ulrich, 1890, Jour. Cin. Soc. Nat. Hist., vol. 13, p. 196, Up. Held. or Ham. Gr.
- lindstromi* and *B. obtusa*, Jones, 1890, Quar. Jour. Geo. Soc., vol. 46, p. 548, Anticosti Gr.
- CALYMENE* has a subquadrate hypostoma, with two short spines posteriorly; the surface, when well preserved, is granular or tubercular.
- multicosta is from the Chazy Gr.
vogdesi, Foerste, 1887, Bull. Denison Univ., vol. 2, p. 95, Niagara Gr.
- CARCINOSOMA*, Claypole, 1890, Am. Geo., vol. 6, p. 400. [Ety. *karkinos*, a crab; *soma*, the body.] Proposed instead of *Eurysona*, on p. 259. Body ovate, narrower in front, abruptly tapering behind into a cylindrical abdomen ending in a spiuiform tail; head-shield entire, roundly triangular, bluntly pointed in front; thoracic segments 6 or more, ending on each side in a backwardly directed point; abdominal segments 4, subquadrate; beyond these is a sharply triangular spine; appendages consist of 5 pairs of organs, the first 4 of which taper rapidly to a point and are furnished with spiuous processes; the swimming feet are thicker and longer than the others, and consist of three segments. Type *C. newlini*, described at the same time on p. 260, from the Waterlime Gr.
- CERATIOCARIS* had numerous body-rings, posterior to the bivalve carapace, carrying lamellar appendages, behind which there was a pointed telson and two lateral spines.
- Conocoryphe* is a synonym for *Atops*.
- CTENOBOLBINA*, Ulrich, 1890, Jour. Cin. Soc. Nat. Hist., vol. 13, p. 108. [Ety. *ktenos*, comb; *bolbos*, bulb.] Carapace small, elongate, suboval, strongly convex; the posterior two-fifths more or less bulbous or subglobular, and separated from the remainder by a deep, narrow sulcus, extending in a gentle curve from the dorsal margin more than half the distance across the valves toward the postero-ventral border; the anterior three-fifths often with another oblique but less impressed sulcus; valves equal, dorsal margin straight, hinge simple, ventral edge thick, and the true contact margins generally with a row of small spines on each side; in a lateral view both are concealed by a frill or flattened border, usually mistaken for the true contact edges; surface generally granulous. Type *C. ciliata*.
- alata*, *C. bispinosa*, *C. ciliata* var. *curta*, *C. ciliata* var. *emaciata*, *tumida*, Ulrich, 1890, Jour. Cin. Soc. Nat. Hist., vol. 13, pp. 108 to 111, Hud. Riv. Gr.; and *C. antespinoza*, *C. informis*, *C. minima*, *C. papillosa*, pp. 186 to 188, Up. Held. or Ham. Gr.; and *C. punctata*, p. 186, from the Niagara Gr.
- ciliata*, Emmons, 1855, (*Beyrichia ciliata*), Am. Geo., p. 219, Hud. Riv. Gr.
- duryi*, S. A. Miller, 1874, (*Beyrichia duryi*), Cin. Quar. Jour. Sci., vol. 1, p. 232, Hud. Riv. Gr.
- CYCLUS*, DeKoninck, 1841, Mem. Acad. Sci. Bruxelles, vol. 14, p. 18. [Ety. *kuklos*, circle.] Carapace longer than wide, somewhat hemispherical, narrow, smooth border, indented behind shield; divided down its center by a dorsal ridge, from which radiate ribs or transverse wrinkles. Type *C. radialis*.
- americana*, Packard, 1886, Mem. Nat. Acad. Sci., vol. 3, p. 143, Coal. Meas.
- Cypridina*, Edwards-Milne, 1838, Lamarck's Anim. Sans Vert., vol. 5, p. 178. [Ety. from the genus *Cypris*.] They have two eyes situated toward the middle of their bivalve test, and a caudal appendage at the posterior border, armed with spines disposed as the teeth of a comb. Edwards mentioned no type when founding the genus upon the living Ostracoda, but it is very evident the genus is not known in Paleozoic rocks.
- herzeri*, Ulrich, 1890, Jour. Cin. Soc. Nat. Hist., vol. 13, p. 209, Keokuk Gr.

- Cythere ohioensis*, see *Cytheropsis ohioensis*.
- CYTHERELLA, Jones, 1849, Monog. Entom. Cret., p. 28. [Ety. diminutive of *Cythere*.] Carapace oblong, compressed, smooth or pitted; no terminal denticulations; contact margins of the right (larger) valve grooved or rabbeted on its inner edge for the reception of a flange presented by the contact margin of the left (smaller) valve; both groove and flange stronger at the posterior than at the anterior portion of the valves. The lucid spots resemble those in *Cypridina*.
- ovatiformis, Ulrich, 1890, Jour. Cin. Soc. Nat. Hist., vol. 13, p. 209, Kas-kaskia Gr.
- Cytherina phaseolus*, see *Leperditia phaseolus*.
- CYTHERELLINA, Jones & Holl, 1869, Ann. and Mag. Nat. Hist., vol. 3, p. 215. [Ety. from *Cytherella*.] Carapace valves elongate, convex, smooth, thick, excavated internally, with undulating contours. Type *C. siliqua*.
- glandella, instead of *Cytheropsis glandella*.
- CYTHEROPSIS *concinna*, see *Aparchites concinnus*.
- ohioensis, Herrick, 1888, (*Cythere ohioensis*.) Bull. Denison Univ., vol. 4, p. 60, Waverly Gr.
- DALMANITES *troosti*, Safford, 1889, (*Chasmops troosti*.) Proc. Acad. Nat. Sci., Trenton Gr.
- DEPRANELLA, Ulrich, 1890, Jour. Cin. Soc. Nat. Hist., vol. 13, p. 117. Carapace small, high, subelliptical in outline, dorsal border straight, terminating abruptly at each end; ventral border nearly straight or gently convex, rounding almost evenly at the ends; a sickle-shaped ridge runs nearly parallel with the posterior and ventral edges, and is sometimes produced beyond the postero-dorsal border; dorsal slope with two or more strong tubercles or ridges; the two valves meet equally at the ventral edge. Type *D. crassinoda*, which is described at the same place, from the Birdseye Gr., with *D. ampla*, *D. elongata*, *D. macer*, *D. nitida*, pp. 119 to 121, Chazy Gr.
- richardsoni, S. A. Miller, 1874, (*Beyrichia richardsoni*.) Cin. Quar. Jour. Sci., vol. 1, p. 347, Hud. Riv. Gr.
- DIONIDE is from N. Jahrb. fur Miner., Hft. 4, p. 391, and Syst. Sil. Boh., p. 640.
- ELLIPTOCEPHALA *broggeri*, Walcott, 1889, (*Olenellus broggeri*.) Proc. U. S. Nat. Mus., vol. 12, p. 41, Up. Taconic.
- ELPE, Barrande, 1872, Syst. Sil. Boh., vol. 1, Supp. p. 510. Type *E. pinguis*.
- tyrrelli, Jones, 1891, Cont. to Micro-Pal., p. 93, Devonian.
- ENCURINURUS *excedrens*, Safford, 1889, Proc. Acad. Nat. Sci., Trenton Gr.
- thresheri, Foerste, 1887, Bull. Denison Univ., vol. 2, p. 101, Niagara Gr.
- ENTOMIS, Jones, 1861, Mem. Geol. Sur. Gt. Brit., Geol. Edinb., p. 137. Carapace ovate-oblong, bean-like; valves indented by a transverse furrow, which begins on the dorsal margin, at about one-third of its length from the anterior extremity, and reaches half-way or more across the valve; surface bearing in front of the sulcus a tubercle or spine which is sometimes wanting; anterior border not indented. Type *E. tuberosa*.
- madisonensis, Ulrich, 1890, Jour. Cin. Soc. Nat. Hist., vol. 13, p. 107, Hud. Riv. Gr.; and *E. waldronensis*, p. 183, Niagara Gr.
- rhomboidea, Jones, 1890, Quar. Jour. Geo. Soc., vol. 46, p. 20, Ham. Gr.
- EURYPHILINA, Ulrich, 1889, Micropalæontology of Can., p. 52. [Ety. *eury*s, broad; *cheilos*, lip.] Valves somewhat semicircular or semi-elliptical; dorsal line straight; subcentral sulcus and a node behind it; broad border, often striated; hinge simple; surface reticulate, granulous, or smooth. Type *E. reticulata*, which is described at the same place from the Trenton Gr., and also *E. manitobensis*.
- æqualis*, *E. granosa*, *E. longula*, *E. obesa*, *E. subradiata*, Ulrich, 1890, Jour. Cin. Soc. Nat. Hist., vol. 13, p. 126 to 129, Chazy and Birdseye Gr.
- striatmarginata, S. A. Miller, (*Beyrichia striatmarginata*.) 1874, Cin. Quar. Jour. Sci., vol. 1, p. 233, Hud. Riv. Gr.
- Eurysoma*, Clavpole, 1890, Am. Geol., vol. 6, p. 259. The name was preoccupied. See *Carcinosoma*.
- newlini*, see *Carcinosoma newlini*.
- GRIFFITHIDES, Portlock, 1843, Rep. Geol. Londonderry, p. 310. [Ety. proper name.] Distinguished from *Phillipsia*, which it closely resembles by the pyriform or tumid glabella and small, smooth, lunate eyes. Type *G. longiceps*.
- bufo, Meek & Worthen, 1870, Proc. Acad. Nat. Sci., p. 52, and Geo. Sur. Ill., vol. 5, p. 528, Keokuk Gr.
- portlocki, Meek & Worthen, 1865, Proc. Acad. Nat. Sci., p. 268, and Geo. Sur. Ill., vol. 5, p. 525, Keokuk Gr.
- sedaliensis, Vogdes, 1888, Trans. N. Y. Acad. Sci., vol. 7, p. 276, Waverly Gr.
- HALLIELLA, Ulrich, 1890, Jour. Cin. Soc. Nat. Hist., vol. 13, p. 184. [Ety. proper name.] Valves similar to *Primitia*, but with a larger sulcus, narrow at the dorsal edge, and widening as it extends downward; posterior lobe smaller than the anterior; the latter generally divided at or near the straight dorsal edge; surface ornamented or smooth; ventral edge thick. Type *H. retifera*, described at the same place from the Up. Held. or Ham. Gr.
- HARPIDES. Type *H. hospes*.
- ISOCHILINA *amii*, *I. labellosa*, *I. grandis* var. *latimarginata*, *I. ottawa* var. *intermedia*, and *I. whiteavesi*, Jones, 1891, Cont. to Can. Micropalæontology, pp. 68 to 78,

- Chazy and Trenton Gr.; and *I. bellula* and *I. dawsoni*, p. 92, Devonian.
- amiana*, *I. ampla*, *I. kentuckiensis*, *I. safordi*, *I. subnodosa*, Ulrich, 1890, Jour. Cin. Soc. Nat. Hist., vol. 13, pp. 177 to 180, Birdseye and Trenton Gr.; and *I. rectangularis*, p. 182, Up. Held. or Ham. Gr.
- fabacea* and *I. lineata*, Jones, 1890, Quar. Jour. Geo. Soc., vol. 46, p. 21, Ham. Gr.
- JONESSELLA**, Ulrich, 1890, Jour. Cin. Soc. Nat. Hist., vol. 13, p. 121. [Ety. proper name.] Carapace small, ovate, moderately convex; valves equal, their outline and general aspect much as in *Primitia*, but differing in having a simple or more or less divided prominent ridge on the posterior two-thirds, more or less curved. Type *J. crepiformis*.
- crassa*, Ulrich, 1890, Jour. Cin. Soc. Nat. Hist., vol. 13, p. 123, Trenton Gr.; *J. digitata* and *J. pedigera*, p. 122, Hud. Riv. Gr.
- crepiformis*, Ulrich, 1879, Jour. Cin. Soc. Nat. Hist., vol. 2, p. 10, Hud. Riv. Gr.
- KARLIA**, Walcott, 1888, Proc. U. S. Nat. Mus., p. 444. [Ety. from the Christian name Karl, which is a violation of all rules, and should be disregarded.] Form elongate-oval, convex; head longitudinally semicircular, deeply marked by the dorsal furrows; glabella clavate, broadly expanded in front, with or without faint glabellar furrows; occipital furrow well defined; fixed cheeks subtriangular; posterior furrow broad; eye lobe small; free cheeks narrow; hypostoma with a thick, rounded anterior margin that is extended into the large lateral wings, the sides of which extend one-half way back on the oval, convex body; posterior marginal rim strong, and separated from the body by a well-defined sulcus; thorax with seven segments; axis with a central spine on each segment; pleural lobes with a broad groove; anterior lateral ends of pleuræ faceted; pygidium short, transverse, four to five segments in the axis, lateral lobes slightly grooved; surface granulose. Type *K. minor*, described at the same place from the Up. Taconic, and also *K. stephenensis*.
- ISONYS**, Walcott, 1890, 10th Ann. Rep. U. S. Geo. Sur., p. 925. Carapace large; dorsal margin slightly curved; dorsal angles produced into sharp points; anterior and posterior ends alate, subequal in outline, and merging into the rounded ventral margin, without forming an angle; marginal rim narrow; valves equal; surface smooth. Type *I. chilhoweana*, Up. Taconic.
- KIRBYA**, Jones, 1859, Trans. Tyneside Nat. Field Club, vol. 4, p. 129. [Ety. proper name.] Carapace valves compressed, thick, oblong, impressed with a subcentral pit and raised into ridges, some concentric with the margin, associated sometimes with longitudinal wrinkles and by a reticulate ornament; valves suboblong, higher behind than before; extremities rounded, one more obliquely than the other; dorsal border straight, and its ends subacute; ventral border nearly straight in its middle third, and broadly curved at the ends; hinge simple; ventral edge of the dextral valve overlaps slightly that of the other. Subcentral pit variable. Type *K. permiana*.
- lindahli*, Ulrich, 1890, Jour. Cin. Soc. Nat. Hist., vol. 13, p. 207, St. Louis Gr., and *K. venosa*, p. 208, Kaskaskia Gr.; *K. parallela*, *K. semimuralis*, *K. subquadrate*, p. 192, Up. Held. or Ham. Gr. Mr. Ulrich also identifies *K. oblonga* and *K. tricollina*, Jones & Kirby, pp. 206 and 207, Kaskaskia Gr., and *K. costata*, McCoy, p. 208, St. Louis Gr.
- walcotti*, Jones, 1890, (*Primitia* (?) *walcotti*), Quar. Jour. Geo. Soc., vol. 46, p. 543, Ham. Gr.
- KLOEDENIA**, Jones & Holl, 1886, Ann. and Mag. Nat. Hist., ser. 5, vol. 17, p. 347. [Ety. proper name.] Carapace valves smooth, convex, impressed with two short, vertical furrows on the dorsal region, and a third smaller furrow defines a narrow semi-lune at the front end of the valve. Type *K. wilkensana*. *Beyrichia notata* and *B. notata* var. *ventricosa*, Hall, 1859, Pal. N. Y., vol. 3, pp. 379, 380, Low. Held. Gr., are referred by Jones to this genus.
- LEPERDITIA** was derived from a proper name. There is generally a tubercular eye-spot near the hinge, below and behind which there is a slight inflation and a vertical groove, extending from the dorsal margin part way across the valves.
- aequilatera*, *fimbriata*, *dorsicornis*, *granilirata*, *germana*, *millepunctata*, *inflata*, *mundula*, *sulcata*, and *tumida*, Ulrich, 1892, Am. Geol., vol. 10, pp. 264 to 269, Birdseye, Trenton, and Hud. Riv. Grs.
- appressa*, *L. caecigena* var. *frankfortensis*, *L. linneyi*, *L. tumidula*, Ulrich, 1890, Jour. Cin. Soc. Nat. Hist., vol. 13, pp. 174 to 177, Trenton Gr.; *L. nicklesi*, p. 200, Warsaw Gr.; *L. subrotunda*, p. 181, Up. Held. or Ham. Gr.
- balthica* var. *primæva*, *L. obscura*, Jones, 1891, Cont. to Micropal., p. 70, Trenton Gr.; *L. balthica* var. *guelphica*, *L. hisingeri* var. *egena*, var. *fabulina*, var. *gibbera*, *L. caeca*, *L. phaseolus* var. *guelphica*, *L. selwyni*, *L. whiteavesi*, pp. 80 to 89, Niagara and Guelph Gr.; *L. exigua*, p. 94, Devonian.
- canadensis* var. *nana*, syn. for *L. canadensis*.
- claypolei*, Jones, 1890, Quar. Jour. Geo. Soc., vol. 46, p. 25, Hud. Riv. Gr.
- crepiformis*, see *Jonesella crepiformis*.
- frontalis*, Jones, 1890, Quar. Jour. Geo. Soc., vol. 46, p. 547, Anticosti-Gr.

hisingeri, Schmidt, 1873, Mem. Acad. Imp. Sci. St. Petersburg, ser. 7, vol. 31, p. 16, Niagara Gr.

marginata, Schmidt, 1873, Mem. Acad. Imp. Sci. St. Petersburg, ser. 7, vol. 31, p. 19, Niagara Gr.

nana, syn. for *L. canadensis*.

parasitica, refer to *Beyrichia parasitica*.

phaseolus, Hisinger, 1831, Anteckn. Phys. Geogr., vol. 5, pp. 110 to 135, Niagara Gr.

punctulifera, see *Primitiopsis punctulifera*.
subcylindrica, Ulrich, 1889, Micropal. of Can., p. 49, Hud. Riv. Gr.

LEPIDOCOLEUS scales or plates are supposed to form the capitulum, (*caput*, head; applied to a barnacle, from its being supported on a peduncle,) but it has been suggested that they are the scales of the peduncle, and the capitulum is unknown.

LICHAS bicornis and *L. robbinsi*, Ulrich, 1890, Am. Geol., vol. 10, pp. 271 and 272, the first Hud. Riv. Gr.; and second Galena Gr.

chAMPLAINENSIS is from the Chazy Gr.

faberi is a synonym for *L. halli*. At the time of the publication of this book I was not aware of the publication of Foerste's species.

halli, Foerste, 1888, Bull. Denison Univ., vol. 3, p. 118, Hud. Riv. Gr.

MACROCARIS, S. A. Miller, 1892, Advance Sheets 18th Rep. Geo. Sur. Ind., p. 78. [Ety. *makros*, long; *karis*, shrimp.] Carapace bivalved, united dorsally with a strong ligament; valves long, narrow, and ornamented with anastomosing striæ; they are pointed on the dorsal side in front, and on the ventral side at the posterior end, while in the middle part the dorsal and ventral sides are subparallel; abdomen consisting of twelve or more segments, which

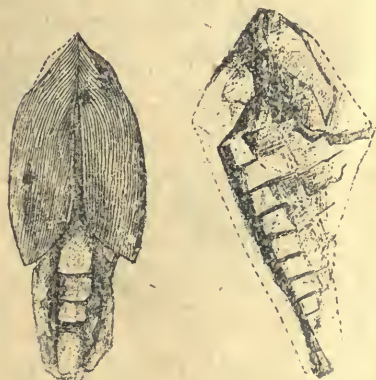


FIG. 1263.—*Macrocaris gorbyi*. Carapace valves, abdominal segments and postabdomen.

very slowly taper from the fourth or fifth to the postabdomen; postabdomen consisting of a short, expanding plate, with a central ridge or line of division.

The genus *Strigocaris* is known only from the carapace valves, and the posterior ends are subtruncated from the ventral side to the dorsal side, while in this genus the posterior ends of the valves are subtruncated from the dorsal to the ventral side. Type *M. gorbyi*, described at the same place from the Keokuk Gr.

MACROCYPRIIS, Brady, 1867, Intellectual Observer, vol. 12, p. 119. [Ety. *makros*, long; *Cypriis*, a genus.] Carapace subcylindrical or long triangular, and often Bairdia-like, generally elongate, attenuated at the extremities; valves thin, smooth, unequal, with beveled plates within the ends, more or less sinuate on the ventral margin, the right larger than the left, and overlapping dorsal hinge-line flexuous.

subcylindrica, Jones, 1890, Quar. Jour. Geo. Soc., vol. 46, p. 549, Anticosti, Gr.

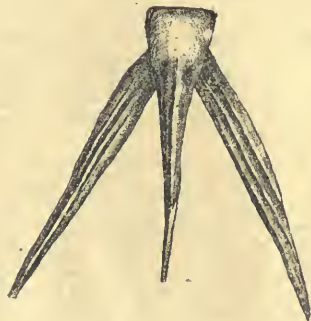


FIG. 1264.—*Mesothyra gurleyi*. Postabdomen.

MESOTHYRA gurleyi, S. A. Miller, 1892, Advance Sheets 18th Rep. Geo. Sur. Ind., p. 77, Kinderhook Gr.

MICRODISCUS bellimarginatus, Shaler & Foerste, 1888, Bull. Mus. Comp., p. 35, Up. Taconic.

helena, Walcott, 1889, Proc. U. S. Nat. Mus., vol. 12, p. 40, Up. Taconic.

MOOREA, Jones & Kirby, 1869, Ann. and Mag. Nat. Hist., ser. 4, vol. 3, p. 225. [Ety. proper name.] Carapace valves simple, thick, flattened, longer on the dorsal than the ventral margin, without any subcentral pit, and ornamented with narrow, rounded ridges, following more or less closely and completely the marginal contour. Type *M. silurica*.

bicornuta, Ulrich, 1890, Jour. Cin. Soc. Nat. Hist., vol. 13, p. 191, Ham. Gr.; and *M. granosa*, p. 206, Kaskaskia Gr. kirbyi, Jones, 1890, Quar. Jour. Geo. Soc., vol. 46, p. 542, Corniferous Gr.

NOTHOZOE was described in 1872, Syst. Sil. Boh., vol. 1, Supp., p. 536. Type *N. pollens*.

Octonaria, Jones, 1887, Ann. and Mag. Nat. Hist., ser. 5, vol. 19, p. 404. [Ety. *octonarius*, a, um, consisting of eight; an adjective.] If any regard to the

- rules of nomenclature is to be observed, such generic names must be disregarded. The characters ascribed to the genus are, probably, like other characters, ascribed by the same author to other genera, of no more than specific value. It would not be advisable, therefore, to propose a substantive name for the adjective. Ulrich defined four species, *curta*, *ovata*, *clavigera*, and *stigmata*, in *Jour. Cin. Soc. Nat. Hist.*, vol. 13, pp. 193 to 195; but it is only necessary to translate such names to show the absurdity. *Octonaria curta*, of eight short; *Octonaria ovata*, of eight ovate, etc. But the rules of nomenclature absolutely require a substantive for a generic name. If authors, who do not know how to distinguish an adjective from a noun, would consult some one who does before publishing their new generic names, we might be spared the trouble of indexing such work.
- OGYGORIS**, Walcott, 1888, *Proc. U. S. Nat. Mus.*, p. 446. [Ety. from resemblance to *Ogygia*.] Distinguished from *Ogygia* by having a well-defined ocular ridge and a narrow palpebral lobe. Type *O. klotzi*.
- klotzi*, instead of *Ogygia klotzi*.
- Oleicellus broygeri*, see *Elliptocephala broygeri*.
- OLENOIDES curticeii**, Walcott, 1888, *Proc. U. S. Nat. Mus.*, p. 443, Up. Taconic.
- desideratus* and *O. elli*, Walcott, 1890, 10th Ann. Rep. U. S. Geo. Sur., pp. 642, 644, Up. Taconic.
- PACHYDOMELLA**, Ulrich, 1890, *Jour. Cin. Soc. Nat. Hist.*, vol. 13, p. 197. [Ety. *pachys*, thick; *domus*, house; *ellus*, diminutive.] Carapace ventricose; valves thick and strong, the left much the largest, its thick edges overlapping the right valve on all sides; dorsal side strongly arched, ventral edge more nearly straight, ends subequal; a faintly impressed, subcentral umbilical pit. Type *P. tumida*, described at the same place from the Up. Held or Ham. Gr.
- PARADOXIDES walcotti**, Shaler & Foerste, 1888, *Bull. Mus. Comp. Zool.*, vol. 16, p. 36, Up. Taconic.
- PHACOPS** has the facial sutures uniting in front and abruptly curving from the eyes to the lateral margins. The hypostoma is convex and subtriangular.
- pulchella*, Foerste, 1887, *Bull. Denison Univ.*, vol. 2, p. 99, Niagara Gr.
- PILETHONIDES immaturus**, *P. occidentalis*, *P. spinosus*, Herrick, 1888, *Bull. Denison Univ.*, vol. 4, pp. 57 to 59, Waverly Gr.
- PHILLIPSIA** has a hypostoma longitudinally convex, winged antero-laterally, and terminating in an obtuse point behind. The type of the genus is *P. kellji* instead of *P. gemmulifera*.
- bufo*, refer to *Griffithides bufo*.
- consors, Herrick, 1888, *Bull. Denison Univ.*, vol. 4, p. 53, Keokuk Gr.
- nodocostata, Hare, 1891, *Kansas City Sci.*, vol. 5, p. 33, Up. Coal. Meas.
- portlocki*, refer to *Griffithides portlocki*.
- sampsoni*, Vogdes, 1888, *Trans. N. Y. Acad. Sci.*, vol. 7, p. 246, Keokuk Gr.
- præcursor, Herrick, 1888, *Bull. Denison Univ.*, vol. 3, p. 29, Waverly Gr.
- serraticandata, Herrick, 1888, *Bull. Denison Univ.*, vol. 4, p. 52, Coal Meas.
- shumardi*, Herrick, 1887, *Bull. Denison Univ.*, vol. 2, p. 69. Proposed instead of *Proctus missouriensis* of Shumard.
- trinucleata*, Herrick, 1887, *Bull. Denison Univ.*, vol. 2, p. 64, Coal. Meas.
- PLACENTULA**, Jones & Holl, 1886, *Ann. and Mag. Nat. Hist.*, ser. 5, vol. 17, p. 407. [Ety. *placentula*, a little cake.] Valves suborbicular, nearly semicircular on the ventral border, straight on the dorsal margin inside, but projecting with unequal and variable angles at the outer dorsal region; surface flat or slightly convex, surrounded by a raised rim, which slopes down suddenly outside the edge of the valve; this rim incloses a depressed and reticulated area, and in or near the antero-dorsal region there is a small depression defined by a raised, loop-like border. Type *P. excavata*.
- inornata*, and *P. marginata*, Ulrich, 1890, *Jour. Cin. Soc. Nat. Hist.*, vol. 13, p. 124, Hud. Riv. Gr.
- POLYCOPE**, Sars, 1865, *Översigt af Norges Marine Ostracoder*.
- sublenticularis*, Jones, 1890, *Quar. Jour. Geo. Soc.*, vol. 46, p. 550, Anticosti Gr.
- PONTOCYPRIS illinoisensis**, Ulrich, 1890, *Jour. Cin. Soc. Nat. Hist.* vol. 13, p. 107, Hud. Riv. Gr.; and *P. acuminata*, p. 210, Waverly Gr.
- PRIMITIA centralis**, *P. perminima*, Ulrich, 1890, *Jour. Cin. Soc. Nat. Hist.*, vol. 13, p. 130, Utica Slate; and *P. glabra*, *P. impressa*, *P. medialis*, *P. milleri*, *P. nodosa*, *P. rudis*, pp. 131 to 136, Hud. Riv. Gr.; and *P. nitida*, *P. sculptilis*, pp. 135, 136, Trenton Gr.; and *P. cestrinensis*, *P. cestrinensis* var. *caldwellensis*, *P. granimarginata*, *P. simulans*, and *P. subaquata*, pp. 201, 202, Kaskaskia Gr.
- clarkei*, Jones, 1890, *Quar. Jour. Geo. Soc.*, vol. 46, p. 535, Corniferous Gr.; *P. walcotti*, p. 543, Corniferous Gr.; *P. billingsi*, p. 547, Clinton Gr.; *P. seminulum*, p. 5, Ham. Gr.; *P. ulrichi*, and *P. whitfieldi*, pp. 6, 9, Utica Slate.
- lativia* and *P. parallela*, ulrich, 1889, *Micro-Pal. of Can.*, pp. 51, 52, Hud. Riv. Gr.
- minuta*, Eichwald, 1854, (Cypridina minuta,) *Bull. Imp. Soc. Nat. Moscow*, vol. 27, p. 99, Hud. Riv. Gr.
- mundula* var. *effusa*, Jones, 1891, *Cont. to Can. Micro Pal.*, p. 64, Chazy Gr.; and *P. incisa*, p. 64, Trenton Gr.; and *P. scitula*, p. 91, Devonian.
- PRIMITIOSIS**, Jones, 1887, *Sil. Ostrac. Goth-*

land, p. 5. [Ety. from the resemblance to Primitia.] Like Primitia externally, except that the anterior end has a specially smooth area, corresponding with an internal portion which is partitioned off from the rest of the cavity by a cross wall. Type *P. planifrons*.

punctulifera, Hall, 1860, (*Leperditia punctulifera*,) 13th Rep. N. Y. St. Mus. Nat. Hist., p. 92, Ham. Gr.

PROETUS determinatus, Foerste, 1887, Bull. Denison Univ., vol. 2, p. 91, Niagara Gr. *longicaudus*, Hall, synonym for *Phillipsia major*.

minutus, Herrick, 1888, Bull. Denison Univ., vol. 4, p. 56, Waverly Gr.

PTYCHOPARIA atleborensis, Shaler & Foerste, 1888, Bull. Mus. Comp. Zool., vol. 16, p. 39, Up. Taconic.

metisensis, Walcott, 1890, 10th Ann. Rep. U. S. Geo. Sur., p. 651, Up. Taconic.

mucronata, Shaler & Foerste, synonym for *Atops trilineata*.

Rusichnites, synonym for *Rusophycus* and *R. acadicus*; *R. carbonarius*, *R. clintonensis*, and *R. grenvillensis* should be referred to *Rusophycus*.

Sao, Barrande, 1846, Notice preliminaire, p. 13, and Syst. Sil. Boh., vol. 1, p. 382. [Ety. mythological name.] Body ovate, trilobation, marked; head subsemicircular; glabella prominent, well defined; dorsal furrows deep; three lateral furrows, between which are lobes in relief, separated on the summit by a longitudinal furrow; facial sutures cut the frontal border and arch outwardly to the anterior projections of the eyes, and the posterior branches arch in like manner to a point at the interior of the genal angle; the eye arch is prolonged in relief toward the front of the glabella; thorax seventeen segments; pygidium small, two articulations. Type *S. hirsuta*.

lamottensis is from the Chazy Gr.

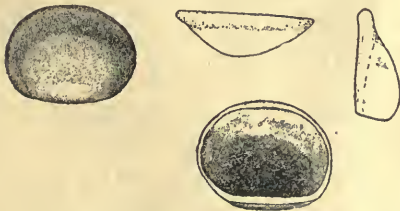


FIG. 1265.—*Schmidella crassimarginata* Interior and exterior views of right valve and anterior and ventral views, magnified 10 diameters.

SCHMIDTELLA, Ulrich, 1892, Am. Geo., vol. 10, p. 269. [Ety. proper name.] Carapace small, rounded, moderately convex and near *Aparchites* among the *Leperditidae*; valves inflated in the dorsal region, which projects shoulder-like over and out from a nearly straight hinge-line; right valve slightly the larger, its

ventral edge overlapping that of the left; no sulcus or tubercles. Type *S. crassimarginata*, described at the same place from the Birdseye limestone.

SOLENOCARIS having been preoccupied before Meek used it, Vogdes proposed *Strigocaris* in 1889, Ann. N. Y. Acad. Sci., vol. 5, p. 34.

SOLENOPLEURA bombifrons, Matthew, 1887, Trans. Roy. Soc. Can., vol. 4, p. 156, Up. Taconic.

harveyi and *S. howleyi*, Walcott, 1889, Proc. U. S. Nat. Mus., vol. 12, p. 45, Up. Taconic.

STREPULA, Jones & Holl, 1886, Ann. and Mag. Nat. Hist., ser. 5, vol. 17, p. 403. [Ety. diminutive of *strepia*, a stirrup, from the loop-like pattern of the ridges.]

Carapace valves slightly convex, suboblong, with rounded ends, or semielliptical, and bear narrow ridges that run into the slightly thickened dorsal margin; the intervening furrows form broad valleys, and a subcentral tubercle or lobular swelling is sometimes present; the chief ridge is a free supramarginal lamina, standing outward and downward, and hiding the real marginal edge in the side view; the edge of the bivalved carapace is narrow, ovate, cross-barred at the sides with ridges, some straight and parallel, some obliquely divergent. Type *S. concentrica*.

lunatifera, Ulrich, 1889, Micro-Pal. of Can., p. 56, Hud. Riv. Gr.

sigmoidalis and *S. plantaris*, Jones, 1890, Quar. Jour. Geo. Soc., vol. 46, pp. 11, 540, Ham. Gr.

Tetradella, Ulrich, 1890, Jour. Cin. Soc. Nat. Hist., vol. 13, p. 112. Carapace oblong or subquadrate, never tumid, hinge-line straight; surface depressed, a ridge follows the margin from the posterior to the antero-dorsal angle; in the inclosed space two narrow ridges traverse the valves in a vertical or oblique direction from the dorsal edge, to the posterior half of the ventral portion of the sub-marginal ridge, uniting with it; the union of these ridges is supposed to be the most significant character of the genus. Type *T. quadrilirata*, which is a straight synonym for *Beyrichia regularis* of Emmons. Mr. Ulrich refers to this genus *Beyrichia oculifera* and *B. chambersi*. I do not agree with him in respect to the genus, or in what he esteems the important characters.

subquadrans, Ulrich, 1890, Jour. Cin. Soc. Nat. Hist., vol. 13, p. 115, Trenton Gr.

TURILEPAS canadensis, Woodward, 1889, Lond. Geo. Mag., 3d ser., vol. 6, p. 274, Utica slate.

ULRICHIA, Jones, 1890, Quar. Jour. Geo. Soc., vol. 46, p. 543. [Ety. proper name.] In form like *Primitia*, except there is no sulcus across the valves, but instead a tubercle on each side of the position in which the sulcus occurs in *Primitia*; a

very weak generic distinction. Type *U. conradi*, described at the same place from Theford, Canada.
confluens and *U. emarginata*, Ulrich, 1890,

Jour. Cin. Soc. Nat. Hist., vol. 13, p. 203, Kaskaskia Gr.
Zacanthoides entoni, Walcott. Not defined.

CLASS ARACHNIDA.

IN this Class (*arachne*, a spider,) the body is divided into segments, some of which are provided with articulated appendages, and a pair of ganglia is developed in each somite. The integument is hardened with chitine. The segments of the head and thorax are united, generally, into a cephalothorax. Instead of antennæ there are chelicere (*chela*, a claw; *keras*, a horn,) or mandibles (*mandibulum*, a jaw.) There are maxillæ (*maxilla*, jaws,) carrying long jointed maxillary palpi, (*palpo*, I feel.)

ARCHITARBUS elongatum, Scudder, 1890, Mem. Bost. Soc. Nat. Hist., vol. 4, p. 449, Coal Meas.
rotundatus, read *A. rotundatum*.

GERATARBUS lacoei and *G. scabrum*, Scudder, 1890, Mem. Bost. Soc. Nat. Hist., vol. 4, p. 448, Coal Meas.

GRÆPHONUS carbonarius, Scudder, 1890, Mem. Bost. Soc. Nat. Hist., vol. 4, p. 454, Coal Meas. This is Fig. 1074, on page 575, over the name *Archinylaeris acadicum*.

KUSTARACHNE tenuipes, Scudder, 1890, Mem. Bost. Soc. Nat. Hist., vol. 4, p. 450, Coal Meas.

CLASS MYRIOPODA.

THIS Class (*myrios*, countless; *podes*, feet,) has the mouth on the under side, provided with mandibles and maxillæ. The head bears a pair of antennæ,

ACANTHERPESTES inequalis, Scudder, 1890, Mem. Bost. Soc. Nat. Hist., vol. 4, p. 424, Coal Meas.

AMYNILYSPES, instead of *Amynilipes*.

ARCHILUS glomeratus, Scudder, 1890, Mem. Bost. Soc. Nat. Hist., vol. 4, p. 436, Coal Meas.

EILETICUS aqualis, Scudder, 1890, Mem. Bost. Soc. Nat. Hist., vol. 4, p. 421, Coal Meas.

EUPHOBERIA cuspidata, Scudder, 1890, Mem. Bost. Soc. Nat. Hist., vol. 4, p. 426, Coal Meas.

granosa is represented by Fig. 1072.

hystricosa, Scudder, 1890, Mem. Bost. Soc. Nat. Hist., vol. 4, p. 426, Coal Meas.

simplex, Scudder, 1890, Mem. Bost. Soc. Nat. Hist., vol. 4, p. 426, Coal Meas.

spinulosa, Scudder, 1890, Mem. Bost. Soc. Nat. Hist., vol. 4, p. 430, Coal Meas.

tracta, Scudder, 1890, Mem. Bost. Soc. Nat. Hist., vol. 4, p. 433, Coal Meas.

ILYODES divisa and *I. elongata*, Scudder, 1890, Mem. Bost. Soc. Nat. Hist., vol. 4, p. 422, Coal Meas.

LATZELIA primordialis, Scudder, 1890, Mem. Bost. Soc. Nat. Hist., vol. 4, p. 419, Coal Meas.

PALENARTHUS impressus, Scudder, 1890, Mem. Bost. Soc. Nat. Hist., vol. 4, p. 422, Coal Meas.

XYLOBUS frustulentus, Scudder, 1890, Mem. Bost. Soc. Nat. Hist., vol. 4, p. 438, Coal Meas.

CLASS INSECTA.

THERE are six principal veins in typical wings arising from the anterior and posterior root, named as follows: The anterior vein at the margin of the wing is the marginal vein; this is followed by the mediastinal and scapular veins, that cut the

anterior margin toward the extremity of the wing; the externomedian vein is directed toward the tip of the wing, and the internomedian and anal veins terminate in the posterior margin of the wing.

- ARCHÆOSCOLEX corneus, Matthew, 1889, Trans. Roy. Soc. Can., vol. 4, p. 59, Low. Devonian.
- ARCHIMYLACRIS acadica is represented by Fig. 1075. Read *A. parallela* for *A. parallellum*.
- paucinervis, Scudder, 1890, Mem. Bost. Soc. Nat. Hist., vol. 4, p. 411, Coal Meas.
- ENCÆNUS, read *Eucænus* on p. 576, and in the Index on p. 658.
- EPHEMERITES affinis, *E. gigas*, *E. primordialis*, and *E. simplex*, are probably not insects. Some of them are plants.
- ETOBLETTINA mazona, instead of *E. mazonana*.
- occidentalis, Scudder, 1890, Mem. Bost. Soc. Nat. Hist., vol. 4, p. 410, Coal Meas.
- LITHOMYLACRIS is feminine, and read *L. angusta* and *L. pittstonana* for *L. angustum* and *L. pittstonanum*.
- pauperata, Scudder, 1890, Mem. Bost. Soc. Nat. Hist., vol. 4, p. 409, Coal Meas.
- MYLACRIS is feminine, and read *M. anthracophila*, *M. antiqua*, *M. bretonensis*, *M. lucifuga*, *M. ovalis*, *M. pennsylvanica*, instead of *anthracophilum*, *antiquum*, *bretonense*, *lucifugum*, *ovale*, and *pennsylvanicum*.
- NECYMYLACRIS is feminine; read *N. lacoana* for *N. lacoanum*.
- PAROMYLACRIS is feminine; read *P. rotunda* for *P. rotundum*.
- ampla, Scudder, 1890, Mem. Bost. Soc. Nat. Hist., vol. 4, p. 408, Coal Meas.
- PROMYLACRIS is feminine; read *P. ovalis* for *P. ovale*.
- rigida and *P. testudo*, Scudder, 1890, Mem. Bost. Soc. Nat. Hist., vol. 4, p. 403, Coal Meas.
- TITANOPHASMA, Brongniart, 1882, Comptes rend. Acad. 95, 1228, instead of *Titanophama* on page 581. The Type is *T. fayoli*.

SUBKINGDOM VERTEBRATA.

CLASS PISCES.

THE work by Agassiz, "Recherches sur les Poissons fossiles"—(Text,) Tome 1-5; (Atlas,) Tome 1-5—was published in parts from 1833 to 1844, and very irregularly. The copy in the Public Library at Cincinnati does not show when published. Woodward & Sherborn, in "A Catalogue of British Fossil Vertebrata, 1890," have published the dates at which each plate and part of the text was published. The list covers about five pages. From this list of dates I make the following corrections: *Acanthodes*, 1833; *Acrolepis*, 1834; *Ceratodus*, 1838; *Chirolepis*, 1835; *Chomatodus*, 1838; *Cocosteus*, 1842; Rep. Brit. Assoc., p. 85, *Cochliodus*, 1838; *Ctenodus*, 1838; *Ctenacanthus*, 1837; *Ctenoptychius*, 1838; *Glyptolepis*, 1843; *Gyracanthus*, 1837; *Helodus*, 1838; *Holoptychius*, 1838, Murch. Sil. Syst., p. 599, type *H. nobilissimus*; *Oracanthus*, 1837; *Orodus*, 1838; *Palæoniscus*, Blainville, 1818, Dict. Hist. Nat., vol. 27, p. 320; *Physonemus*, named but not described until 1855, Brit. Pal. Foss., p. 638; *Platysomus*, 1835; *Pleuracanthus*, 1837; *Pœcilodus*, named but not described until 1855, Brit. Pal. Foss., p. 638; *Psephodus* was described by Morris & Roberts; *Pterichthys*, 1843; *Pygopteris*, 1834, type *P. mandibularis*.

- ACANTHODES semistriatus, Woodward, 1892, Geo. Mag., vol. 9, p. 3, Low. Devonian.
- Acantholepis*, Newberry, 1875, was preoccupied by Mayer in 1861 in Hymenoptera. See *Eczematolepis*.
- Actinophorus*, Newberry, 1889, Pal. Fish N.

- Am., p. 174. The name was preoccupied by Creutz in 1799. See *Tegeolepis clarkii*, see *Tegeolepis clarkii*.
- ANTLIODUS arcuatus, Newberry, 1889, Pal. Fish N. Am., p. 208, St. Louis Gr.
- ASTEROPYCHIUS elegans, Newberry, 1889, Pal. Fish N. Am., p. 176, Waverly Gr.

- BOTHROLEPIS leidyi**, Newberry, 1889, Pal. Fish N. Am., p. 111, Catskill Gr.; and B. minor, p. 112, Chemung Gr.
- CALLOGNATHUS**, Newberry, 1889, Pal. Fish N. Am., p. 69. [Ety. *kallos*, beautiful; *gnathos*, jaw.] Small fishes, of which only the mandibles are known; these are from one to three inches in length; the posterior end of the dentary bone flat, thin, spatulate, smooth; the anterior half narrower, thicker, and ornamented; the upper edge closely set with numerous subequal, conical, obtuse, blunt-pointed teeth. Type *C. regularis*, described at the same place from the Huron Shale, as well as *C. serratus* from the Cleveland Shale.
- Carcharopsis* was not defined by Agassiz, and the forms subsequently defined under that name belong to *Dierenodus*.
- Cephalaspis laticeps* and *C. campbelltonensis*, Traquair, 1890, Lond. Geo. Mag., 3d ser., vol. 7, p. 16. Not defined so as to be recognized.
- CLADODUS curinatus**, Newberry, 1889, Pal. Fish N. Am., p. 103. Too poorly defined to warrant recognition; beside the name was preoccupied.
- kepleri*, Newberry, 1889, Pal. Fish N. Am., p. 103, and *C. terrelli*, p. 170, and *C. tumidus*, p. 172, Cleveland Shale.
- CELOSTEUS**, Newberry, 1889, Pal. Fish N. Am., p. 188. [Ety. *koilos*, hollow; *osteon*, bone.] Fishes of large size allied to *Dendrodus* and *Rhizodus*; only a coracoid, mandible, and tooth are known. The bones consist of a thin shell of dense osseous tissue inclosing large cavities, once doubtless filled with cartilage; the coracoid is about a foot in length and an inch and a half in diameter at the middle, and the central cavity is as large, relatively, as in the long bones of birds, the shell which surrounded it being but from one-eighth to one-quarter of an inch in thickness; the dentary bone is about one foot in length, two and a half inches wide in the middle, where it is one and a quarter inches in thickness, and four inches wide at the posterior end, where it was doubtless joined to the angular and articular elements; on the outside the posterior half is excavated to form a deep sulcus for the reception of the motor muscle; on the inside the jaw is flattened and gently arched downward to the rounded lower edge; the upper side bears on the outside a subacute toothless ridge; within and below this is a wide shoulder with seven broad, shallow pits, in which were planted the rounded bases of the teeth; teeth strong, conical, straight, acute and smooth above, plicated below; complicated interior structure as in *Dendrodus*. Type *C. ferox*, described at the same place from Carboniferous rocks.
- CTENACANTHUS angustus**, Newberry, 1889, Pal. Fish N. Am., p. 181, Berea Grit; and *C. clarkii*, and *C. compressus*, p. 168, Cleveland Shale; and *C. cylindricus*, p. 202, Keokuk Gr.; and *C. littoni*, p. 201, St. Louis Gr.; and *C. randalli*, p. 105, Olean conglomerate. And he refers *C. parvulus* to *Hoplonchus*, a genus established by Davis in 1875, in Quar. Jour. Geo. Soc. Lond., with *H. elegans* as the type. See p. 169.
- CTENODUS wagneri**, Newberry, 1889, Pal. Fish N. Am., p. 172, Cleveland Shale.
- DIERENODUS**, Romanofsky, 1853, Bull. Soc. Imp. Moscou, p. 408. This name has priority over *Carcharopsis*, which was not defined by Agassiz, nor by any other one until 1883, and it has priority over *Pristicladodus*, both of which names Woodward & Sherborn say are synonyms.
- Dinichthys*, Newberry, 1873, Ohio Pal. vol. 1, p. 313. This name was preoccupied by Hitchcock, among the fishes, in 1868. See *Ponerichthys*.
- corrugatus*, *D. curtus*, *D. gouldi*, *D. hertzeri*, *D. intermedius*, *D. minor*, *D. precursor*, *D. terrelli*, *D. tuberculatus*. See *Ponerichthys*.
- Diplodus* was preoccupied in 1810, by Rafinesque, for a genus of Sparidae, before Agassiz used the word. See *Dissodus*.
- acinaces*, *D. compressus*, *D. gracilis*, *D. latus*, *D. penetrans*, *D. problematicus*. See *Dissodus*.
- DIPLOGNATHUS**, Newberry, 1878, Ann. N. Y. Acad. Sci., vol. 1, p. 188, and Pal. Fish N. Am., p. 159. [Ety. *diploos*, double; *gnathos*, the jaw.] Dentary bones long and slender, flattened, straight, spatulate behind, were originally covered with cartilage; anterior and exposed portions rising into points which diverge from the symphysis, giving a forked extremity to the lower jaw; conical acute teeth formed from the jaw tissue are set along the outer margin of the mandibles and on the inside of the divergent extremities beyond the symphysis; the teeth are recurved, and formed a kind of forked rake; a deep pit in each dentary bone marks the point of insertion of a powerful ligament, which bound the rami together and prevented splitting. Type *D. mirabilis*, which was described at the same place from the Cleveland Shale.
- DIPTERUS flabelliformis**, *D. levis*, *D. minutus*, *D. nelsoni*, *D. radiatus*, Newberry, 1889, Pal. Fish N. Am., pp. 89 to 119, Chemung Gr.
- DISSODUS** n. gen. [Ety. *dissos*, double; *odous*, tooth.] Proposed for *Diplodus*, Agassiz, 1843, Recherches sur les Poissons Fossiles, t. 3, p. 204, which name was preoccupied. The type is *D. gibbosus*, and the American species are *D. acinaces*, *D. compressus*, *D. gracilis*, *D. latus*, *D. penetrans*, *D. problematicus*, Woodward, (*Diplodus problematicus*.) 1892, Geo., Mag., vol. 9, p. 2, Low. Devonian.

- ECZEMATOLEPIS**, n. gen. [Ety. *eczema*, a cutaneous eruption; *lepis*, scale.] Proposed for *Acantholepis*, Newberry, 1875, Ohio Pal., vol. 2, p. 38, which name was preoccupied. The type is *E. pustulosa*, Newberry, 1875, (*Acantholepis pustulosa*,) Ohio Pal., vol. 2, p. 38, Up. Held. Gr.
- Eurylepis**, Newberry, 1856, Proc. Acad. Nat. Sci. Phil., and Ohio Pal., vol. 1, p. 350. This name was preoccupied by Blyth, among the reptiles, in 1854. See *Haplolepis*.
- corrugata*, *E. granulata*, *E. insculpta*, *E. lineata*, *E. minima*, *E. ornatissima*, *E. ovoidea*, *E. striolata*, *E. tuberculata*. See *Haplolepis*.
- GAMPHACANTHUS**, n. gen. [Ety. *gamphos*, bent; *akantha*, spine.] Proposed for *Heteracanthus*, Newberry, 1889, Pal. Fish. N. Am., p. 65, which name was preoccupied. Pectoral (?) spines eight inches or more in length, robust, with a posterior opening reaching to or near the summit; base compressed, one and a half inches wide, obliquely rounded below; shaft curved forward, regularly arched transversely, covered with highly polished enamel, and marked by fine denticulate, longitudinal sutures, which divide the surface into broad, nearly equal bands or flattened ridges; the sutures are most numerous below, but terminate in succession above, so that few reach the conical pointed summit. Type *G. politus*.
- politus*, Newberry, 1889, (*Heteracanthus politus*,) Pal. Fish. N. Am., p. 66, Ham. Gr.
- GANORHYNCHUS**, Traquair, 1873, Lond. Geo. Mag., vol. 10, p. 552. [Ety. *ganos*, brightness; *rhynchos*, beak.] This genus was founded on the fragment of a snout 1½ inches long and 3 inches wide, supposed to belong to a fish 4 or 5 feet long. The country from which it came and its geological age are wholly unknown. Type *G. woodwardi*.
- becheri*, Newberry, 1889, Pal. Fish. N. Am., p. 95, Chemung Gr.
- GLYPTASPIS**, Newberry, 1889, Pal. Fish. N. Am., p. 157. [Ety. *glyptos*, sculptured; *aspis*, shield.] Placoderm fishes of large size, protected by thick bony plates, of which those of the plastron were probably 5 in number; the middle one is lance-shaped or subrhomboidal, its central portion tuberculated, its margins sloped off and smoothed or striated by the overlap of the lateral ventral plates. The upper part of the body carried a number of lanceolate or ellipsoidal plates, of which the central parts are ornamented, the margins smooth and sloped down to thin edges; other parts unknown. Type *G. verrucosa*.
- verrucosa*, Newberry, 1889, Pal. Fish. N. Am., p. 158, Cleveland Shale.
- GLYPTOPOMUS**, Agassiz, 1844, Monographie des Poissons fossiles du Vieux Gres Rouge ou Systeme Devonien des Iles Britanniques et de Russie, p. 77. Type *G. minor*, of which Huxley figured and described nearly an entire specimen in 1866, in Brit. Organic Remains, dec. 12, (Mem. Geo. Sur.,) p. 4.
- sayrei*, Newberry, 1878, Ann. N. Y. Acad. Sci., vol. 1, p. 189, and Pal. Fish. N. Am., p. 116, Catskill Gr.
- Goniodus**, Newberry, 1889, Pal. Fish. N. Am., p. 67. This name was twice preoccupied, first by Agassiz in 1836, and by Dunker, in 1848, in the mollusca. See *Xenodus hertzeri*, Newberry, 1889, see *Xenodus hertzeri*.
- GORGONICHTHYS**, Claypole, 1892, Am. Geo., vol. 10, p. 1. [Ety. *Gorgon*, mythological name; *ichthys*, fish.] Founded upon the lower left mandible, which is similar to that in *Ponerichthys*, and the point of a premaxillary tooth, behind which there is a tooth terminating downward in two blunt processes, the larger one in front, which distinguishes it from the upper cutting blade in *Ponerichthys*. Type *G. clarki*, described at the same place from the Cleveland Shale.
- GYRACANTHUS incurvus**, Traquair, 1890, Geo. Mag., vol. 7, p. 21, Low. Devonian.
- sherwoodi*, Newberry, 1889, Pal. Fish. N. Am., p. 119, Catskill Gr.; and *G. inornatus*, p. 177., Waverly Gr.
- HAPLOLEPIS**, n. gen. [Ety. *haplos*, simple; *lepis*, scale.] Proposed for *Eurylepis*, Newberry, 1856, Proc. Acad. Nat. Sci. Phil., and Ohio Pal., vol. 1, p. 350. Type *H. tuberculata*, Newberry, 1856, (*Eurylepis tuberculata*,) Proc. Acad. Nat. Sci., and Ohio Pal., vol. 1, p. 350, Coal Meas. The species are *H. corrugata*, *H. granulata*, *H. insculpta*, *H. lineata*, *H. minima*, *H. ornatissima*, *H. ovoidea*, *H. striolata*, *H. tuberculata*.
- HARPACANTHUS**, Traquair, 1886, Ann. and Mag. Nat. Hist. A sickle-shaped spine, with *H. fimbriatus*, from Scotland, as the type. Cited by Newberry in Pal. Fish. N. Am., p. 203.
- Heteracanthus*, Newberry, 1889, Pal. Fish. N. Am., p. 65. The name was preoccupied in 1836 by Diesing, among the Vermes. See *Gamphacanthus politus*, Newberry, see *Gamphacanthus politus*.
- HOLONEMA**, Newberry, 1889, Pal. Fish. N. Am., p. 92. [Ety. *holos*, entire; *nema*, thread.] A placoderm fish of medium size, having the body inclosed in armor made up of polygonal plates, of which the external surface is entirely covered by radiating lines of enamel; the central plate of the plastron is coffin shaped, pointed before, broadest near the anterior end, where the sides are produced into prominent lateral angles; from this point backward it narrows to a truncated end, which is half as wide as the greatest

- breadth. Other parts unknown. Type *H. rugosum*.
rugosum, Claypole, 1883, (*Pterichthys rugosa*.) Proc. Am. Phil. Soc., vol. 20, p. 664, Chemung Gr.
- HOLOPTYCHUS** *granulatus*, *H. pustulosus*, *H. tuberculatus*, Newberry, 1889, Pal. Fish N. Am., pp. 100, 101, Chemung Gr.; and *H. halli* and *H. radiatus*, pp. 114, 115, Catskill Gr.
- ICANODUS**, n. gen. [Ety. *ikanos*, befitting; *odus*, tooth.] Proposed for *Tomodus*, Agassiz, MSS. and St. John & Worthen, 1883, Geo. Sur. Ill., vol. 7, p. 171, which name was preoccupied among the fishes by Trautschold, in 1879. Type *I. limitaris*.
limitaris, St. John & Worthen, 1883, (*Tomodus limitaris*.) Geo. Sur. Ill., vol. 7, p. 173, Up. Burlington Gr.
- JANASSA** has for its type *J. bituminosa*.
- LABODUS** *marginalis*, Newberry, 1889, Pal. Fish N. Am., p. 198, St. Louis Gr. The genus *Labodus* was not defined by Agassiz. Davis used it in 1883, but in 1889, Woodward & Sherborn classed it as a synonym for *Copodus*. The species illustrated by Newberry will belong to some other genus, probably not yet defined.
- LIIGNATHUS**, Newberry, 1873, Ohio Pal., vol. 1, p. 306. The name was preoccupied among the fishes by Laepepe, in 1802. See *Lispognathus*.
spatulatus, see *Lispognathus spatulatus*.
- LISPOGNATHUS**, n. gen. [Ety. *lispos*, smooth; *gnathos*, jaw.] Proposed for *Liognathus*, Newberry, 1873, Ohio Pal., vol. 1, p. 306, which name was preoccupied. Type *L. spatulatus*.
spatulatus, Newberry, 1873, (*Liognathus spatulatus*.) Ohio Pal., vol. 1, p. 306, Up. Held. Gr.
- MAZODUS**, Newberry, 1889, Pal. Fish N. Am., p. 178. [Ety. *maza*, a barley-cake; *odus*, tooth.] Teeth of Elasmobranch or Selachian fishes, often of large size, thick and massive, with an ovoid, elliptical, or angular outline; upper surface arched in both directions, smooth or finely granulated; under surface concave, coarsely pitted, and variously furrowed and lobed; sides marked by irregular, often pustulous ridges; interior similar throughout, showing irregular, vertical, calcigerous tubes or columns closely compacted into a dense, hard, and enamel-like tissue; mandibles 7 to 8 inches long, and 1½ inches to 1½ inches wide. Type *M. kepleri*.
kepleri, Newberry, 1889, Pal. Fish N. Am., p. 180, Cuyahoga Shale.
- MILLERICHTHYS**, n. gen. Proposed for *Pterichthys*, Agassiz, 1843, Poiss. Foss., vol. 2, p. 302, which name was preoccupied among the fishes by Swainson, in 1839. [Ety. the name is proposed in honor of Hugh Miller, who was really the first to fully characterize and illustrate the genus in his work on "The Old Red Sandstone." Type *M. milleri*. It is doubtful whether or not this genus is represented in North America.
- MVLOSTOMA**, Newberry, 1883, Trans. N. Y. Acad. Sci., vol. 2, p. 146, and Pal. Fish N. Am., p. 161. [Ety. *mulos*, a grinder; *stoma*, mouth.] Teeth consist of strong and massive tables of bony tissue, becoming more dense and enamel-like toward the triturating surface; they apparently formed several pairs on both the upper and lower jaws; the principal plates of the lower jaw had long oval or spatulate crowns, 3 to 6 inches in length by 1 to 2 inches wide, and half an inch or more in thickness, supported by strong, vertical, spatulate bones, which projected downward and backward, terminating posteriorly in thin, rounded margins. The upper surface of the crown is raised into a more or less prominent tubercle, which is situated near the exterior margin, and slightly anterior to the middle; another pair are triangular in outline; the dental plates of the upper jaw are tabular and consist of very dense tissue. Type *M. variabile*.
terrelli, *M. variabile*, Newberry, 1883, Trans. N. Y. Acad. Sci., vol. 2, p. 146, and Pal. Fish N. Am., p. 164, Cleveland Shale.
- SPHENOPHORUS**, n. gen. Proposed for *Sphenophorus*, Newberry, 1889, Pal. Fish N. Am., p. 92, which name was preoccupied by Schoenherr, in 1838, among the Coleoptera. [Ety. *oistos*, an arrow; *phoros*, bearing.] The clavicle is a flattened bone, 6 inches or more in length by 1½ inches in width at the middle, narrowing to either end; the anterior margin strongly reflexed; the exterior surface is marked by many rows of relatively large arrowhead-like tubercles, closely set one behind the other, the points directed forward; other parts unknown. Type *O. lilleyi*.
lilleyi, Newberry, 1889, (*Sphenophorus lilleyi*.) Pal. Fish N. Am., p. 92, Chemung Gr.
- ONYCHODUS** *ortoni*, Newberry, 1889, Pal. Fish N. Am., p. 71, Ham. Gr.
- PETALORHYNCHUS**, Agassiz, MSS. only, Newberry & Worthen, 1866, Geo. Sur. Ill., vol. 2, p. 32.
- PHANEROPLEURON**, Huxley, 1859, Anderson's Dura. Den., p. 67. Type *P. andersoni*.
- PHÆBODUS** *politus*, Newberry, 1889, Pal. Foss. N. Am., p. 173, Cleveland Shale.
- PHYLLOLEPIS**, Agassiz, 1844, Poiss. Foss. Vieux Gres Rouge, etc., p. 67. [Ety. *phyllon*, a leaf; *lepis*, scale.] Thin, more or less elliptical scales. Type *P. concentricus*.
delicatula, Newberry, 1889, Pal. Fish N. Am., p. 97, Chemung Gr.

- PHYSONEMUS altonensis*, see *Stethacanthus altonensis*.
stellatus, Newberry, 1889, Pal. Fish N. Am., p. 200, St. Louis Gr.
- PONERICHTHYS**, n. gen. [Ety. *poneros*, wicked; *ichthys*, a fish.] Proposed for *Dinichthys*, Newberry, 1873, Ohio Pal., vol. 1, p. 313, and vol. 2, p. 3, which was preoccupied among the fishes by Hitchcock, in 1868. Type *P. terrelli*.
corrugatus, *P. curtus*, *P. gouldi*, *P. intermedius*, *P. minor*, Newberry, 1889, Pal. Fish N. Am., pp. 149 to 156, Cleveland Shale.
hertzeri, Newberry, 1873, (*Dinichthys hertzeri*.) Ohio Pal., vol. 1, p. 316, Portage Gr.
præcursor, Newberry, 1889, Pal. Fish N. Am., p. 51, Corniferous Gr.
terrelli, Newberry, 1873, (*Dinichthys terrelli*.) Ohio Pal., vol. 1, p. 313, and vol. 2, p. 3, Portage Gr.
tuberculatus, Newberry, 1889, Pal. Foss. N. Am., p. 98, Chemung Gr.
- Pristicladodus* is said to be a synonym for *Dicrenodus*, by Woodward & Sherborn.
- PRISTODUS**, Agassiz, MSS. only, Davis, 1883, Trans. Roy. Soc. Dub., vol. 1, p. 519.
- PROTODUS**, Woodward, 1892, Lond. Geo. Mag., vol. 9, p. 1. [Ety. *protos*, first; *odus*, tooth.] A Selachian tooth; dental crown consists of a single robust, solid, conical cusp, invested with gano-dentine; root large, undivided, laterally expanded and antero-posteriorly compressed. Type *P. jexi*, described at the same place from the Low Devonian.
- Pterichthys* was preoccupied by Swainson among the fishes in 1839. See *Millerichthys*.
rugosus, see *Holonema rugosum*.
- RHIZODUS anceps**, Newberry, 1889, Pal. Fish N. Am., p. 191, St. Louis Gr.
- RHYNCHODUS greenei**, Newberry, 1889, Pal. Fish N. Am., p. 51, Ham. Gr.
- Sphenophorus*, Newberry, 1889, Pal. Fish N. Am., p. 92. The name was preoccupied among the Coleoptera, by Schoenherr, in 1838. See *Oestophorus*.
- STETHACANTHUS**, Newberry, 1889, Pal. Fish N. Am., p. 198. [Ety. *stethos*, the breast; *akantha*, a spine.] Pectoral spines of medium or large size, unsymmetrical, (rights and lefts,) broadly falcate in outline, the conical summit compressed, with anterior and posterior margins rounded; below the solid summit the posterior margin is opened by a deep sulcus, of which the walls, of unequal thickness, terminate posteriorly in thin and fragile edges; anterior border gently concave, about one third its length from the base rising into a strong, often tumid, shoulder; basal portion narrow and compressed, terminating in a cartilaginous condyle for articulation. In life the posterior sulcus was occupied by the base of the pectoral fin. Type *S. altonensis*, St. John & Worthen, 1875, (*Physonemus altonensis*.) Geo. Sur. Ill., vol. 6, p. 454, St. Louis Gr.
- tumidus*, Newberry, 1889, Pal. Fish N. Am., p. 198, Berea Grit.
- TEGEOLEPIS**, n. gen. [Ety. *tegeos*, a roof; *lepis*, scale.] Proposed for *Actinophorus*, Newberry, 1889, Pal. Fish N. Am., p. 174, which was preoccupied among the Coleoptera, by Creutz, in 1799. Tile-scaled ganoids, of medium or large size, long and slender; body cylindrical; head pointed, bony; teeth numerous, conical, acute; fins without fulcra, delicate, many-rayed; scales narrow, quadrangular, thin. Type *T. clarkii*.
clarkii, Newberry, 1889, (*Actinophorus clarkii*.) Pal. Fish N. Am., p. 175, Cleveland Shale.
- TITANICHTHYS**, Newberry, 1889, Pal. Fish N. Am., p. 130. [Ety. mythological name; *ichthys*, a fish.] Cranium of more gigantic size than that of *Ponerichthys*, being about 4 feet broad at the occiput, 3 feet or more in length, triangular in outline, and marked by incised lines; supra-scapulas or supra-clavicles rhomboidal or trapezoidal in outline, from 15 to 20 inches in diameter; clavicles 2 feet in length by eight inches in breadth, turned forward and narrowed at the lower end; mandibles 2 or 3 feet in length, subcylindrical or subtriangular rods curved upward anteriorly and furrowed like a gouge. Type *T. agassizi*, which, with *T. clarkii*, is described at the same place from the Cleveland Shale.
- Tomodus*, Agassiz, MSS., and St. John & Worthen, 1883, Geo. Sur. Ill., vol. 7, p. 171, was preoccupied among the fishes by Trautschold, in 1879. See *Icanodus limitaris*, see *Icanodus limitaris*.
- TRACHOSTEUS**, Newberry, 1889, Pal. Fish N. Am., p. 166. [Ety. *trachys*, rough; *osteon*, a bone.] Placoderm fishes inclosed in defensive armor, consisting of a number of large, but relatively thin, bony plates, of which the outer enameled surface is thickly set with high conical tubercles, that are acute, rounded, or cupped at the summit; the spaces between these tubercles are radiately lined; under jaws consisted of cartilaginous, angular, and articular parts with dense bony dentary portions; dental bones straight, posterior end spatulate, anterior third or exposed part carries a row of slender, conical, acute teeth along its upper margin; premaxillaries subtriangular in outline, anterior face arched, and terminating below in an acute point; posterior edge horizontal, and carrying slender, pointed teeth, which matched with a portion of those of the mandible; eye orbits relatively large and round, encircled by a ring composed of four sclerotic plates, those on one side narrower than the others;

surface in part tuberculated. Type *T. clarkii*, which is described at the same place from the Cleveland Shale.

XENODUS, n. gen. [Ety. *xenos*, strange; *odous*, tooth.] Proposed for *Goniodus*, Newberry, 1889, Pal. Fish. N. Am., p. 67, which was preoccupied among the fishes, by Agassiz, in 1836, and among the Mollusca by Dunker, in 1848. Teeth numerous, composing a roughened pavement, small, variable in size and

form; generally subtriangular in outline, depressed, with the central portion elevated into an obtuse angular ridge of denser tissue, and having a polished surface; other portions of the crown and the lateral margins roughened by a vermicular pitted or corrugated marking; the lower surface rough and bone-like. Type *X. hertzeri*, which was described at the same place from the Ham. Gr.

CLASS BATRACHIA.

CERATERPETON, Huxley, 1867, Trans. Roy. Irish Acad., vol. 24, p. 354. Type *C. galvani*.

GLOSSARY.

ERRATA.

Altilis, e—Fattened, instead of flattened.
 Coriformis, e—Heart-shaped, instead of like *Coris*.
 Craticulus, instead of *Cratiulus*.
 Eugenium, noble; instead of *Euginum*, fertile.

Macronotus, a, um—Having a long back, instead of long known.
 Ornogranulus, instead of *Ornigranulus*.
 Vadosus, a, um—Full of shallows, instead of shadows.

INDEX OF GENERA.

ERRATA.

Encænus, instead of *Encænus*.
 Lithomylacris, f.
 Mylacris, f.

Necomylacris, f.
 Paromylacris, f.
 Promylacris, f.

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