NORTH AMERICAN

GEOLOGY AND PALÆONTOLOGY

FOR THE USE OF

AMATEURS, STUDENTS, AND SCIENTISTS

BY

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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.

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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 petrifactions, and from the study and determination of the characters of the petrifactions 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 petrifaction. 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 mass is destroyed by one side of the fracture being elevated higher than the other. A *dyke* is a wall of rock between the two sides of a fault or fracture, interrupting the continuity of the beds on either side. Sometimes a dyke shows an overflow at the top. When strata terminate abruptly, they terminate in an *escarpment*. An *outlier* is a lone rock in place, or a hill detached by erosion from the surrounding mass of similar beds, of which it evidently once formed a part.


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, *débris* 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,

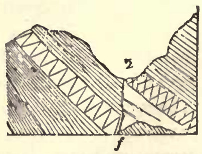


FIG. 4. Strata inclined but conformable. Fault from *f* to 2 and dyke in the fault.

because the same materials in a multitude of cases have been broken up again and again, and restratified, 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 mechancial 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 bowlders, 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 bowlders 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 currrents, 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, bowlders, 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 Herculaneum 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 ingulfed 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.

Geyser (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 pyrophyllite.

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, Ponent, Vespertine, Umbral, and Seral, meaning respectively the formations of the Dawn, Daybreak, 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 afterward 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	"
	Utica Slate Group,	600	"
	Hudson River Group,	1,200	"
Upper Silurian.	Medina Group,	2,500	"
	Clinton Group,	500	"
	Niagara Group,	800	"
	Guelph Group, Onondaga Group,	1,200	"
	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 "
	Total,	211,150 feet.

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 uncomformably 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 laminæ 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 parellel 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 accupied 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,	32,250 feet.

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 foraminiferal 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 algæ 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 *Bythotrephis 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 differerent 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° 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*, *Anopolenus*, *Bathynotus*, *Solenopleura*, *Acrothele*, *Salterella*, *Scenella*, *Iphidea*, *Hyolithellus*, *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 composed 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 equivalent 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*, *Dicellocephalus 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. uniangularis*, *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*, *Maclurea matutina*, *M. sordida*, *Eccyliomphalus canadensis*, *Camarella calcifera*, *Lingulella mantelli*, *L. irene*, *Amphion salteri*, *Bathyurus cordai*, *B. conicus*, and *Asaphus canalis* have been described from this Group and from the Quebèc. 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 nonconformability 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 Calciferous, 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 arenaceocalcareous 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 fucoidal 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 bowlders 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; *Hybocrinus 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 characteristic 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 callicephala*, *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 serveral 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 *Triarthus 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. pattersoni* 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 ofthis 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 *Arthrophycus 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. Carbureted 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*, *Leptocœlia hemispherica*, *Triplesia congesta*, *Cyclonema 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 solarioides*, 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 sublæve*, *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 Water-lime-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 Encrinites, 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 subdivisons 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 Gaspe 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 Gaspe 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*, *Streptoryhnchus 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 Gaspe 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 Gaspe, 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 Gaspe 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. musculosa*, *Strophodonta magniventra*, *S. magnifica*, *Cyrtina rostrata*, *Eatonia peculiaris*, *Leptocœlia 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 sullivanti* 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 Waterlime 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 lævis* 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 interlaminations 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 dispandus*, *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 Pennsylvania 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 catskillensis*, *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 Gaspe, 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 *Spiriferidæ*, 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 Sytem 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 proboscidialis, Platycrinus planus, Amphoracrinus 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 biturbinatus, B. indianensis, Goniasteroidocrinus 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***, ***Batocrinus icosidactylus***, ***Pentremites koninckanus***, ***Productus biseriatus***, ***Spiriferina norwoodana***, ***Athyris hirsuta***, ***Rhynchonella grosvenori***, ***R. mutata***, ***Terebratula turgida***, ***T. formosa***, ***Cypricardinia indianensis***, ***Bellerophon sublævis***, ***Naticopsis carleyana***, ***Holopea proutana***, ***Cyclonema leavenworthanum***, ***Pleurtomaria subglobusa***, 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 *Acrocrinus 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*, *Spirifera 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 Novia 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 37½ feet thick, and another 22¼ 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 $25\frac{1}{2}$ feet. The thickest vein at Wilkesbarre is $29\frac{1}{2}$ 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 sufficient 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, Crenipecten retiferus, Myalina subquadrata, Bellerophon carbonarius, Pleurotomaria tabulata, P. sphærulata, 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 *Spirifera*, 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 succeded 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*, *Axinœa 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, *Crocodilus*, *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 bowlder 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, bowlders, 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, bowlders, 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 Gaspe Peninsula, ocean-terraces and stratified clay, containing marine testacea, occur at the height of 600 feet above the sea. In the Champlain region of Vermont, 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 Missisippi 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 bowlders, 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 bowlders 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 bowlders, 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 bowlders, 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 Naturæ;* 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 Naturæ*, 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; Ranunculas*, *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 *eæ* is admitted; as, *Dipterocarpeæ*, from *Dipterocarpus*. 3. For some very large families universally known under their exceptional names, the ancient designation is preserved; as, *Cruciferæ*, *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 *eæ* or *ineæ*, and also the names of tribes and sub-tribes which take the termination *eæ*; 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;	(βῆτα)	Beta.
β	=	b;	(βραχίων)	Brachium.
γ	=	g;	(γλῶσσα)	Glossa.
δ	=	d;	(διψάς)	Dipsas.
ε	=	e;	(ὑαλέος)	Hyalea, not Hyalæa.
ζ	=	z;	(ζίζυφον)	Zizyphus, Zizyphinus.
η	=	e;	(πειρήνη)	Pirena, not Pirina.
η final	=	a;	(πειρήνη)	Pirena, not Pirene.
ϑ, θ	=	th;	(τηϑύς)	Tethys; (θέτις) Thetis.
ι	=	i;	(βαλιός)	Balia, not Balea.
κ	=	c;	(ἱπποκρήνη)	Hippocrena, not Hippochrenes.
λ	=	l;	(φυλλίς)	Phyllis.
μ	=	m;	(μέλας)	Melas.
ν	=	n;	(πειρήνη)	Pirena.
ξ	=	x;	(ξένος)	Xenus, Xenophora.
ο, ω	=	o;	(φορός)	Phorus; (πῶμα) Poma.
π	=	p;	(ποταμός)	Potamus.

ρ	= r;	(πτερόν)	Pterum.
ρρ	= rrh;	(φυλλίρ-ῤοή)	Phyllirrhoa, not Phyllirhoe.
σ, ς	= s;	(γλωσσός)	Glossus.
τ	= t;	(πτερόν)	Pterum.
υ	= y;	(ὑβός)	Hybolithus, not Hibolites.
φ	= ph;	(φορός)	Phorus.
χ	= ch;	(κοχλίας)	Cochlias.
ψ	= ps;	(ψάμμος)	Psammus.
αι	= æ;	(λιμναῖος)	Limnæa, not Limnea.
αυ	= au;	(γλαυκός)	Glaucus.
ει	= e;	(τείνω)	Exotenobranchia.
ε͂ι	= i;	(χεῖλος)	Chilostoma, not Cheilostoma.
ευ	= eu;	(εὖρος)	Eurus.
ῳ, οι	= oe;	(δίς, οἰκέω)	Dioeca, not Dioica.
ον final	= um;	(ἐφίππιον)	Ephippium, not Ephippion.
ος final	= us;	(᾽ομφαλος)	Euomphalus, not Euomphalos.
ου	= u;	(λουτήριον)	Luterium, not Lotorium.
γγ	= ng;	(᾽αγγαρεία)	Angaria.
γχ	= nch;	(ἄγχωστόμα)	Anchistoma, not Angistoma.
γκ	= nc;	(ἄγκιστρον)	Ancistrodon, not Agkistrodon.
῾ρ	= rh;	(῾ρέα)	Rhea.
῾	= h;	(῾ερμαία)	Hermæa, not Ermæa.

It follows therefore, that *Buthotrephis* must, according to the laws of etymology, be spelt *Bythotrephis; Xenophasia*, instead of *Zenophasia; Pœocephala*, 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, *toccus*, 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'Neall; 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. Comparative 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 Perouse, Perousia.

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 *Linnæus, linnæanus; Lesquereux (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, geinitzanus; 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, eriensis.* 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 terminination *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 *—oideus* 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 *pachyoderma, euryoteines, Platyostoma,* 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, Cordaiteæ, 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, Arthrophycus, 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 cryptogamus 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 *aceæ*, we have Equisetaceæ; from Filices, Filicaceæ, etc.

The Equisetaceæ 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, Arthrostigma, Asterophyllites, Bechera, Bornia, Calamites, Calamodendron, Calamostachys, Equisetites, Macrostachya, Nematophyllum, Sphenophyllum, Volkmannia.

The Filicaceæ, 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, Megaphytum, 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, Lepidodendreæ.

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

2. Order, Tæniophylleæ.

Tæniophyllum.

3. Order, Sigillariæ.

Didymophyllum, Pinnularia, Sigillaria, Sigillarioides, Sigillariostrobus, Spirangium, Stigmaria, Syringodendron.

4. Order, Noeggerathiæ.

Noeggerathia, Whittleseya.

The Cordaiteæ, 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, Dicranophyllum, 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, Ormoxylon, 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; *pteris*, fern.] Fronds polypinnate; 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 Pseudopecopteris subcrenulata.

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.

halli, see Pecopteris halli.

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 Pseudopecopteris hymenophylloides.

inflata, see Callipteridium inflatum.

ingens, Dawson, 868, Acad. Geol. p. 553, Devonian.

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

lanceolata, see Pecopteris lanceolata.

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

FIG. 5.—Alethopteris lonchitica.

longifolia, see Pecopteris longifolia.

macrophylla, see Danæites Macrophyllus.

massillionis, see Callipteridium massilloneum.

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 Aneimia, 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.—Aneimites 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, spathulate, 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, Prodrome Hist. Veg. Foss., p. 156, and Coal Flora of Pa., p. 45, Coal Meas.
minuta, Bronginart, 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.
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.

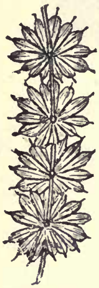


FIG. 7.—Annularia Sphenophylloides.

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.
pitcairniæ, 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.


FIG. 8. Antholithes priscus.

Aphlebia adnascens, see Rhacophyllum adnascens.
flabellata, see Rhacophyllum flabellatum.
irregularis, see Rhacophyllum irregulare.
Araucarites gracilis, see Walchia gracilis.
ARCHÆOPHYTON, 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; *pteris*, 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 pinnæ. Veins spreading from the base, curved or straight, dividing dichotomously into fine veinlets; fertile pinnæ bearing groups of oval sporecases instead of pinnules. Type A. hibernica.
acadica, see Aneimites acadicus.
alleghaniensis, syn. for A. rogersi.
bockschiana, see Aneimites bockschii.
browni, see Cyclopteris browni.
denticulata, Lesquereux, 1884, Coal Flora of Pa., p. 774, Subcarboniferous.
gaspensis, Dawson, 1881, Can. Nat. and Geol., vol. 10, p. 8, Devonian.
hallana, Goeppert, 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.
hartti, Dawson, 1863, (Palæopteris hartti,) 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.


FIG. 9. Archæopteris hibernica.

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-

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.

Aristophycus, Miller and Dyer, 1878, Cont. to Pal. No. 2, p. 3. Probably inorganic, and, if fucoidal, too irregular and too little known to be retained as a genus.

ramosum, Miller and Dyer, 1878, Cont. to Pal. No. 2, p. 4. Hud. Riv. Gr. Probably inorganic.

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.

FIG. 11. Arthraria 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.—Arthrophycus 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.

camptotænia, syn. for Sigillaria monostigma.

manephleus, a doubtful species of Sigillaria.

ornithicnoides.see Sigillaria ornithicnoides.

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 pinnules, 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. 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.—Asterphyllites 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. Geo. 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. Geo. 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.

FIG. 15.—Astropolithon hindii.

ASTEROPTERIS, Dawson, 1881, Quar. Jour. Geo. Soc., vol. 37, p. 299. [Ety. *aster*, star; *pteris*, 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. Geo. Soc., vol. 37, p. 299, Portage Gr.

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

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

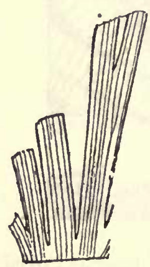


FIG. 16.—Baiera virginiana.

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. tæniata.

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

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.—Bornia 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 obtusus.

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.

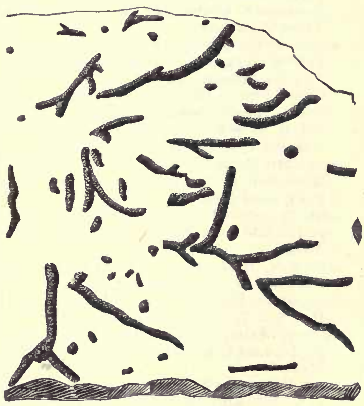


Fig. 19.—Bythotrephis ramulosa, showing the ends, and branches as they appear on a nodule.

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 obconical 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.

bistriatus, Lesquereux, 1858, Geo. Sur. Pa., vol. 2, p. 850, Coal Meas. This name was preoccupied by Sternberg.

canniformis, Schlotheim, 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.

cruciatus, 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.

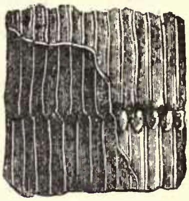


FIG. 20.—Calamites Suckovi.

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. equiseliformis*, *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.

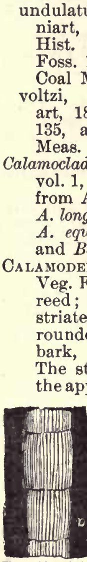


FIG. 21—Calamodendron approximatum.

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.

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

prælongus, see Volkmannia 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.

dawsonanum, 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.

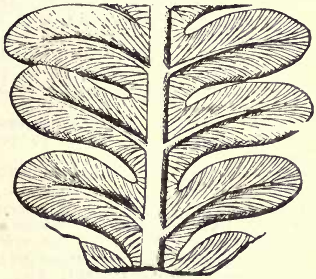


FIG. 22.—Callipteridium sullivanti.

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.

massilloneum, Lesquereux, 1866, (Alethopteris massillionis,) 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; *pteris*, 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.

CARDIOCARPON, 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, Gœppert & 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.
pachytesta, 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 retusus,) 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.

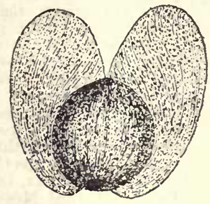


FIG. 23.—Cardiocarpon samariforme.

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 Vegetale, vol. 1, p. 457. [Ety. *kardia*, heart; *pteris*, fern.] Leaves simple, pinnate; stipe striated, rounded, base spoon-like, dilated; pinnæ 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 Cardiocarpon 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.

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.
latior, 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. whitianus.
minimus, 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.
transsectus, 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.
whitianus 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.

Caulerpites, 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; *pteris*, 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.

FIG. 24.—Caulopteris primæva.

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.
lacœi, 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.

CELLULOXYLON, Dawson, 1881, Lond. Quar. Jour. Geo. Soc., vol. 37, p. 302. [Ety. *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.

Chloephycus, 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.

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 concentrical laminæ; 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.

FIG. 26. Cordaicarpus apiculatus.

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; *strobus*, 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 Cahier., p. 36, and Coal Flora of Pa., p. 532, Coal Meas.

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

costatus, Lesquereux, 1878, Proc. Am. Phil. Soc., p. 323, and Coal Flora of Pa., p. 540, Coal Meas.

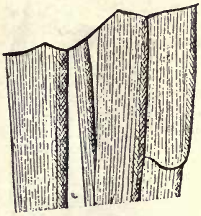


FIG. 27.—Cordaites costatus.

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.

lacoei, 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; *pteris*, 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; *pteris*, fern.] Leaflets orbicular or reniform, large, veins numerous, and not positively referable to other genera. Type C. orbicularis.

acadica, see Aneimites acadicus.

alleghaniensis, 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.

browni, see Rhacophyllum browni.

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.

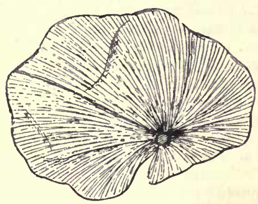


FIG. 28.—Cyclopteris elegans.

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 Geol., 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.

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

CYCLOSTIGMA, Haughton, 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 surface 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, Haughton, 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.] Frond pinnate, or bipinnate; pinnæ 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.


FIG. 29.—Dactylophycus tridigitatum.

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.

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.

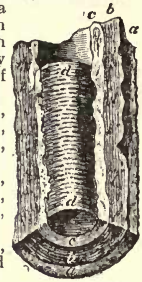


FIG. 30.—Dadoxylon. *a*, bark; *b*, woody zone or fiber (pleurenchyma); *c*, medulla or pith; *d*, cast of hollow pith or sternbergia.

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.


FIG. 31.—Danæites macrophyllus.

DANÆITES, 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 concentrical striæ, on the middle of which were attached leaves, probably cylindrical. Type D. euphorbioides.

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.

Dictuolites, see Dictyophyton in the class Protozoa.

becki see Dictyophyton becki.

DICTYOPTERIS, Gutbier, 1835, Verst. Zwick. Schwarzk, p. 63. [Ety. *dictyon*, net; *pteris*, fern.] Frond bipinnate; pinnules 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. Steinkohlengeb. 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.

FIG. 32.—Dictyopteris obliqua.

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.

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; *stege*, a covering; but spelled by Corda Diplotegium.] Thick trunks of trees longitudinally furrowed; bark thick, and imbricated in short cylindrical overlaps. Type D. brownanum.

FIG. 33. Diplostegium retusum.

brownanum, Corda, 1845, Beitrage zur Flora der Vorwelt, p. 112, Coal Meas.

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.

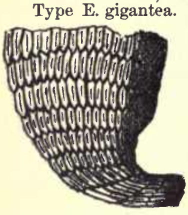


FIG. 35.—Equisetites curtus.

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.

wrightanus, see Echinocaris wrightana.

Equisetum, see Equisetites.

columnare, see Equisetites columnaris.

stellifolium, see Equisetites stellifolius.

EREMOPTERIS, Schimper, 1869, Traité de Palæontologie Vegetale, vol. 1, p. 416. [Ety. *eremos*, isolated; *pteris*, fern.] Upper part of fronds dichotomous; pinnæ open or oblique, irregularly pinnatifid; laciniæ 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.

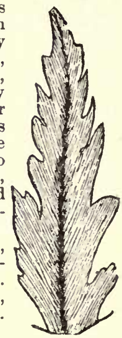


FIG. 36. Eremopteris marginata.

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

cheathami, 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 crispa.

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.

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

alleghaniensis, see Arthrophycus harlani.

auriformis, Hall, 1843. Not organic.

bilobatus, see Rusophycus bilobatum.

caudagalli, see Taonurus caudagalli.

demissa, Conrad probably phytopsis tubulosa.

dentatus, Brongniart probably Diplograptus pristiniformis.

filiciformis, see Rhacophyllum filiciforme.

flexuosus, see Bythotrephis flexuosa.

gracilis, see Bythotrephis gracilis.

graphica. Not defined so as to be determined.

harlani, see Arthrophycus harlani.

heterophyllus, 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.

permianus, 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 *Halonia*.] 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.

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

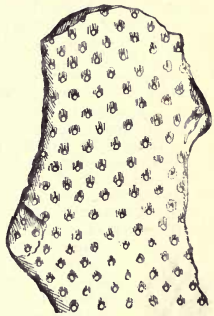


FIG. 38.—Halonia flexuosa.

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 Arthrophycus.

halli, syn. for Arthrophycus harlani.

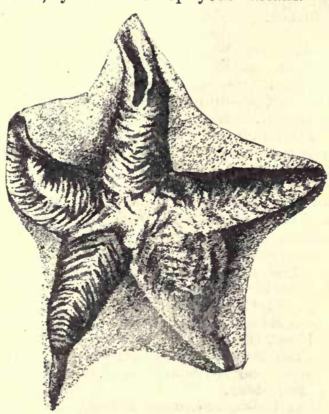


FIG 39.—Heliophycus stelliforme.

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.

HIPPODOPHYCUS, 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.

FIG. 40. Hymenophyllites curtilobus.

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 Rhacoyhyllum clarki.

curtilobus, Dawson, 1862, Quar. Jour. Geo. Soc., vol. 18, p. 321, and Acad. Geol., p. 552; Devonian.

delicatulus, 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.

myriophyllus, 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.

schlotheimi, Brongniart, 1828, (Sphenopteris schlotheimi,) Hist. d. Veg. Foss., p. 193, Coal Meas.

spinosus, 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.

ICHNOPHYCUS, Hall, 1852, Pal. N. Y., vol. 2, p. 26. [Ety. *ichnos*, a footprint; *phukos*, a seaweed.] Tridactyle impressions somewhat resembling a foot-track, the middle stem being the longer. Type I. tridactylum.

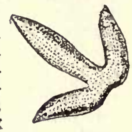


FIG. 41.—Ichnophycus tridactylum.

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.

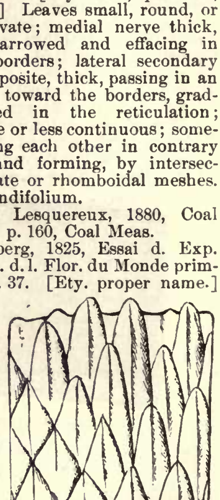


FIG. 42. Knorria imbricata.

compacta, Lesquereux, 1884, Coal Flora of Pa., p. 839, Coal Meas.

imbricata, Sternberg, 1825, Flor. d. monde primitif fasc. 4, p. 37, Kaskaskia Gr.

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.

LEPIDOCYSTIS, 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.
obtusus, 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. 455, 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. 368, 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.
chilalloeum, 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, (Lycopodiolithes elegans,) Vers. Darst. Flor. d. Vorwelt 4 fasc., p. 8, Coal Meas.

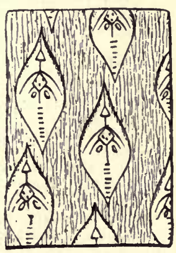


FIG. 43.—Lepidodendron distans.

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.
harcourti, 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.

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.
oweni, 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 decorticated specimen of L. vestitum or L. latifolium.

FIG. 44.—Lepidodendron sternbergi.

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.
tijoui, Lesquereux, 1870, Geo. Sur. Ill., vol. 4, p. 431, Coal Meas.
tumidum, Bunbury, 1847, (Lepidophloios tumidum,) Quar. Jour. Geo. 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.
uræum, 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 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. laricinus.

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.

laricinus, 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 sarræpontana fossilis, vol. 3, p. 37, Coal Meas.

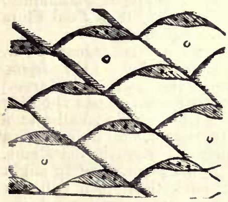


FIG. 45.—Lepidophloios macrolepidotus.

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.

campbellanum, 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, Prodrome 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; *strobus*, 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 laminæ, 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.

Fig. 46. Lepidostrobus hastatus.

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.

lacoei, 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.

mansfieldi, Lesquereux, 1880, Coal Flora of Pa., p. 444, Coal Meas.

mirabilis, Newberry, 1873, (Polysporia mirabilis,) Ohio Pal., vol. 1, p. 362, Low. Coal Meas.

oblongifolius, Lesquereux, 1870, Geo. Sur. Ill., vol. 4, p. 441, Coal Meas.

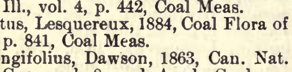


Fig. 47.—Lepidostrobus ornatus. Cone ½ size.

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, see 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 laciniæ; nervation distinct with the glass; 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.

Leptophlœum, 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, Palæontologie Vegetale, vol. 1, p. 465. [Ety. proper name; *pteris*, a fern.] Fronds large, bi

Fig. 48.—Lescuropteris adiantites.

tripinnate; rachis broad; foliate; pinnæ 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 moori,) 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.—Licrophycus ottawense.

LICROPHYCUS, 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.

Lithodictuon becki, Conrad. Not properly defined; but see Dictyophyton becki.

LONCHOPTERIS, Brongniart, 1828, Prodr. Hist. Veg. Foss., p. 59. [Ety. *lonche*, spear; *pteris*, 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.

annulariifolius, 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.

lacoei, 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.

FIG. 50.—Lycopodites matthewi; *a*, branch and leaves: *b*, *c*, *d* leaves.

meeki, 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.

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 Vegetale, 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. Gesellsh. 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.

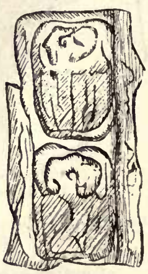


FIG. 52.—Megaphyton protuberans.

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.

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.

FIG. 53.—Neriopteris lanceolata. Single pinnule.

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 pediceled; veins either from the base of the pinnules or from a costa, diverging fanlike 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. 857, 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 Pseudopecopteris 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.

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.

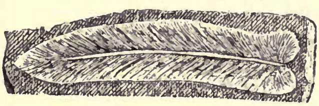


FIG. 54.—Neuropteris hirsuta.

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.

NŒGGERATHIA, 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.
Nœggerathia 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.
obtusa, see Aneimites obtusus.

ODONTOPTERIS, Brongniart, 1822, Mem. du Mus. d'Hist. Nat. de Paris, t. 8, p. 203. [Ety. *odous*, tooth; *pteris*, 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, Gutbier, 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 indentified by Lesquereux in Geo. Sur. Pa., vol. 2, p. 860, is O. subcrenulata.
dawsonana, 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.

FIG. 56.
Odontopteris gracillima.

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.

reichiana, Lesquereux, 1884, Coal Flora of Pa., p. 831, Coal Meas.
rotundifolia, Wood, 1866, Trans. Am. Phil. Soc., vol. 13, p. 348, Coal Meas.
schlotheimi, Brongniart, 1828, Hist. d. Veg. Foss., p. 256, and Coal Flora of Pa., p. 136, Coal Meas.


FIG. 57.—Odontopteris schlotheimi.

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.
subcrenulata, 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 pinnæ 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.

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.


FIG. 58. Orthogoniopteris clara, part of a pinnule.

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; *pteris*, 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.

PALÆOPHYCUS, 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, Calcif. 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, Calcif. Gr.

gracile, Lesquereux, 1876, 7th Ann. Rep. Geol. Sur. Ind., p. 137, Coal Meas.

FIG. 59. Palæophycus gracile.

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. 98, 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.

Palæopteris, Schimper, being preoccupied by Geinitz, see Archæopteris.

acadica, see Aneimites acadicus.

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.

nœggerathi, see Trigonocarpum nœggerathi.

PECOPTERIS, Brongniart, 1822, Class d. Veg. Foss. in Mem. du Mus. d'Hist. Nat. d. Paris, tom. 8, p. 203. [Ety. *peko*, comb; *pteris*, 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.

chærophylloides, see Sphenopteris chærophylloides.

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 cyatheus,) 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.
oreopteroidea, 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.

ovoides, 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.

pluckeneti, see Pseudopecopteris pluckeneti.

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, Schlotheim, 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 Geo., 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.

schimperi, 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.

subfalcata, 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.

FIG. 60. Pecopteris unita.

villosa, Brongniart, 1828, Hist. d. Veg. Foss., p. 316, and Coal Flora of Pa., p. 253, Coal Meas.

PHYLLOPTERIS, Brongniart, 1849, Table d. Gen. d. Veget. Foss., pp. 22, 103. [Ety. *phyllon*, leaf; *pteris*, fern.] Pinnate, 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.

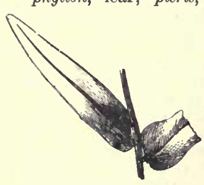


FIG. 61.—Phyllopteris antiqua.

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 laminæ, 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.

Plumalina plumaria.

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.

plumula, Dawson, 1873, (Lycopodites plumula,) Rep. Foss. plants Low. Carb. and Millstone Grit, p. 24, Subcarboniferous.

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.

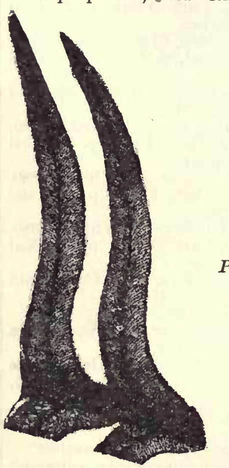


FIG. 65.

Protoblechnum holdeni.

Polysporia, Newberry, syn. for Lepidostrobus.

mirabilis, see Lepidostrobus mirabilis.

PROTOBLECHNUM, Lesquereux, 1880, Coal Flora of Pa., p. 188. [Ety. *protos*, first;

Blechnum, a genus.] Fronds large, pinnate; rachis thick, scaly toward the base; pinnæ 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.

Protostigma, 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 medullar tissue. Type P. helmintholithus.

erianus, Dawson, 1871, Foss. Plants Can., p. 58, Ham. Gr.

textilis, Dawson, 1871, Foss. Plants Can., p. 59, Ham. Gr.

Pseudopecopteris, 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 polypinnate, 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.

Fig. 66. Pseudopecopteris mazonana.

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.

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, (Alethopteris 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 gracillimus.
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. 38, Devonian.
robustium, 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. Semin., p. 20, and Coal Flora of Pa., p. 844, Coal Meas.
bockshianus, Gœppert & Berger, 1848, De Fruct. et Semin. 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 Geo., 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 Sternberg'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.

RHACHIOPTERIS, 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. Schwarzk. u. sein. Umg., p. 11, and Coal Flora of Pa., p. 316, Coal Meas.

filiforme, Gutbier, 1842, (Fucoides filiformis,) Abdr. u. Verst. d. Zwick. Schwarzk. 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.

fucoideum, 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 mollis,) 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.
thalliforme, Lesquereux, 1870, (Hymenophyllites thalliformis,) 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.

Rhizolithes, F. Braun, 1847, in Flora, etc. [Ety. *rhiza*, root; *lithos*, stone.]
palmatifidus, see Pinnularia palmatifidus.

Rhizomopteris, 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 Lycodites 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.
sigillariæ, Lesquereux, 1877, Proc. Am. Phil. Soc., p. 174, and Coal Flora of Pa., p. 3, Coal Meas.

Rotularia longifolia, see Sphenophyllum longifolium.

RUSOPHYCUS, 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.

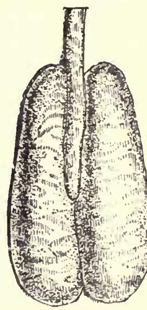


FIG. 70.—Rusophycus bilobatum.

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 laminæ; 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 laciniate, 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.

Schutzia, Gœppert, 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.

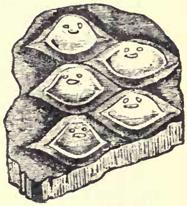


FIG. 71.—Sigillaria brardi.

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.

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.
lacoei, 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.
marineria, 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.
ornithicnoides, 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 Geo., 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.
schimperi, Lesquereux, 1858, Geo. Sur. Pa., vol. 2, p. 871, Coal Meas.
schlotheimana, 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 stigmariod 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*; *strobus*, cone.] Sporanges attached in horizontal rows to a vertical axis, supported by persistent sporangiophores, 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; *oulos*, entire.] Probably a decorticated Syringodendron. Type S. psilophlœus.
psilophlœus, 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.

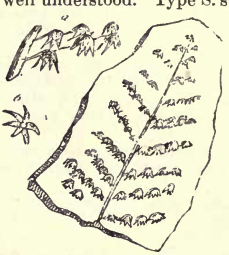


FIG. 72.—Sorocladus asteroides.

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 laciniate-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.
densifoliatum, 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.

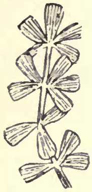


FIG. 73. Sphenophyllum schlotheimi.

schlotheimi, Brongniart, 1828, Prodr. Hist. Veg. Foss., p. 68, and Coal Flora of Pa., p. 52, Coal Meas.

tenerrimum, Stur, 1877, Culm. Flora, p. 108, and Coal Flora of Pa., p. 728, Coal Meas.

trifoliatum, Lesquereux, 1858, Geo. Sur. Pa., vol. 2, p. 853, Coal Meas.

SPHENOPTERIS, Brongniart, 1822, Mem. du Mus. d'Hist. Nat. de Paris, tom. 8, p. 203. [Ety. *sphen*, wedge; *pteris*, fern.] Fronds 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 laciniate; 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 Pseudopecopteris abbreviata.

acrocarpa, Fontaine & White, 1880, Perm. or Up. Carb. Flora, p. 40, Coal Meas. or Permian.

acuta, See Pseudopecopteris 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.

artemesiæfolia 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.

chærophylloides, Brongniart, 1828, (Pecopteris chærophylloides,) 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 Pseudopecopteris 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 Pseudopecopteris decipiens.

dissecta, 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 Paleont., 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.

fuciformis, Lesquereux, 1884, Am. Naturalist, vol. 18, p. 921, Carboniferous.

furcata, Brongniart, 1828, Hist. d. Veg. Foss., p. 179, and Coal Flora of Pa., p. 282, Coal Meas.

gersdorfii, see Hymenophyllites gersdorfii.

glandulosa, see Pseudopecopteris 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.
hitchcockana, 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,) Culm Flora, p. 168, and Coal Flora of Pa., p. 288, Coal Meas.
latifolia, see Pseudopecopteris latifolia.
latior, 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. Geo. 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, Traitê de Palêontologie Vegetale, 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. Geo. 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 Vegetale, 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. Geo. 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, 1883, 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 macrosphores 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. *stemmatos*, 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 horseshoe, 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.

cyclostigma, 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.

FIG. 77.—Stemmatopteris mimica, leaf scar.

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, (Caulopteris punctata,) Geo. Sur. Pa., vol. 2, p. 869, Coal Meas.

schimperi, 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 eccentrical, 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 concentrical rings, with a central umbonate mammilla, pitted in the middle by a punctiform vascular scar. Type S. ficoides.

amœna, 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 Can., 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.

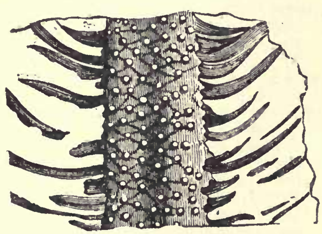


FIG. 79.—Stigmaria ficoides, ¼ diam.

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. *syrinx*, 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. *syrinx*, 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.

TÆNIOPHYLLUM, 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.

TÆNIOPTERIS, 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.

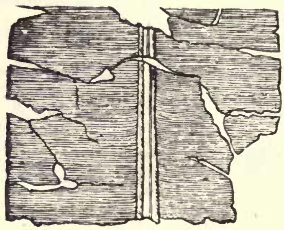


FIG. 80.—Tæniopteris smithi.

truncata, Lesquereux, 1884, Coal Flora of Pa., p. 743, Coal Meas.

TAONURUS, Fisher-Ooster, 1858, Foss. Fucoiden d. Schweizer Alpen, p. 41. [Ety. *taon*, peacock; *oura*, tail.] Frond membranaceous, derived from utricules 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.

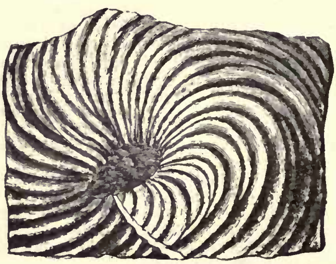


FIG. 81.—Taonurus caudagalli.

archimedes, Ringueberg, 1884, (Spirophyton archimedes,) Proc. Acad. Nat. Sci. Phil., p. 144, Medina Gr.

caudagalli, Vanuxem, 1842, (Fucoides

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, (Caulerpites 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 pinnules attached to long petioles, which are of doubtful generic affinity.

filicula, 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.


FIG. 82.—Trichophycus 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.

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 Trigonocarpon 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.

multicarinatum, 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.


FIG. 83. Trigonocarpon oliviforme.

perpusillum, Lesquereux, 1884, Coal Flora of Pa., p. 820, Coal Meas.

racemosum, Dawson, 1862, Quar. Jour. Geo. 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.

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.—Triphyllopteris cheathami.

cheathami, 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., 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 Plumalina linearis.

ULODENDRON, Rhode, 1823, Beiträge z. Pflanz. d. Vorwelt. [Ety. *ule*, wood; *dendron*, tree.] Arborescent; rarely branching; bearing in two opposite rows round or oval scars, impressions of the base of strobiles, marked with concentrical scales and a central mammilla; leaves short lanceolate, leaf scars disposed in spiral, small, rhomboidal or subrhomboidal; fructifications in long, cylindrical strobiles. Type U. majus.

FIG. 85.—Ulodendron elongatum.

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.

elongatum, Lesquereux, 1870, Geo. Sur. Ill., vol. 4, p. 437, Coal Meas.

flexuosum, see Halonia 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.

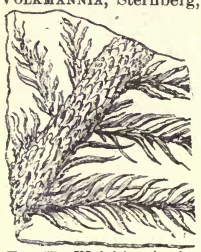


FIG. 87.—Walchia pinniformis.

crassa, Lesquereux, 1884, Coal Flora of Pa., p. 719, Coal Meas.

fertilis, Lesquereux, 1884, Coal Flora of Pa., p. 720, Coal Meas.

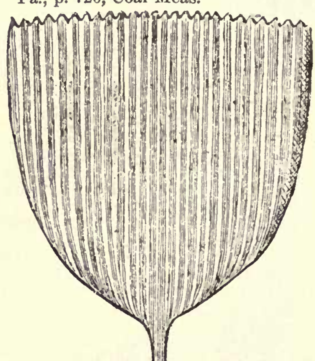


FIG. 88.—Whittleseya elegans.

prælonga, Lesquereux, 1880, (Calamostachys prælongus,) 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.] Frond 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; *eidos*, 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 litle 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 Nummulite 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 CALCISPHÆRIDÆ.—Calcisphæra.
FAMILY EOZOONIDÆ.—Eozoon.
FAMILY FUSULINIDÆ.—Fusulina, Loftusia, Mœllerina.
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 inter-communicating 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, Chirospongia.

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 PATTERSONIIDÆ.—Pattersonia.

FAMILY PHARETRONES.—Batospongia, Camarocladia, Cylindrocœlia, Streptospongia.

FAMILY RECEPTACULITIDÆ.—Cerionites, Receptaculites.

FAMILY STROMATOPORIDÆ.—Caunopora, Cœnostroma, Cryptozoon, Dictyostroma, Megastroma, Strephochetus, Stromatocerium, Stromatopora, Syringostroma.

FAMILY AFFINITY UNCERTAIN.—Astroconia, Fungispongia, Lepidolites, Leptomitus.

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.

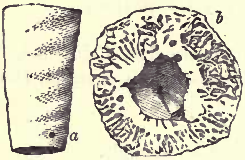


FIG. 89.—Archæocyathus atlanticus. *a*, reduced; *b*, transverse section.

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.

rensselæricus, see Ethmophyllum rensselæricum.

ASTRÆOSPONGIA, 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.

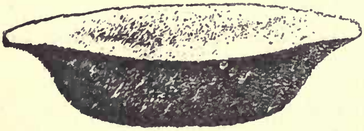


FIG. 90.—Astræospongia meniscus.

ASTROCONIA, Sollas, 1881, Quar. Jour. Geo. Soc. Lond., vol. 37, p. 254. [Ety. *aster*, star; *konia*, 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.

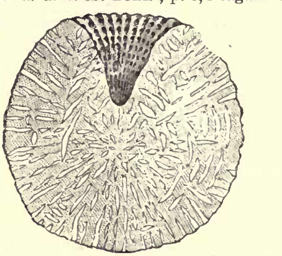


FIG. 91.—Astylospongia præmorsa. Vertical section, showing cup.

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. *aulokopeo*, 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 substellate 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 Ceriolidæ. 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, Konig, 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.

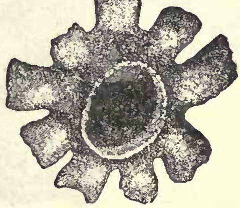


FIG. 92.—Brachiospongia digitata. ¼ diam., showing large gastral cavity.

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.

roemerana, 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 deep. Type C. formosum.

affine, Billings, 1865, Pal. Foss. vol. 1, p. 209, Quebec Gr.

anstedi, Billings. 1865, Pal. Foss., vol. 1, p. 201 and 337, Quebec Gr.

canadense, Billings, 1865, Pal. Foss., vol. 1, p. 377, Chazy Gr.

FIG. 93.—Calathium canadense. Vertical section, showing cup.

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.

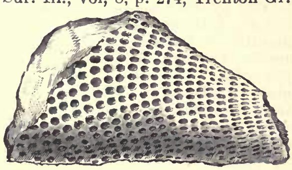


FIG. 94.—Calathium formosum.

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.

CALCISPHÆRA, Williamson, 1880, Mem. Org. of the plants of the Coal Meas., pt. 10. [Ety. *calcis*, limestone; *sphæra*, 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.

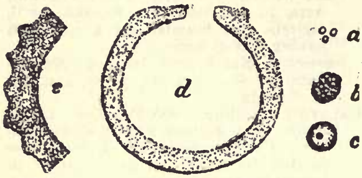


FIG. 95.—Calcisphæra robusta. *a*, natural size; *b*, magnified, showing sculpture; *c*, showing aperture; *d*, magnified, showing aperture; *e*, section of wall magnified.

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, cribrose 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. [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.

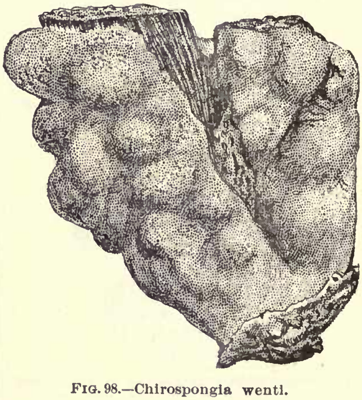


FIG. 98.—Chirospongia wenti.

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.

wenti, 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 vesiculose 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.

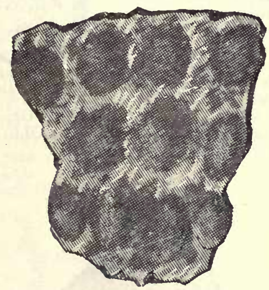


FIG. 99.—Chirospongia faberi; reticulated depressions should indicate papillæ.

CLEODICTYA, Hall, 1884, 35th Rep. N. Y. St. Mus. Nat. Hist., p. 467. [Ety. *kleo*, closed up; *dictuon*, 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. Geo. Soc., vol. 35, p. 52, Guelph Gr.

monticuliferum, Winchell, 1866, (Stromatopora monticulifera,) Rep. Low. Penin. Mich., p. 91, Ham. Gr.

FIG. 100.—Cœnostroma constellatum, horizontal section.

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.

CONOPTERIUM, 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 laminæ, resembling Stromatopora, substance traversed by minute canals, which branch and anastomose irregularly. Type C. proliferum.

minnesotense, Winchell, 1886, 14th Ann. Rep. Geo. Minn., p. 313, Calciferous Gr.

proliferum, Hall, 1884, 36th Rep. N. Y. St. Mus. Nat. Hist., p. 95, Calciferous

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.

CYLINDROCŒLIA, 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; *inus*, 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, Chemumg Gr.

baculum, Hall, 1884, 35th Rep. N. Y. St. Mus. Nat. Hist., p. 471, Chemung Gr.

becki, Conrad, 1837, (Lithodictuon 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 Rep. 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.

tenue, 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 laminæ have horizontal canals, and are probably minutely perforate. Type D. undulatum.

FIG. 101.—Dictyostroma 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. 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; *dictuon*, net.] A reticulate frond irregularly expanded or explanate; reticulation irregular presenting radiating and concentric striæ. 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. *endos*, 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.

FIG. 103. Endothyra baileyi, magnified.

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. roemeri.

roemeri, 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 successive laminæ, 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.

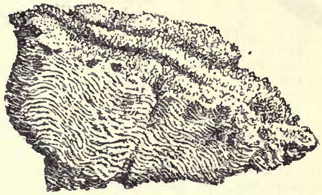


FIG. 104.—Ezoon canadense.

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; spiculæ branching. Type E. whitneyi.

gracile, Meek, syn. for E. whitneyi.

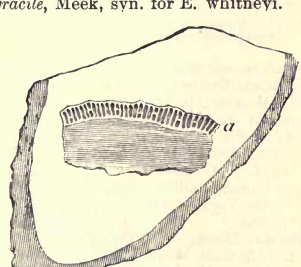


FIG. 105.—Ethmophyllum profundum. Longitudinal and transverse section of a fragment.

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, (Protocyathus rarus,) Am. Jour. Sci. and Arts, 3d ser., vol. 15, p. 124, Up. Taconic.

rensselæricum, Ford, 1873, (Archæocyathellus rensselæricus,) 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.

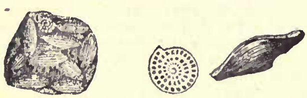


FIG. 107.—Fusulina cylindrica. Natural size, magnified, and transverse section.

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. dickhauti. The name was preoccupied in mineralogy.

dickhauti, 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. dickhauti.

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.

Leptopterion, 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; *dictuon*, 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.

FIG. 108.—Microspongia 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.

MŒLLERINA, 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 imperforate, texture finely arenaceous, aperture simple or compound. Type N. digitata.

priscilla, Dawson, 1868, (Dentalina priscilla,) Acadian Geology, p. 285, Carboniferous.

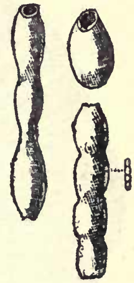


FIG. 109.—Nodosinella priscilla. Natural size and enlarged.

Nullipora, Lamarck, 1801, Systéme des Anim. sans Vert. [Ety. *nullus*, no; *poros*, pore.] Not American Palæozoic.

? obtexta, 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, (Sphenopoterium cuneatum,) Proc. Acad. Nat. Sci., p. 448, syn. for P. cuneiformis.

cuneiformis, M. Edwards, 1860, Hist. Nat. d. Corollairs, tome 3, p. 171, Warsaw Gr.

FIG. 110. Palæacis cuneiformis.

enormis, Meek, & Worthen, 1860, (Sphenopoterium enorme,) Proc. Acad. Nat. Sci., p. 448, and Geo. Sur. Ill., vol. 2, p. 146, Kinderhook Gr.

enormis, var. depressus, Meek & Worthen, 1866, (Sphenopoterium enorme var. depressum,) Geo. Sur. Ill., vol. 2, p. 146, Kinderhook Gr.

obtusus, Meek & Worthen, 1860, (Sphenopoterium obtusum,) Proc. Acad. Nat. Sci., p. 448, and Geo. Sur. Ill., vol. 2, p. 233, Keokuk Gr.

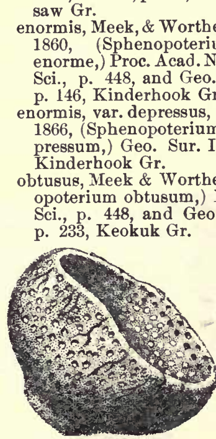


FIG. 111.—Palæomanon cratera.

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-

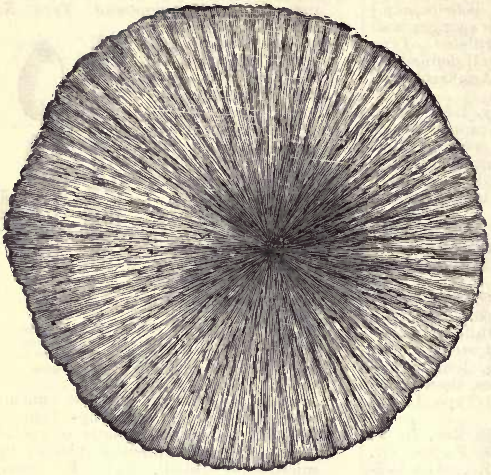


FIG. 112.—Palæospongia trentonensis. View of calice.

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.

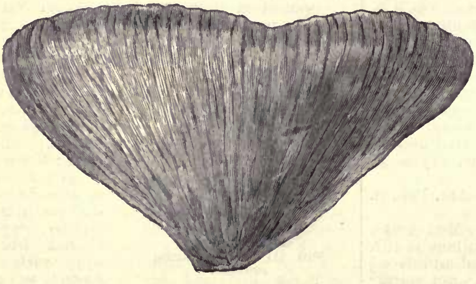


FIG. 113.—Palæospongia trentonensis. Side view.

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.

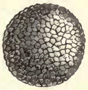


FIG. 114. Pasceolus claudii.

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.

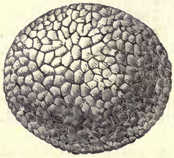


FIG. 115.—Pasceolus darwini. Upper surface.

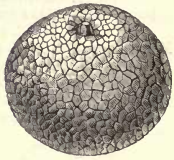


FIG. 116.—Pasceolus darwini. Under surface.

halli, Billings, 1857, Rep. of Progr. Geo. Sur. Can., p. 342, Anticosti Gr.

intermedius, Billings, 1866, Catal. Sil. Foss. Antic., p., 72, Anticosti Gr.

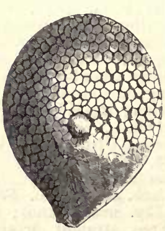


FIG. 117.—Pasceolus halli.

PATTERSONIA, S. A. Milller, 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; *dictuon*, 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, (Uphantænia 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 spiculæ 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.
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.

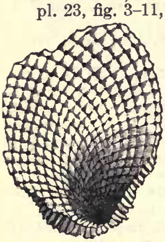


FIG. 120.—Receptaculites occidentalis, showing the endorhin, the pores at the angles of the plates, and deeply concave nucleus.

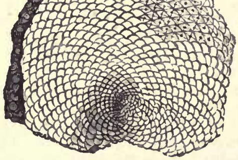


FIG. 121.—Receptaculites occidentalis, showing the nucleus and ectorhin.

sacculus, Hall, 1879, Desc. New Species Foss. from Waldron, Ind., p. 1, and 11th Rep. Geo., 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 preoccupied 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, Lamarck, 1804, Ann. Mus. [Ety. *rota*, wheel.] Not Palæozoic.
baileyi, see Endothyra baileyi.

Saccammina, 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 Calcisphæra robusta.

SACCOSPONGIA, Ulrich, 1879, Am. Geo., vol. 34, 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 obtusus.

Spongia, Linnæus. Not American Palæozoic.

inciso-lobata, see Astylospongia incisolobata.

stellatim-sulcata, see Astylospongia stellatimsulcata.

FIG. 122. — Strephochetus richmondensis, showing several specimens on a slab.

STREPHOCHETUS, Seely, 1885, Am. Jour. Sci. and Arts, 3d ser., vol. 30, p. 355. [Ety. *strepho*, I 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.

STROMATOPORA, Goldfuss, 1826, Petref. Germ., p. 22. [Ety. *stroma*, stratum; *poros*, pore.] Dimorphous masses or extended sheets composed of delicate calcareous laminæ, 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.

cæspitosa, 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., p. 22, and Pal. N. Y., vol. 2, p. 136, Niagara Gr.

FIG. 123.—Stromatocerium rugosum.

constellata, see Cœnostroma 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 Caunopora incrustans.
mammillata, Nicholson, 1873, Ann. and Mag. Nat. Hist., 4th ser., vol. 12, p. 92, Corniferous Gr.
monticulifera, see Cœnostroma 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 Cœnostroma pustuliferum.
pustulosa, Safford. Not defined.
solidula, see Cœnostroma 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 concentric laminæ, 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.

Textularia palæotrochus, see Valvulina palæotrochus.

THAMNODICTYA, Hall, 1884, 35th Rep. N. Y. St. Mus. Nat. Hist. p 466. [Ety. *thamnos*, shrub; *dictuon*, 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.

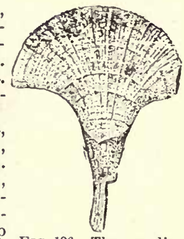


FIG. 126.—Thamnodictya newberryi.

TRACHYUM, Billings, 1865, Pal. Foss., vol. 1, p. 211. [Ety. *trachus*, rough, rugged.] Turbinate or cylindrical, with a cup on the upper surface. It has a close texture, without large canals. 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.

UPHANTÆNIA, 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 subcylindrical, 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 CŒLENTERATA.

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 zoophyte, 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, Acrophyllum, 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, Palæocyclus.

FAMILY CYSTIPHYLLIDÆ.—Cystiphorolites, Cystiphyllum, Cystostylus.

FAMILY FAVOSITIDÆ.—Alveolites, Chonostegites, Cladopora, Cœnites, Dendropora, Emmonsia, Favosites, Leptopora, Lunatipora, Michelinia, Pleurodictyum, Pachypora, Sphærolites, 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, Dicranograptus, 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., vol. 8, p. 462. [Ety. *akantha*, spine; *grapho*, I write.] Shrub-like; one side spinous. Stronger and more bushy than Dendrograptus. Type A. granti.

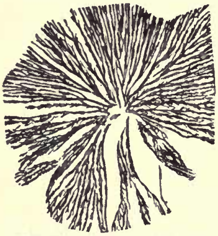


FIG. 128.—Acanthograptus pulcher.

granti, Spencer, 1878, 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.

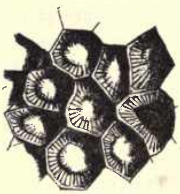


FIG. 129.—Acervularia clintonensis.

clintonensis, Nicholson, 1875, Ohio Pal., vol. 2, p. 227, Niagara Gr.

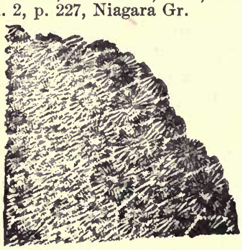


FIG. 130.—Acervularia davidsoni.

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.

FIG. 131.—Acrophyllum oneidaense.

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 incrusting; 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.

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.

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. 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,) Amaen. 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.
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) Sutherland's Jour., vol. 2, p. ccxxx, Niagara Gr.

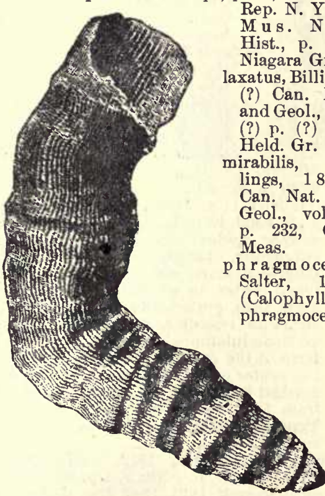


FIG. 133.—Amplexus yandelli

shumardi, Edwards & Haime, 1851, (Cyathophyllum 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. ccxxxii, Up. Sil.

Astræa, Lamarck, 1816, Hist. Nat. d. Anim. sans 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 venustus.

AULACOPHYLLUM, Edwards & Haime, 1850, Brit. Foss. Corals, p. lxvii. [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.

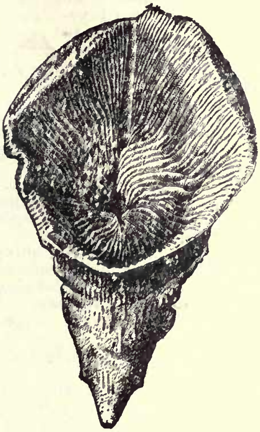


FIG. 136.—Aulacophyllum princeps.

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.
trisculcatum, 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.
precius, 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.

FIG. 137.—Aulopora serpens.

serpuloides, Winchell, 1866, Rep. Low. Penin. Mich., p. 91, Ham. Gr.
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.
vanclevii, Hall, 1883, 12th Rep. Ind. Geo., p. 255, Niagara Gr.

Axinura, Castlenau, syn. for Lithostrotion.
canadense, see Lithostrotion canadense.

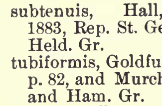


FIG. 138.—Axophyllum rude.

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.


FIG. 139. — Blothrophyllum promissum.

cæspitosum, Rominger, 1876, Foss. Corals, p. 114, Niagara Gr.
decorticatum, Billings, 1859, Can. Jour., vol. 4, p. 130, Up. Held. Gr.
multicalicatum, 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.

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.

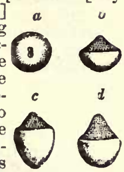


FIG. 140.—Bolboporites americanus. *a*, view of base; *b*, *c*, *d*, side views.

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. *buthos*, in the deep; *grapho*, I write.] Frond consisting of a central stipe, with closely arranged lateral branches, flexuous or recurved; celluliferous on one side; substance corneous brown or black. Type B. laxus.
laxus, 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.
helioliti formis, 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*, 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.

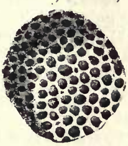


FIG. 141.—Calapœcia cribriformis.

cribriformis, Nicholson, 1874, (Columnopora cribriformis,) Geo. Mag., vol. 1, p. 253, and Pal. Ohio, vol. 2, p. 186, Hud. Riv. Gr.

huronensis, Billings, 1865, Can. Nat. and Geo., 2d ser., vol. 2, p. 426, Hud. Riv. Gr.

CALCEOLA, Lamarck, 1801, Syst. des Anim. sans 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.

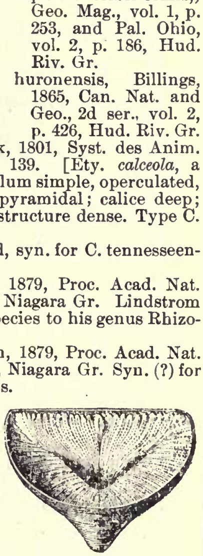


FIG. 142.—Calceola sandalina, showing deep calicle.

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.

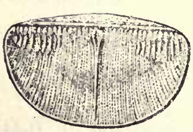


FIG. 143.—Calceola sandalina, operculum.

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. I, Mus. Univ. St. Mo. p. 22. Niagara Gr.

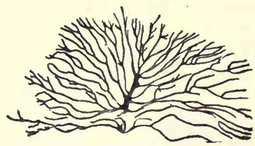


FIG. 144.—Callograptus niagarensis.

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 Dictyonema. Type C. cyathiformis.

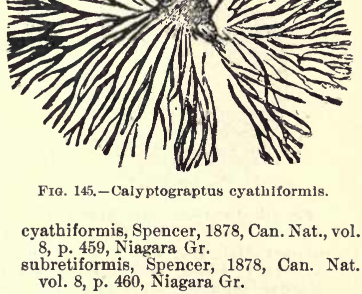


FIG. 145.—Calyptograptus cyathiformis.

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. lxviii. [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.

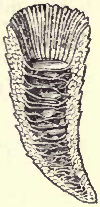


FIG. 146.—Campophyllum flexuosum. Vertical section ½ diam. showing smooth central tabulæ.

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, (Cyathophyllum 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. Paleont., t. 1, p. 105. Not defined so as to be recognized.

FIG. 147.—Campophyllum torquium.

sulcata, D'Orbigny, 1850, Prodr. d. Paléont., t. 1, p. 105. Not defined so as to be recognized.

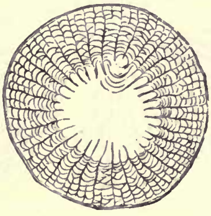


FIG. 148.—Campophyllum torquium. Transverse section.

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.

michelini, 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.

attritus, Nicholson, syn. for Dekayia aspera.

barrandii, see Monticulipora barrandii.

briareus, see Monotrypella briareus.

calicula, 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.

corticosa, see Trematopora corticosa.

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.
filiasa, see Monticulipora filiasa.
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.
helderbergiæ, see Ptychonema helderbergiæ.
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.
petechialis, see Petigopora petechialis.
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.
sphæricus, see Favosites sphæricus.
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.

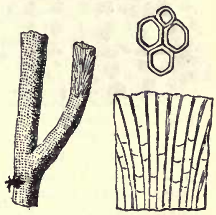


FIG. 149.—Chetetes tumidus.

CHONOPHYLLUM, Edwards & Haime, 1850, Brit. Foss. corals, p. lxix. [Ety. *chonos*, funnel; *phyllon*, leaf.] Corallum simple, constituted, principally, by a series of infundibuliform tabulæ, superposed and invaginated, upon the surface of which, equally developed septal radii extend from center to circumference; no walls or columella. Type C. perfoliatum.
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.

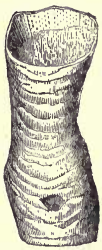


FIG. 150.—Chonophyllum niagarense.

niagarense, Hall, 1852, (Conophyllum niagarense,) 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.
CHONOSTEGITES, Edwards & Haime, 1851, Pol. Foss. d. Terr. Pal., p. 299. [Ety. *konos*, cone; *stege*, covering.] Subhemispheric; corallites cylindrical, annulated, connected at the expansions, imperforate at the constrictions; mural pores where the [corallites] are contiguous; tabulæ

numerous; septa consisting of short spines; growth by gemmation. Type C. clappi.

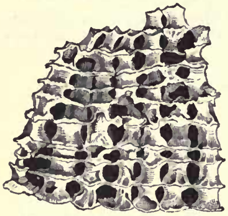


FIG. 151.—Chonostegites ordinatus.

clappi, Edwards & Haime, 1851, Pol. Foss. d. Terr. Pal., p. 299, Up. Held. Gr.

ordinatus, Billings, 1859, (Haimeophyllum ordinatum,) Can. Jour., vol. 4, p. 139, Up. Held. Gr.

CLADOGRAPTUS, Geinitz, 1852, (Cladograpsus,) 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.

inæqualis, 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; tabulæ 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.

multipora, 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.

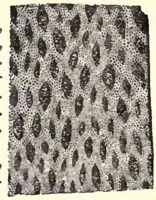


FIG. 152.—Cladopora reticulata.

pinguis, Rominger, 1876, Foss. Corals, p. 53, Up. Held. Gr.

prolifica, 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.

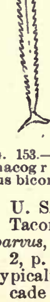


FIG. 153.—Climacograptus bicornis.

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.

emmonsi, 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.

CLISIOPHYLLUM, Dana, 1848, Explor. Exped., vol. 8, p. 361. [Ety. *klision*, tent; *phyllon*, leaf.] Simple, branched or aggregate, 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.

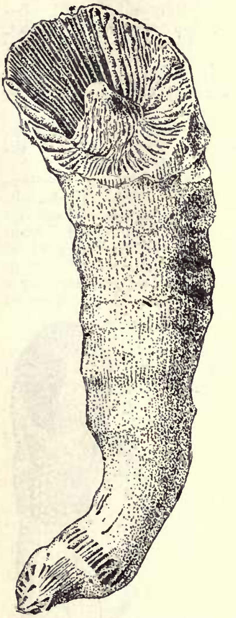


FIG. 154.—Clisiophyllum conigerum.

austini, Salter, 1852, (Strephodes austini,) Sutherland's Jour., vol. 2, p. ccxxx, 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.

gabbi, 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.

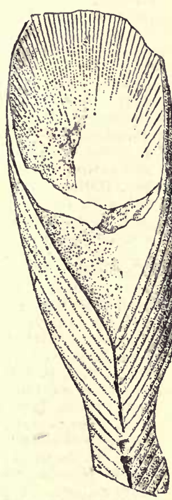


FIG. 156.—Coleophyllum romingeri.

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.

blainvilli, Billings, 1858, Can. Nat. and Geo., vol. 3, and Rep. of Progr. Geo. Sur. Can., p. 166. Hud. Riv. Gr.

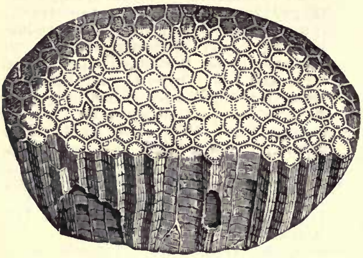


FIG. 157.—Columnaria alveolata.

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.
inæqualis, 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. ccxxxii, 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 Calapœcia.
cribriformis, see Calapœcia cribriformis.

COMBOPHYLLUM, Edwards & Haime, 1850, Brit. Foss. Corals, p. lxvii. [Ety. *kombos*, strip of cloth; *phyllon*, leaf.] Corallum, 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.
niagarense, see Chonophyllum niagarense.

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. *krepis*, 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.
subcæspitosum, Nicholson, 1874, (Heliophyllum subcæspitosum,) Lond. Geo. Mag. n. ser., vol. 1, p. 58, Ham. Gr.

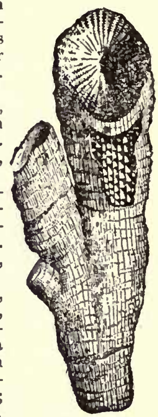


FIG. 158. Crepidophyllum subcæspitosum.

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 & Haime, 1851, Pol. Foss. d. Terr. Pal., p. 323, Carboniferous.

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, Castlenau, 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.

arctifossa, Hall, 1882, Foss. Corals Niagara, and Up. Held. Gr., 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. Mus. Nat. Hist., p. 443, Up. Held. Gr.

ceratites, Goldfuss. Not American.

coalitum, Rominger, 1876, Foss. Corals, p. 108, Up. Held. Gr.

cohærens, 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.

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.

FIG. 160.—Cyathophyllum cæspitosum. *b.* transverse section. *c.* vertical section.

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'orbignyi, Castelnau, 1843, Syst. Sil., p. 49. Not recognized.

eriphyle, Billings, 1862, Pal. Foss., vol. 1, p. 111, Anticosti Gr., Div. 4.

euryone, 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

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.
intervesicula, 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, Castelnau, 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.
perfossulatum, 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, Castelnau, 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.
radicula, 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, Castelnau, 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.

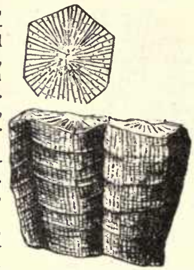


FIG. 161.—Cyathophyllum rugosum.

shumardi, see Amplexus shumardi.
solitarium, Billings, 1866, Catal. Sil. Foss. Antic., p. 93, Clinton and Niagara Grs.
striatulum, Castelnau, Syst. Sil., p. 48. Not recognized.
subcæspitosum, Meek, 1872, 6th Rep. Hayden's Geo. Sur. Terr., p. 470, and U. S. Geo. 40 Parallel, vol. 4, p. 60, Subcarboniferous.
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, Castelnau, 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.

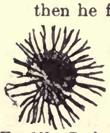


FIG. 162.—Cyclograptus rotadentatus.

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 preoccupied.
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; *phyllon*, 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.


FIG. 164.—Cystiphyllum vesiculosum.

superbum, Nicholson, 1875, Geo. Mag. vol. 2, N. S., p. 33, Ham. Gr.
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.

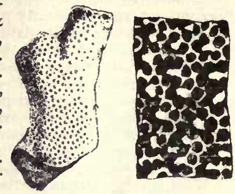


FIG. 165.—Dekayia aspera, natural size, and magnified.

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.

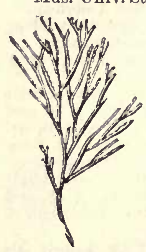


FIG. 166.—Dendrograptus hallanus.

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.

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.
spinosus, 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.
proboscidialis, 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.

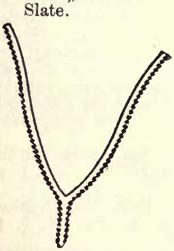


FIG. 167.—Dicranograptus ramosus.

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.

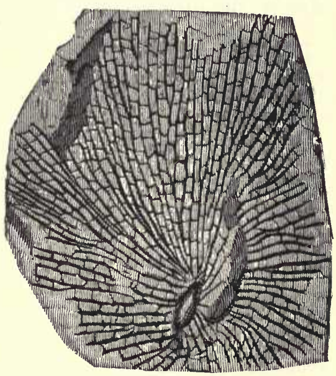


FIG. 168.—Dictyonema retiforme.

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, Gaspe 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. *diphyia*, 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, 55, 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, (Eridophyllum 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.

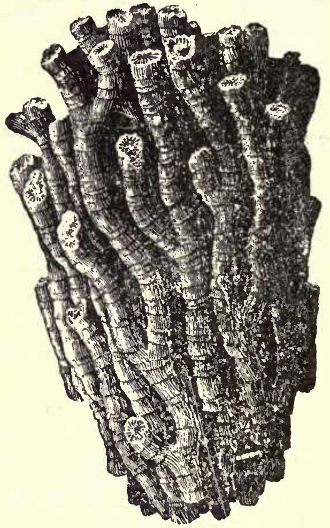


FIG. 170.—Diphyphyllum stramineum.

vennori, Billings, 1865, (Eridophyllum vennori,) Can. Nat. and Geo., 2d ser., vol. 2, p. 431, Clinton Gr.

verneuilanum, Edwards & Haime, 1850, (Eridophyllum verneuilanum,) Brit. Foss. Corals, p. lxxi, and Pol. Foss. des Terr. Pal., p. 424, Up. Held Gr.

DIPLOGRAPTUS, McCoy, 1854, (Diplograpsus,) 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.

dissimilaris, Emmons, 1856, Am. Geo., p. 105, Up. Taconic.

foliaceous, (?) Murch, 1839, (Graptolites foliaceus,) Murch. Sil. Syst., p. 695, Hud. Riv. Gr.

foliosus, Emmons, 1856, Am. Geo., p. 105, Up. Taconic.

FIG. 171. Diplograptus folium.

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.

Diplophyllum, 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.

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; calycle 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.

FIG. 172. Duncanella borealis magnified.

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 Ky., 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.

verneuilanum, see Diphyphyllum, verneuilanum.

Favastrea, DeBlainville, 1830, Man. d. Actinol, p. 374. Not an American palæozoic genus.

striata, D'Orbigny, 1850, Prodr. d. Palé-ont., 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 silicified, indeterminate fragment.

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.

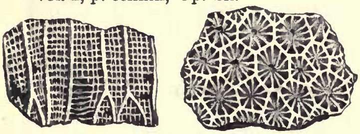


FIG. 173.—Favistella stellata.

stellata, Hall, 1847, Pal. N. Y., vol. 1, p. 275, Hud. Riv. Gr.

FAVOSITES, Lamarck, 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.

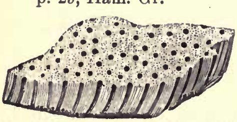


FIG. 174.—Favosites canadensis.

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.

cristatus, 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.

emmonsi, Rominger, 1876, Foss. Corals, p. 27, Up. Held. Gr. Syn. (?) for F. helioltiformis.

emmonsi, 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.

FIG. 175.—Favosites forbesi var. occidentalis.

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.

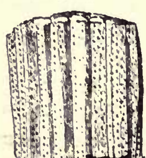


FIG. 176. — Favosites goldfussi.

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, 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.

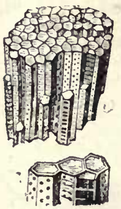


FIG. 177.—Favosites gothlandicus.

hamiltonensis, Rominger, 1876, Foss. Corals, syn. for F. dumosus.

hamiltoniæ, Hall, 1876, Illust. Dev. Foss., pl. 34, Ham. Gr.

helderbergiæ, 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.

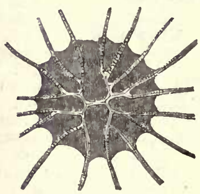


FIG. 178.—Graptolithus logani.

marcidus, see Diplograptus marcidus.

milesi, Hall, 1861, Geo. Sur. Vermont, vol. 1. p. 372, Quebec Gr.

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 pristiniformis.

quadribrachiatus, Hall, 1858, Geo. Sur. Can., p. 125, and Can. Org. Rem., Decade 2, p. 91, Quebec Gr.

quadrimucronatus, 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. whitianus.

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.
serratulus, 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.
whitianus, 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. lxvii. [Ety. *hadros*, mighty; *phyllon*, leaf.] Corallum short; calicle superficial; one very large septal fossula and three small ones representing a cross; radiate arrangement of the septa somewhat irregular. Type H. orbignyi.

FIG. 179. Hadrophyllum glans.

glans, White, 1862, (Zaphrentis glans,) Proc. Bost. Soc. Nat. Hist., vol. 9, p. 32, and Cont. to Pal., No. 8, p. 156, Burlington Gr.
orbignyi, Edwards & Haime, 1850, Brit. Foss. Corals, p. lxvii, Up. Held Gr.

Haimeophyllum, Billings, 1859, Can. Jour., vol. 4, p. 139, syn. for Chonostegites.
ordinatum, see Chonostegites ordinatus.

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.
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.

FIG. 180.—Halysites catenulatus.

catenulatus var. microporus, Whitfield, 1882, Geo. Wis., vol. 4, p. 272, Niagara, Gr.
compactus, Rominger, 1876, Foss. Corals, syn. for H. agglomeratus.
escharoides, Lamarck, 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 larger ones cylindrical, with twelve infoldings 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.

interstinctus, Linnæus, 1767, (Madrepora interstincta,) Syst. Nat., 12th Ed., p. 1276, Niagara Gr.

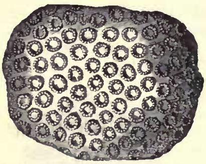


FIG. 181.— Heliolites interstinctus.

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.

æquale, 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.

æquum, 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.

eriense, 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, Illust. Dev. Foss., pl. 25, Ham. Gr.

halli var. reflexum, Hall, 1876, Illust. 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.

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.

invaginatum, Hall, 1882, Foss. Corals Niagara and Up. Held. Grs., p. 47, and 12th Rep. Geo. Ind., p. 306, Up. Held. Gr.

irregulare, Hall, 1876, Illust. Dev. Foss., pl. 24, Ham. Gr.

latericrescens, 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, Illust. 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.

subcæspitosum, see Crepidophyllum subcæspitosum.

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-columella, 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.

prolifica, 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.

INOCAULIS, 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, Ringueberg, 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. Verly poorly defined, but a syn. for Stromatapora.
infundibularia, Owen, 1840, Rep. on Minn. Lands, p. 70. A species of Stromatapora, 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.
ramulosa, see Cœnites ramulosus.


FIG. 184. — Lithostrotion basaltiforme.

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.

Linipora rotunda, Troost, not defined.

LITHOSTROTION, Lhwyd, 1869, Lithophyl. Britann. Ichnographia, Epistola 5, tab. xxiii. [Ety. *lithos*, stone; *strotion*, little rafter.] Corallum composite, astreiform; corallites loosely approximated, and circular 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.


FIG. 185. — Lithostrotion canadense.

mammillare, Castelnau, 1843, (Astrea mammillaris,) Syst. Sil., p. 50, syn. for L. canadense.
microstylum, White, 1880, 12th Rep. U. S. Geo. Sur. Terr., p. 158, 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.

LONSDALIA, McCoy, 1849, Ann. & Mag. Nat. Hist. 2d ser., vol. 3, p. 10. [Ety. proper name.] Corallum aggregate; corallites circular, not laterally united; septa and tabulæ numerous; visceral chamber separated into two zones, the outer one 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.


FIG. 186.—Lonsdalia 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 crescentiform 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.

FIG. 187.—Lophophyllum proliferum.

proliferum, McChesney, 1860, (Cyathaxonia prolifera,) New Pal. Foss., p. 75, and Pal. E. Neb., p. 144, Coal Meas.

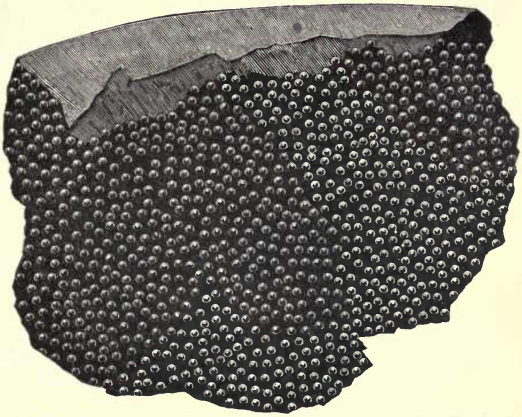


FIG. 189 —Megalograptus welchi. Cylindrical part of the body depressed, showing cells.

LUNATIPORA, Winchell, 1866, Rep. Low. Penin. Mich. 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.

papillata, Rominger, 1876, Foss. Corals, p. 16, Niagara Gr.

parvituba, 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. *megale*, large; *grapho*, I write.] Very large cylindrical, bearing fronds with spinous processes, and covered with cellular openings. Type M. welchi.

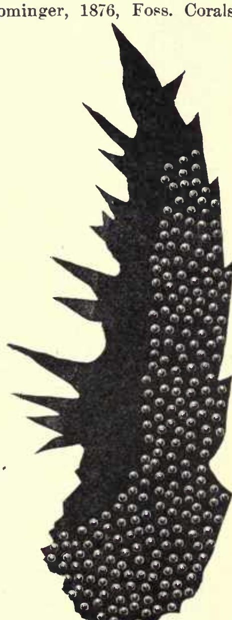


FIG. 190.—Megalograptus welchi. Frond, showing cells and spinous processes.

welchi, S. A. Miller, 1874, Cin. Quar. Jour. Sci., vol. 1, p. 343, Hud. Riv. Gr.

MICHELINIA, DeKoninck, 1842, Descrides 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.

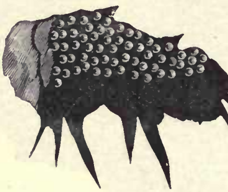


FIG. 191.—Megalograptus welchi. Frond, showcells and spinous processes.

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.

FIG. 193.—Michelinia eugeneæ. Another specimen, with larger corallites.

intermittens, Billings, 1859, Can. Nat. and Geo. Sur., vol. 4, p. 113, Corniferous 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.

FIG. 194.—Microcyclus discus.

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 clusters (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 microscopial 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.] Ramose, 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. æqualis.

abrupta, Hall, 1879, (Chetetes abruptus,) 32d Rep. N. Y. St. Mus. Nat. Hist., p. 148, Low. Held. Gr.

æqualis, 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.

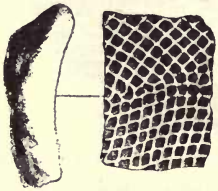


FIG. 195.—Monotrypella quadrata, natural size and magnified.

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, 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.

decipiens, Rominger, 1866, (Chetetes decipiens,) Proc. Acad. Nat. Sci. Phil., p. 3, Hud. Riv. Gr.

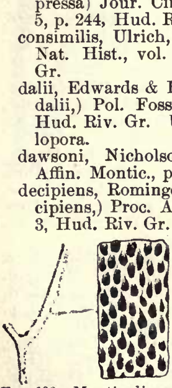


FIG. 196.—Monticulipora delicatula.

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.

dychei, James, 1883, Jour. Cin. Soc. Nat. Hist., vol. 6, p. 235, Hud. Riv. Gr.

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. River 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.

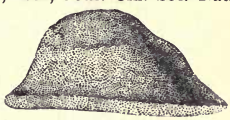


FIG. 197.—Monticulipora lycoperdon.

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.

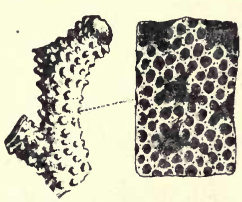


FIG. 198.—Monticulipora ramosa, natural size and magnified.

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.

vaupeli, Ulrich, 1883, (Heterotrypa vaupeli,) 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; tabulæ 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 compound 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. *nuktos*, 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.

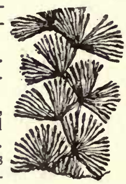


FIG. 199.—Oldhamia antiqua.

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.

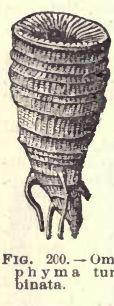


FIG. 200.—Omphyma turbinata.

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. lxviii. [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.

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.

PACHYPORA, Lindstrom, 1873, Ofversight af K. Vetensk Akad. Forhandl., p. 14. [Ety. *pachys*, thick; *poros*, pore.] Dendroid or frondescent; 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. *palaios*, 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.

FIG. 203.—Palæocyclus rotuloides.

rotuloides, Hall, 1852, (Cyclolites rotuloides,) Pal. N. Y., vol. 2, p. 42, Clinton Gr.

PALÆOPHYLLUM, Billings, 1858, Rep. of Prog. Geo. Sur. Can., p. 168. [Ety. *palaios*, ancient; *phyllon*, leaf.] Fasciculate 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.—Palœophyllum 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.

pygmæa, see Streptelasma pygmæum.

rustica, see Streptelasma rusticum.

selecta, see Streptelasma selectum.

waynensis, see Streptelasma wayneuse.

PHILLIPSASTREA, D'Orbigny, 1849, Note Sur. des Polypiers 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. hennahi.

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.

hennahi, Lonsdale, 1840, (Astræa hennahi,) Geo. 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.

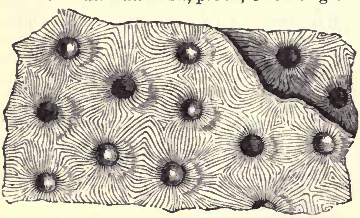


FIG. 205.—Phillipsastrea verneuli.

verneuli, Edwards & Haime, 1851, Polypiers 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. *phyllon*, 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.

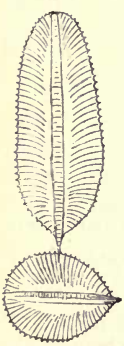


FIG. 206.—Phyllograptus typus.

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.

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, subhemispheric; basal epitheca, concentrically folded; calices immersed; septa rudimentary; tabulæ horizontal; walls thin; cœnenchyma composed of vertical radiate laminæ united by smaller horizontal plates. Type P. petaliformis.

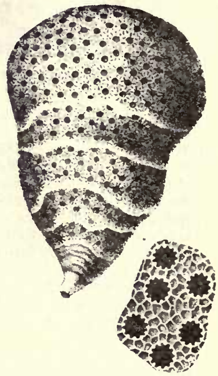


FIG. 207.—Plasmopora follis. Natural size, and magnified.

follis, Edwards & Haime, 1851, Mon. Pol. Foss. de Terr. Pal., p. 220, Niagara 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.

FIG. 208.—Pleurodictyum problematicum. Under side, showing serpula like body.

problematicum, Goldfuss, 1826, Petref. Germ., vol. 1, p. 113, Onondaga Gr.

Polydilasma, Hall, 1852, Pal. N. Y., vol. 2, syn. for Zaphrentis.

turbinatum, see Zaphrentis turbinata.

Porites, Lamarck, 1816, Hist. des Anim. sans Vert., t. 2, p. 267. Not an American Palæozoic genus.

astræiformis, 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, concavo-convex 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.

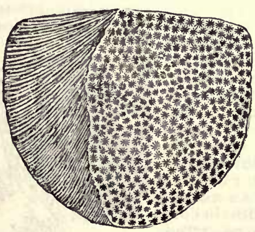


FIG. 209.—Protarea vetusta, on Strophomena alternata.

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, 1878, Can. Nat., vol. 8, and Bull. No. 1, Mus. Univ. St. Mo., p. 41, Niagara Gr.

FIG. 210.—Ptilograptus foliaceus.

geinitzanus, Hall, 1865, Can. Org. Rem., Decade 2, p. 140, Quebec Gr.
plumosus, Hall, 1865, Can. Org. Rem., Decade 2, p. 140, Quebec Gr.

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. lxix. [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.

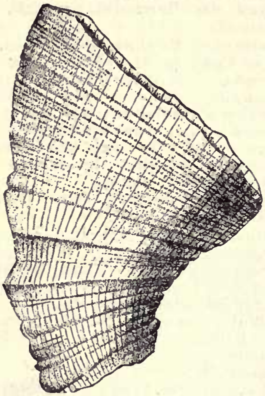


FIG. 211.—Ptychophyllum knappi.

knappi, Hall, 1883, 12th Rep. Geo. Ind., p. 278, Up. Held. Gr.

stokesi, Edwards & Haime, 1851, Brit. Foss. Corals, p. lxix, 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.

FIG. 212. — Pycnostylus guelphensis; two branches are broken off at *C, C.*

guelphensis, Whiteaves, 1884, Pal. Foss., vol. 3, p. 3, Guelph Gr.

Quenstedtia, Rominger, 1876, Foss. Corals, p. 71. Being preoccupied, Nicholson proposed Romingeria.

niagarensis, see Romingeria niagarensis.

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. Type R. peregrinus.

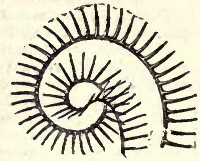


FIG. 213. — Rastrites peregrinus.

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.

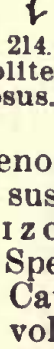


FIG. 214.—Retiolites venosus.

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 Anim. sans Vert., t. 2, p. 222. Not an American Palaeozoic genus.

glabra, Owen, 1840, Rep. on Mineral Lands. See Lyellia glabra.

(?)*obsoleta*, Hall, 1857, Geo. 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.

SPHÆROLITES, 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, (Staurograpsus,) 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.

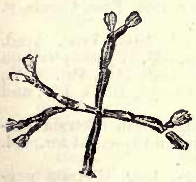


FIG. 216. — Staurograptus dichotomus.

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.

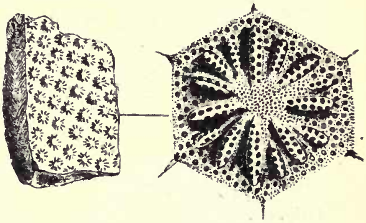


FIG. 217.—Stellipora polystomella, natural size and magnified star.

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 similiar 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.

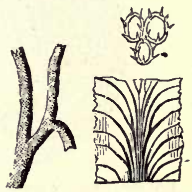


FIG. 218.—Stenopora exilis.

patula, see Monticulipora patula.

spinigera, see Chetetes spinigerus.

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 fossette. 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.

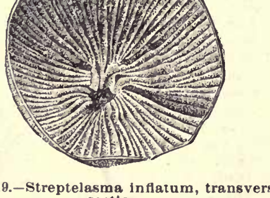


FIG. 219.—Streptelasma inflatum, transverse section.

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.

limitare, 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. Streptelasma 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.
ungula, 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 striæ the bands may bear spinules; tabulæ 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.
linnæana, 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.

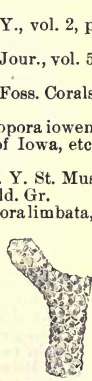


FIG. 221.—Striatopora linnæana.

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 tabulæ, united by ascending trabiculæ, 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.

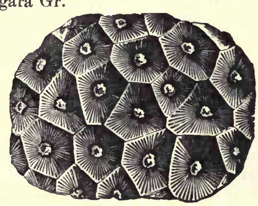


FIG. 222.—Strombodes pentagonus.

pentagonus, Goldfuss, 1826, Germ. Petref. p. 62, Niagara Gr.
pygmæus, 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; tabulæ 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. *syrinx*, pipe; *poros*, pore.] Corallum aggregating, at first creeping after the manner of Aulopora, then sending up numerous vertical, cylindrical corrallites, 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.

FIG. 223.—Syringopora maclurii.

maclurii, Billings, 1860, Can. Jour., vol. 5, p. 258, Corniferous Gr.

multattenuata, 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. Geo. Soc., 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.

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.

TETRADIUM, Dana, 1848, Wilkes. Expl. Exped. Zooph., vol. 8, p. 701. [Ety. *tetra*, four.] Aggregate, massive, subhemispheric; 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.—Tetradium 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. apertum, 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.

FIG. 225.—Tedradium fibratum. Corallites scattered through the rock.

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.

Tetragraptus, 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.

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.

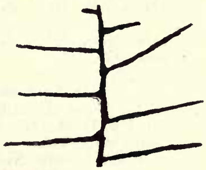


FIG. 226. — Thamnograptus typus.

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.

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.

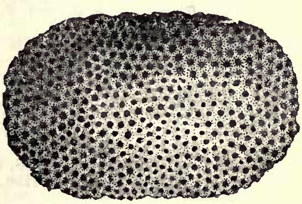


FIG. 227.—Thecia major.

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; *stege*, 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.

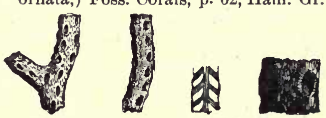


FIG. 229.—Trachypora elegantula. Portion of two corallites — a longitudinal section and a corallite enlarged.

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. verneuilanum.

verneuilanum, 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.
bigsbyi, 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.
carniatas, 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, Gaspe limestone No. 8, Devonian.
clappi, syn. for Z. gigantea.
cliffordana, Edwards & Haime, 1851, Mon. d. Pol. Foss. d. Terr. Pal., p. 329, Subcarboniferous.
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, Lesueur, 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 Nigara 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.
inæqualis, Hall, 1882, Foss. Corals Niagara and Up. Held. Grs., syn. for Palæophyllum 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, Niagra 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. 288, 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.
prolifica, Billings, 1858, Can. Jour. N. S., vol. 4, p. 121, Up. Held. and Ham. Grs.
prona, M. Edwards, 1860, Hist. d. Coralllaires, 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, Gaspe 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.
trisutura, Hall, 1882, Foss. Corals Niagara and Up. Held. Grs., p. 30, and 12th Rep. Geo. Ind., p. 289, Up. Held. Gr.
turbinata, Hall, 1852, (Polydilasma 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, Corniferus 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 interradials, 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 interradial 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 interradial 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 respiratory 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 interradial 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 interradial 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 exserted 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 Perischoechineda 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, Amphoracrinus, Batocrinus, Dorycrinus, Eretmocrinus, Gennæocrinus, Megistocrinus, Melocrinus, Physetocrinus, Saccocrinus, Siphonocrinus, (?) Steganocrinus, Stereocrinus, Strotocrinus, Teleiocrinus.

FAMILY AGASSIZOCRINIDÆ.—Agassizocrinus.

FAMILY ALLAGECRINIDÆ.—Allagecrinus.

FAMILY ANCYROCRINIDÆ.—Ancyrocrinus.

FAMILY ARTHRACANTHIDÆ.—Arthracantha.

FAMILY BELEMNOCRINIDÆ.—Belemnocrinus.

FAMILY CALCEOCRINIDÆ.—Calceocrinus, Deltacrinus.

FAMILY CAMAROCRINIDÆ.—Camarocrinus.

FAMILY CATILLOCRINIDÆ.—Catillocrinus.

FAMILY CUPRESSOCRINIDÆ.—Aspidocrinus.

FAMILY CYATHOCRINIDÆ.—Ampheristocrinus, Arachnocrinus, Atelestocrinus, Barycrinus, Carabocrinus, Cyathocrinus, Erisocrinus, Eupachycrinus, Euspirocrinus, Menocrinus, Palæocrinus, Vasocrinus.

FAMILY DICHOCRINIDÆ.—Cotyledonocrinus, Dichocrinus, Pterotocrinus, Talarocrinus.

FAMILY DIMEROCRINIDÆ.—Coronocrinus, Cytocrinus.

FAMILY EDRIOCRINIDÆ.—Edriocrinus.

FAMILY EUCALYPTOCRINIDÆ.—Eucalyptocrinus.

FAMILY GASTEROCOMIDÆ.—Myrtillocrinus.

FAMILY GAUROCRINIDÆ.—Gaurocrinus, Retiocrinus, Rhaphanocrinus, Thysanocrinus.

FAMILY GLYPTASTERIDÆ.—Glyptaster, Lampterocrinus.

FAMILY GLYPTOCRINIDÆ.—Archæocrinus, Compsocrinus, Glyptocrinus, Pycnocrinus, Schizocrinus.

FAMILY HAPLOCRINIDÆ.—Coccocrinus, Haplocrinus.

FAMILY HETEROCRINIDÆ.—Ectenocrinus, Heterocrinus, Iocrinus, Ohiocrinus.

FAMILY HYBOCRINIDÆ.—Anomalocrinus, Hybocrinus.

FAMILY ICHTHYOCRINIDÆ.—Cleiocrinus, Ichthyocrinus, Lecanocrinus, Mespilocrinus, Nipterocrinus, Onychocrinus, Taxocrinus.

FAMILY MELOCRINIDÆ.—Allocrinus, Dolatocrinus, Macrostylocrinus, Mariacrinus, Technocrinus.

FAMILY PISOCRINIDÆ.—Pisocrinus.

FAMILY PLATYCRINIDÆ.—Cordylocrinus, Eucladocrinus, Marsupiocrinus, Platycrinus.

FAMILY POTERIOCRINIDÆ.—Bursacrinus, Cœliocrinus, Dendrocrinus, Graphiocrinus, Homocrinus, Hydreionocrinus, Merocrinus, Ottawacrinus, Poteriocrinus, Stemmatocrinus, Zeacrinus.

FAMILY RHODOCRINIDÆ.—Goniasteroidocrinus, Hadrocrinus, Lyriocrinus, Rhodocrinus.

FAMILY SYNBATHOCRINIDÆ.—Synbathocrinus.

FAMILY TAXOCRINIDÆ.—Cupulocrinus, Forbesiocrinus, Taxocrinus.

FAMILY XENOCRINIDÆ.—Xenocrinus.

FAMILY AFFINITY UNCERTAIN.—Brachiocrinus, 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.—Allocystites, Crinocystites, Holocystites.

FAMILY HYBOCYSTIDÆ.—Hybocystites.

FAMILY LEPADOCRINIDÆ.—Apiocystites, Callocystites, Glyptocystites, Lepadocrinus, 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.—Eleutherocrinus.

FAMILY GRANATOCRINIDÆ.—Granatocrinus, Schizoblastus.

FAMILY NUCLEOCRINIDÆ.—Nucleocrinus.

FAMILY PENTREMITIDÆ.—Pentremites, Pentremitidea.

FAMILY STEPHANOCRINIDÆ.—Stephanocrinus.

FAMILY TROOSTOCRINIDÆ.—Troostocrinus, Tricœlocrinus.

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 interradials, one in the first series, two in the second, and one or two in the third; azygous interradials, one in line with the first primary radials, and ot 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.
clœlia, see Eretmocrinus clœlia.
clypeatus, see Batocrinus clypeatus.
concavus, see Dorycrinus concavus.
concinnus, see Steganocrinus concinnus.
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.

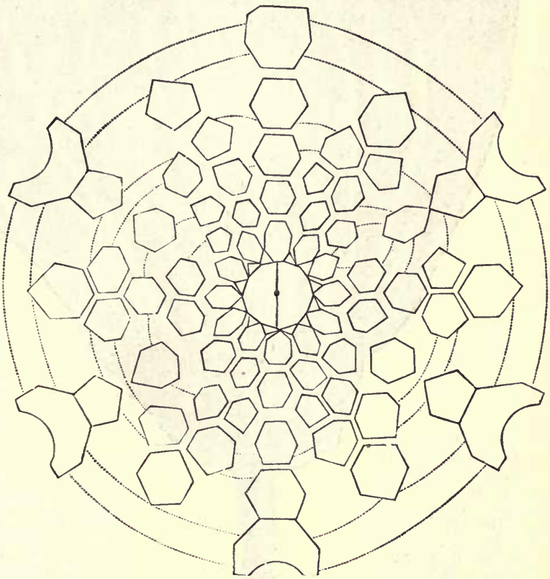


FIG. 231.—Acrocrinus wortheni; diagram.

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 Crinoidea, p. 3, and Geo. Sur. Ill., vol. 5, p. 341, Burlington Gr.
fibula, Troost, 1850, Catal. Not defined.
fiscellus, see Agaricocrinus fiscellus.
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. 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.

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.
lagena, 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.

matuta var. attenuatus, see Eretmocrinus attenuatus.
meeki, 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.
oblatus, see Batocrinus oblatus.
obpyramidalis, see Melocrinus obpyramidalis.
olla, McCoy, 1849. Not American.
olliculus, syn. for Megistocrinus whitii.
opusculum, Hall, 1861, Bost. Jour. Nat. Hist., p. 264, Burlington Gr.

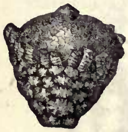


Fig. 233. — Actinocrinus ornatissimus.

ornatissimus, Wachsmuth & Springer, (in press), Geo. Sur. Ill., vol. 8, p. 163, Kinderhook Gr.
ornatus, see Physetocrinus ornatus.
ovatus, 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.
pocillum, see Gennæocrinus pocillum.
polydactylus, see Mariacrinus polydactylus.
præcursor, see Dorycrinus præcursor.
proboscidialis, Hall, 1858, Geo. Rep. Iowa, p. 584, Burlington Gr.

Fig. 234.—Actinocrinus proboscidialis.

pyriformis, see Batocrinus pyriformis.
pyriformis, var. rudis, Meek & Worthen, see Batocrinus pistilliformis.
pyramidatus, see Agaricocrinus pyramidatus.
quadrispinus, see Amphoracrinus quadrispinus.
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.

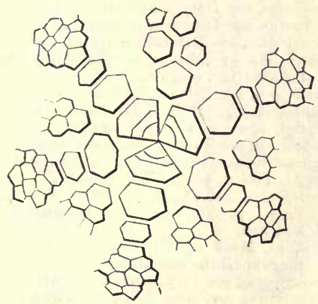


Fig. 235.—Actinocrinus scitulus. Diagram x 2.

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 konincki.
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.
verneuili, see Melocrinus verneuili.
verneuilianus, see Eretmocrinus verneuilanus.
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 Amphoracrinus 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, (Amphoracrinus 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.

FIG. 237.—Agaricocrinus elegans, view of the vault.

eris, Hall, 1864, (Actinocrinus helice var eris,) 17th Rep. N. Y. St. Mus. Nat. Hist., p. 53, and Ohio Pal., vol. 2, p. 164, Waverly Gr.

FIG. 238.—Agaricocrinus elegans, basal view.

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. 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 Criniodea, p. 4, and Bost. Jour. Nat. Hist., p. 284, Burlington Gr.
macadamsi, Worthen, (in press,) Geo. Sur. Ill., vol. 8, p. 94, Keokuk Gr.

FIG. 239—Agaricocrinus helice.

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.

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 anchylosed, very small inner cavity; subradials 5, thick, usually anchylosed; radials 2 x 5; 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.

FIG. 240. — Agassizocrinus dactyliformis.

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 consisting 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.

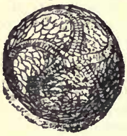


FIG. 241.—Agelacrinus cincinnatiensis.

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., Decade 3, p. 84, Trenton Gr.

hamiltonensis, Vanuxem, 1842, Geo. Rep. 3d Dist. N. Y., p. 158, Ham. Gr.

holbrooki, 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, anchylosed; 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 subelliptical, 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 anchylosed 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.

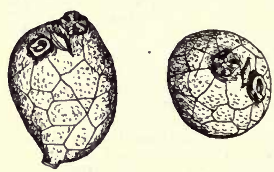


FIG. 242.—Allocystites hammelli. Side and summit view.

ALLOPROSALLOCRINUS, Casseday & Lyon, 1860, Proc. Am. Acad. Arts and Sci., vol. 5, p. 29.] Ety. *alloprosallos*, 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 bellitrema.

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.

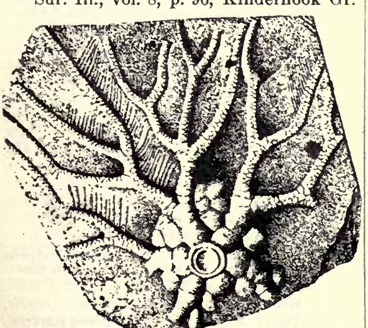


FIG. 244.—Amphoracrinus viminalis.

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. lævis, 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.

ANCYROCRINUS, 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.

spinosus, 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. *anomalos*, 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.

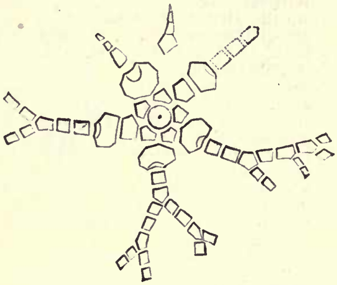


FIG. 246.—Anomalocrinus incurvus. Diagram.

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; *kustis*, 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.

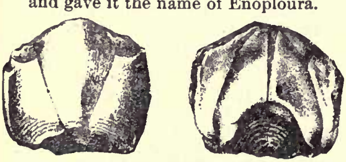


FIG. 247.—Anomalocystites balanoides. Convex and flattened sides.

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; *kustis*, 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 calycine 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. pentremitoides.

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. Palæocrinoidea, p. 93, Ham. Gr.

knappi, Wachsmuth & Springer, 1879, Revis. Palæocrinoidea, p. 93, Ham. Gr.

pisiformis, Roemer, 1860, (Poteriocrinus pisiformis,) Sil. Fauna W. Tenn., p. 54, Niagara Gr. Wachsmuth says it is a Lecanocrinus.

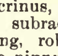


FIG. 248. Arachnocrinus pisiformis.

ARCHÆOCIDARIS, 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 articulation 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.

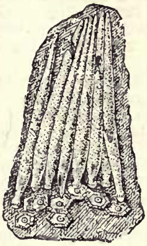


FIG. 249. — Archæocidaris agassizi, showing spines.

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 preoccupid 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. Palæocrinoidea, p. 189. [Ety. *archaios*, ancient; *krinon*, lily.] Basals 5; subradials 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.

ARTHRACANTHA, 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 pinnules; 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.
tennesseex, Troost, 1850. Not defined.

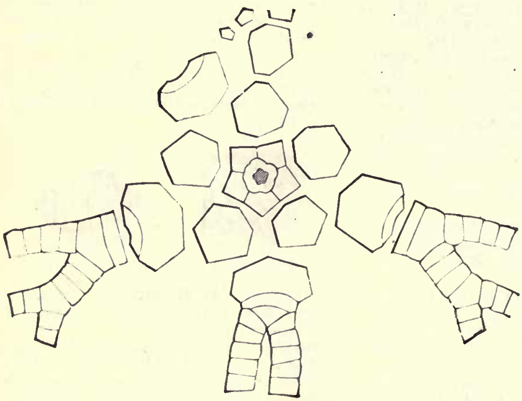


FIG. 251.—Barycrinus wachsmuthi. Diagram.

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.
lævis, 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 or base of Keokuk Gr.

Balanocrinus, Troost, 1850. This name was preoccupied. See Lampterocrinus.
inflatus, see Lampterocrinus inflatus.

BARYCRINUS, 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, (Poteriocrinus 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.

BATOCRINUS, 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 2 x 10; tertiary radials 2 x 2 x 10; 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 cayleulus 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.

FIG. 252.—Batocrinus dodecadactylus. Diagram.

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.

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 nashvillæ,) Geo. Sur. Iowa, p. 609, Keokuk Gr.

nashvillae var. subtractus, White, 1863, (Actinocrinus nashvillæ 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 pistillus,) 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.

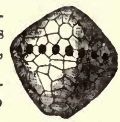


FIG. 254.—Batocrinus rotundus.

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.

BELEMNOCRINUS, White, 1862, Proc. Bost. Soc. Nat. Hist., vol. 9, p. 14. [Ety. *belemnon*, 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.

FIG. 255.—Belemnocrinus 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.

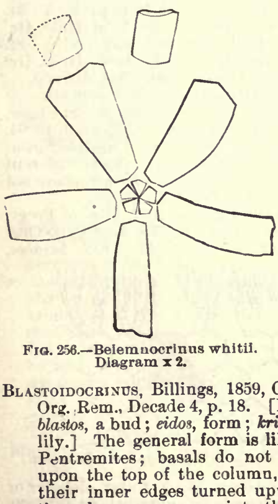


FIG. 256.—Belemnocrinus whitii. Diagram x 2.

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.

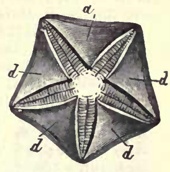


FIG. 257.—Blastoidocrinus carcharidens. *d*, deltoid plates extending the whole length of the pseudambulacra.

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.

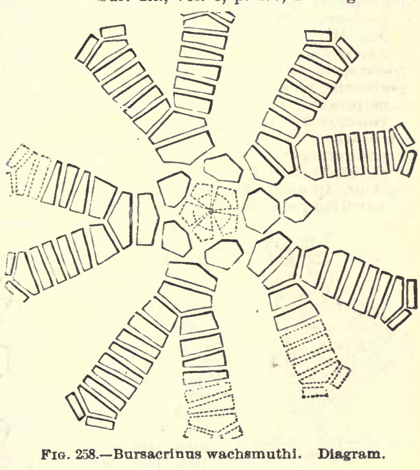


FIG. 258.—Bursacrinus wachsmuthi. Diagram.

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 Teleiocrinus.

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.

furcillatus, Billings, 1887, Trans. Ottawa Field Nat. Club, vol. 3, p. 51, Trenton Gr.

inæqualis, Billings, 1859, (Heterocrinus inæqualis,) 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.

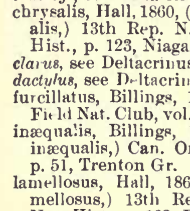


FIG. 259.—Calceocrinus rugosus.

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.

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, radiciform, 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.

Canistrocrinus, Wachsmuth & Springer, 1885, Palæocrinidæ, 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*, a crab; *krinon*, lily.] Calyx globular or ovoid; basals 5; subradials 5; primary radials 5; arms five, and frequently

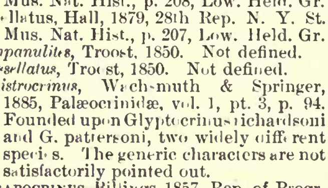


FIG. 261.—Carabocrinus radiatus. Diagram.

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.
vancortlandti, 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.
meconoideus, 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.

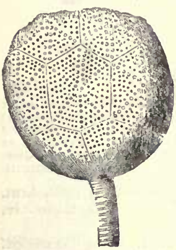


FIG. 262.—Caryocrinus ornatus.

Caryocystites, Von Buch, as cited by Hall in 1861, in Geo. Rep. Wis. See Holocystites.
alternatus, see Holocystites alternatus.
cylindricus, see Holocystites cylindricus.

CATILLICRINUS, 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. tennesseeæ.
bradleyi, Meek & Worthen, 1868, Proc. Acad. Nat. Sci. Phil., p. 342, and Geo. Sur. Ill., vol. 5, p. 504, Keokuk Gr.
tennesseeæ, 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, Wachsmuth & 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.

Ceriocrinus, White, 1880, proposed as a subgenus of Erisocrinus, but the name was preoccupied.

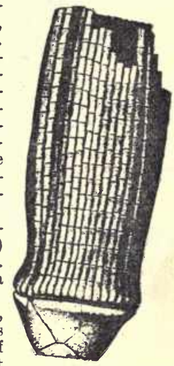


FIG. 263.—Catillocrinus wachsmuthi.

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.

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.

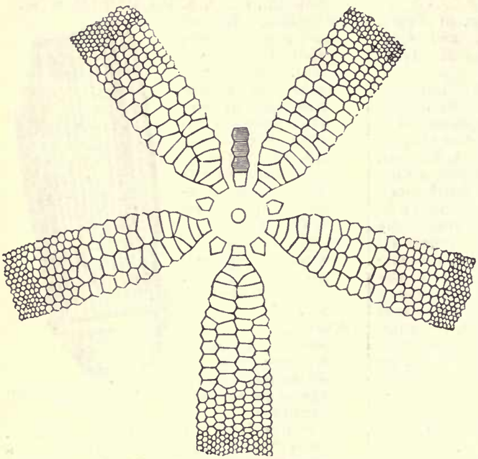


FIG. 264.—Cleiocrinus regius. Diagram.

CLOSTEROCRINUS, Hall, 1852, Pal. N. Y., vol. 2, p. 79. [Ety. *kloster*, a spindle; *krinon*, lily.] Body obconic; basals 3; subradials 1 x 5; 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.

COCCOCRINUS, Muller, 1855, Verhand, Naturhist. Vereins Rhein und Westph., Jahr. 12, p. 20. [Ety. *kokkos*, a berry; *krinon*, lily.] Basals 3; radials 2 x 5; interradials 1; column round; distinguished from Haplocrinus 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.—Coccocrinus 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 1 x 5, 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.

FIG. 266.—Codaster gratiosus. Summit and side view of cast, the latter showing an aperture at the summit.

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.

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.

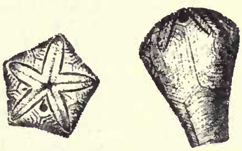


FIG. 268.—Codonites conicus.

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.

FIG. 269.—Codonites fusiformis.

stelliformis, Owen & Shumard, 1850. (Pentremites stelliformis,) Jour. Acad. Nat. Sci. Phil., 2d ser., vol. 2, p. 67, Burlington Gr.

CŒLIOCRINUS, White, 1863, Jour. Bost. Soc. Nat. Hist., vol. 7, p. 499. [Ety. *koilia*, 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.

Cœlocrinus, Meek & Worthen, 1865, Proc. Acad. Nat. Sci. Phil., and Geo. Sur. Ill., vol. 2, p. 214, syn. for Dorycrinus.

concavus, see Dorycrinus concavus.

COMAROCYSTITES, Billings, 1854, Can. Jour., vol. 2, p. 269, and Can. Org. Rem., 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.

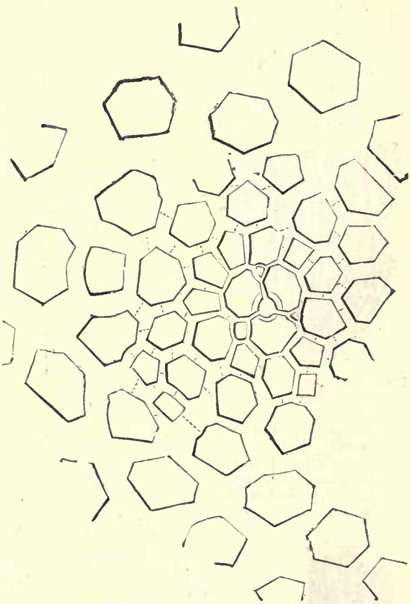


FIG. 270.—Comarocystites shumardi. Diagram of part of it.

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.

COMPSASTER, Worthen & Miller, 1883, Geo. Sur. Ill., vol. 7, p. 327. [Ety. *kompsos*, elegant; *aster*, star.] Central disk small; rays large, long, fusiform; grooves deep, bordered by numerous adambulacral plates; several rows of disk-plates upon each side 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. *kompsos*, elegant; *krinon*, lily.] Basals 4; primary radials, 3 x 5; 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.

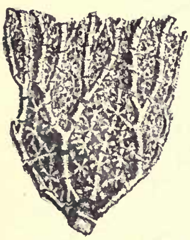


FIG. 271. — Compsocrinus harrisi. Mag. 2 diam.

harrisi, S. A. Miller, 1881, (Glyptocrinus harrisi,) Jour. Cin. Soc. Nat. Hist., vol. 4, p. 74, Hud. Riv. Gr.

Conocrinus, Troost. Not defined.

CORDYLOCRINUS, Angelin, 1878, Icon. Crin. Suec., p. 3. [Ety. *kordyle*, a cudgel; *krinon*, lily.] Body resembling Platycrinus; basals 3; unequal; radials 3 x 5; 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 3 x 5; secondary radials 2 x 10; arms 10; interradials 3 x 5. 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.

Cremacrinus, 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, Castelnau, 1843, Syst. Sil. Probably a fucoid.

Cromyocrinus, Trautschold, 1867, syn. for Eupachycrinus.

gracilis, see Eupachycrinus gracilis.

Crumenæcrinites, 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 4 x 5, 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 1 x 5; 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.

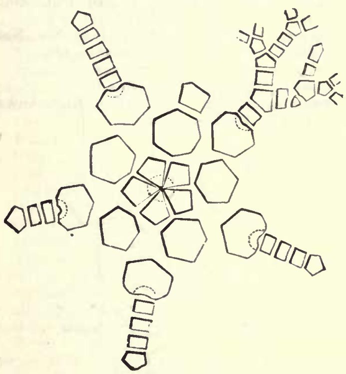


FIG. 273.—Cyathocrinus arboreus. Diagram.

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.

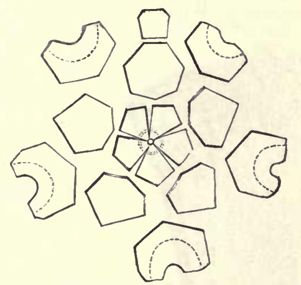


FIG. 274.—Cyathocrinus farleyi. Diagram.

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.
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.

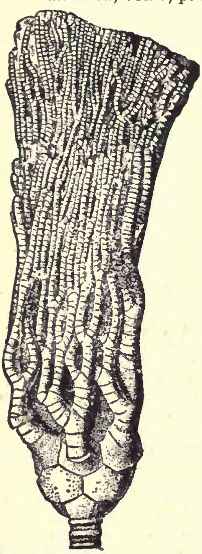


FIG. 275.—Cyathocrinus multibrachiatus.

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.
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 lævis

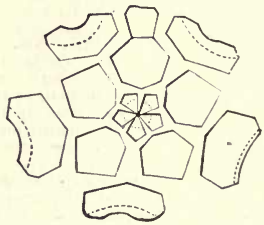


FIG. 276.—Cyathocrinus quinquelobus.

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.

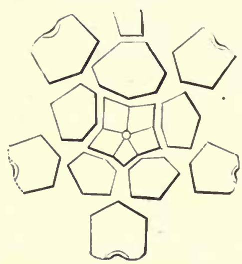


FIG. 277.—Cyathocrinus saffordi. Diagram.

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. 258, 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.

tennesseeæ, 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, Burlington 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, Niagara 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 Edrioaster.

bigsbyi, see Edrioaster 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 integument 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, Trenton 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.

Dæmonicrinites, Troost Not defined.

Decadactylocrinites, Owen. Not defined.

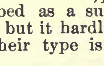


FIG. 279.—Cystocrinus tennesseensis.

Decadocrinus, Wachsmuth & Springer, 1879, Proc. Acad. Nat. Sci. Phil. and Revis. Palæocrinoidea, pt. 1, p. 119. It was described as a subgenus of Poteriocrinus, but it hardly arises to that dignity. Their type is Scaphiocrinus scalaris.

DELTACRINUS, Ulrich, 1886, 14th Rep. Geo. Sur. Minn., p. 109. [Ety. *delta*, Greek letter; *krinon*, lily.] Basal piece triangular, composed of anchylosed plates; four plates form the dorsal side above the base; lower central plate triangular 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.

barrisi, Worthen, 1875, (Calceocrinus barrisi, Geo. Sur. Ill., vol. 6, p. 510, Ham. Gr.

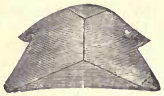


FIG. 280.—Deltacrinus barrisi.

bradleyi, Meek & Worthen, 1869, (Calceocrinus bradleyi,) Proc. Acad. Nat. Sci. Phil., p. 73, and Geo. Sur. Ill., vol. 5, p. 502, Keokuk Gr.

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.

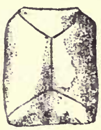


FIG. 281.—Deltacrinus stigmatus. Dorsal view of calyx enlarged 2 diam.

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.

DENDROCRINUS, Hall, 1852, Pal. N. Y., vol. 2, p. 193. [Ety. *dendron*, tree; *krinon*, lily.] Calyx obconoidal; basals 5; subradials 5; radials 1 x 5, and an additional one caused by a division of the plate on the left side of the large azygous one; regular interradials 0; azygous interradial 1; large and long proboscis or ventral sac rises from the azygous interradial; arms long, branching; ambulacral furrow deep; pinnules wanting; column round or pentagonal; without base or roots for attachment. Type D. longidactylus.

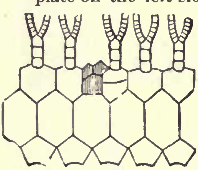


FIG. 282.—Dendrocrinus. Diagram.

acutidactylus, Billings, 1857, Rep. of Progr. Geo. Sur. Can., p. 266, and Can. Org. Rem., Decade 4, p. 37, Trenton Gr.

ancilla, 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.

erraticus, 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.

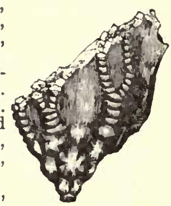


FIG. 283.—Dendrocrinus jewetti.

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.

navigiolum, S. A. Miller, 1880, Jour. Cin. Soc. Nat. Hist., vol. 3, p. 235, Utica Slate Gr.

nucleus, see Cyathocrinus nucleus.

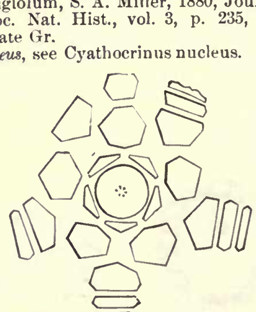


FIG. 284.—Dendrocrinus oswegoensis. Diagram.

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, (Poteriocrinus 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 Prog. 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.

DICHOCRINUS, 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.

FIG. 285. — Dichocrinus inornatus.

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.

Dictyocrinus, Conrad, 1841, (Dictuocrinites,) 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.

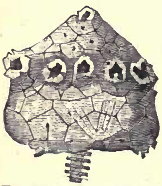


FIG. 286.—Dolatocrinus lacus. Side view.

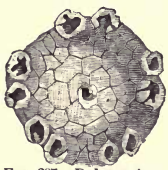


FIG. 287.—Dolatocrinus lacus. Ventral view.

glyptus var. intermedius, Hall, 1862, (Cacabocrinus glyptus var. intermedius,) 15th Rep. N. Y. St. Mus. Nat. Hist., p. 141, Ham. Gr.

FIG. 288.—Dolatocrinas 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.

Donacicrinites, 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.

concavus, Meek & Worthen, 1861, (Actinocrinus concavus,) Proc. Acad. Nat. Sci. Phil., p. 131, and Geo. Sur. Ill., vol. 2, p. 215, Low. Burlington Gr.

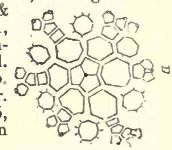


FIG. 289.—Dorycrinus concavus. Diagram.

cornigerus, Hall, 1858, (Actinocrinus cornigerus,) Geo. Rep. Iowa, p. 576, Burlington Gr.

gouldi, Hall, 1858, (Actinocrinus gouldi,) Geo. Rep. Iowa, p. 613, Keokuk Gr.

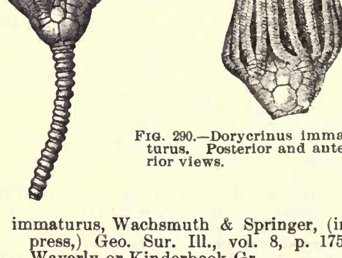


FIG. 290.—Dorycrinus immaturus. Posterior and anterior views.

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.

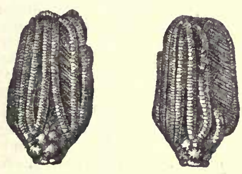


FIG. 292.—Dorycrinus radiatus. Posterior and anterior views.

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.

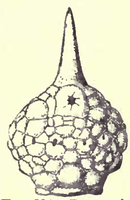


FIG. 294.—Dorycrinus unicornis.

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 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.

FIG. 295. Ectenocrinus grandis.

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. 7, Hud. Riv. Gr.

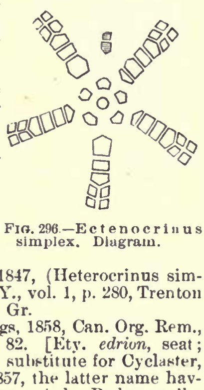


FIG. 296.—Ectenocrinus simplex. Diagram.

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 depression, the other smaller and succeeding the first; arms composed of transversely linear plates and bifurcating. Type E. pociliformis.

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.

Elæacrinus, 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 1 x 5, four-forked, occupying nearly the length of the calyx, one short and not forked; interradials 1 x 5; 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. cassedayi.

cassedayi, 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.

EOCIDARIS, 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. Geo. Sur., No. 30, p. 94, Upper Taconic.

primævus, Billings, 1868, Acad. Geol. p. 643, Up. Taconic, St. John's Gr.

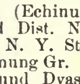


FIG. 297. Eocystites primævus.

ERETMOCRINUS, Lyon & Casseday, 1859, Am. Jour. Sci. and Arts, vol. 28, p. 241. [Ety. *eretmos*, oar; *krinon*, lily.] Body biturbinate 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.

gemmiformis, Hall, 1860, (Actinocrinus gemmiformis,) Supp. Geo. Sur. Iowa, p. 23, Burlington Gr.

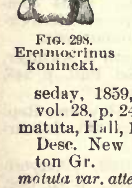


FIG. 298. Eretmocrinus konincki.

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 & Casseday, 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, (Batocrinus 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.

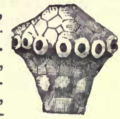


FIG. 299. Eretmocrinus verneuilanus.

verneuilanus, Shumard, 1855, (Actinocrinus verneuilianus,) Geo. Sur. Mo., p. 193, Burlington Gr.

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.

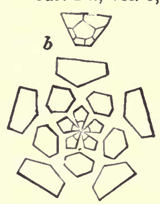


FIG. 300. — Erisocrinus conoideus. Side view, natural size; *b*, diagram, 2 diam.

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.

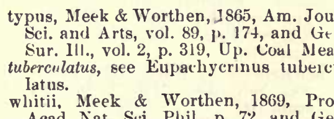


FIG. 301.—Erisocrinus typus. Two side views, basal view, and top view of calyx.

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 Eupachycrinus 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 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.

cælatus, Hall, 1843, (Hypanthocrinites cælatus,) 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.

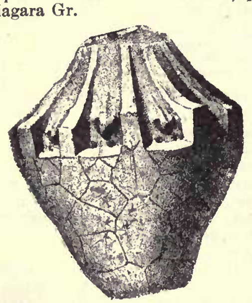


FIG. 302.—Eucalyptocrinus crassus.

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.

nashvillæ, 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.

FIG. 303 —Eucalyptocrinus tuberculatus.

EUCLADOCRINUS, 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 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.

concinnus, 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 & Worthem, 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.

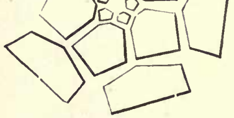


FIG. 304.—Eupachycrinus crassus. Diagram.

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, (Poteriocrinus hemisphericus,) Trans. St. Louis, Acad. Sci., vol. 1, p. 221, and Geo. Sur. Ill., vol. 5, p. 561, Coal Meas.

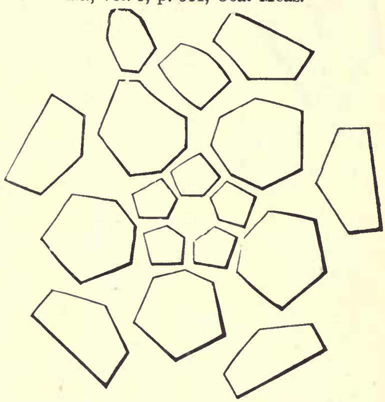


FIG. 305.—Eupachycrinus sangamonensis. Diagram.

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.

sangamonensis, Meek & Worthen, 1861, (Cyathocrinus sangamonensis,) 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.

EUSPIROCRINUS, Angelin, 1878, Iconogr. Crinoid Suec., p. 24. [Ety. *euspeires*, winding; *krinon*, lily.] Calyx cyathiform; basals 5; subradials 5, large; radials 1 x 5, wider than high, excavated for the attachment of the arms; azygous area wide, plates large; ventral tube composed of large plates; vault covered with large plates; arms bifurcate. Type E. spiralis.

obconicus, W. R. Billings, 1885, Ottawa Field Nat. Club, vol. 2, p. 248, Trenton Gr.

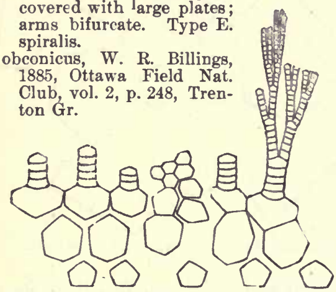


FIG. 307.—Euspirocrinus obconicus. Diagram.

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 interradials 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.

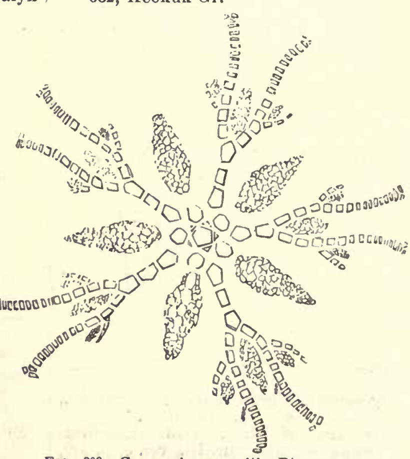


FIG. 309.—Gaurocrinus nealli. Diagram.

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 3 x 5, or the left posterior ray only 2; secondary radials 10 to 16 x 10; 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.

FIG. 310.—Gaurocrinus nealli.

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.

GENNÆOCRINUS, 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 3 x 5; secondary radials 1 x 10; 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 3 x 5; 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.

FIG. 312.—Glyptaster occidentalis.

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. 280. [Ety. *glyptos*, sculptured;

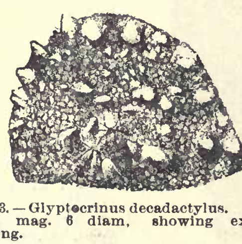


FIG. 313.—Glyptocrinus decadactylus. Part of vault mag. 6 diam, showing excurrent opening.

krinon, lily.] Calyx obconoidal, interradial areas flattened or depressed; surface sculptured and having radial ridges; basals 5; primary radials 3 x 5;

scondary radials 1 or more by 10; tertiary radials usually present; arms 10 to 20 or more, bearing pinnules; first interradial resting upon the first

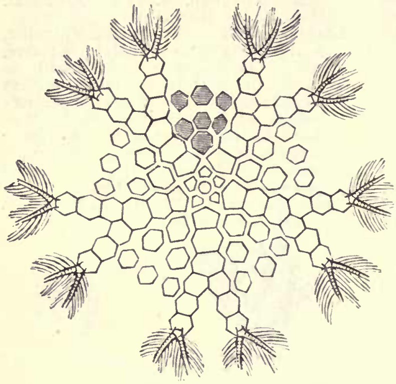


FIG. 314.—Glyptocrinus decadactylus. Diagram.

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. decadactylus.

FIG. 315.—Glyptocrinus decadactylus.

angularis, see Gaurocrinus angularis.

FIG. 316.—Glyptocrinus fornshelli.

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.

decadactylus, 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. A. Miller, 1878, Jour. Cin. Soc. Nat. Hist., vol. 1, p. 103, Hud. Riv. Gr.

fimbriatus, Shumard, 1855, Geo. Sur. Mo., p. 194, Trenton Gr.

fornshelli, S. A. Miller, 1874, Cin. Quar. Jour. Sci., vol. 1, p. 348, Hud. Riv. Gr.

gracilis, Wetherby, syn. for Gaurocrinus angularis.

harrisi, see Compsocrinus 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.

siphonatus, 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 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.

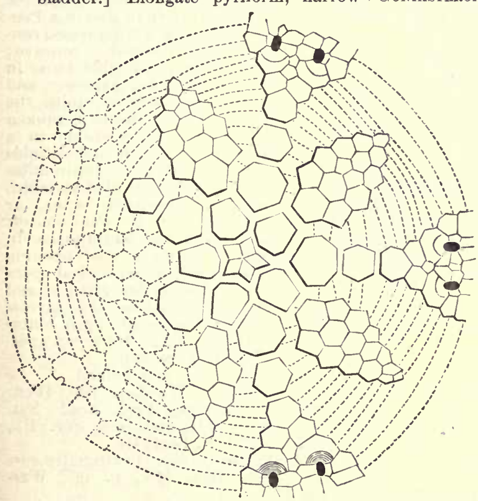


FIG. 318.—Goniasteroidocrinus fiscellus. Diagram 2 diam.

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, pendent, 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

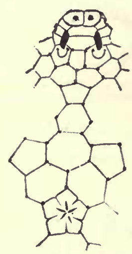


FIG. 320. — Diagrammatic view of Gilbertsocrinus bursa to show it is distinct from Goniasteroidocrinus.

generic name, but it was not defined or established; there are others who use *Gilbertsocrinus*, 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.

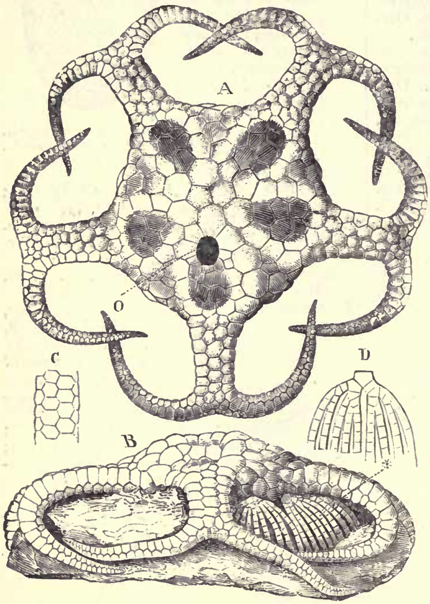


FIG. 321.—Goniasteroidocrinus tuberosus. *A* is the vault; *O*, the opening; *B*, side view of vault; *C*, under side of false arms; *D*, enlargement of base of arms.

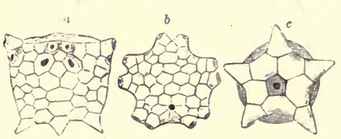


FIG. 322.—Three views of Gilbertsocrinus calcaratus, to show the genus is distinct from Goniasteroidocrinus.

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.

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.

tuberculosus, Hall, 1860, (Trematocrinus tuberculosus,) 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,) Geo. 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.

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.

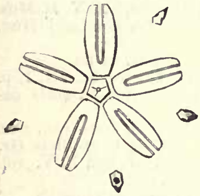


FIG. 324.—Granatocrinus projectus. Diagram.

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.
longicirrifer, 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 Eupachycrinus decembrachialis.

FIG. 325.—Graphiocrinus longicirrifer.

rudis, Meek & Worthen, 1869, (Scaphiocrinus rudis,) Proc. Acad. Nat. Sci. Phil., p. 39, and Geo. Sur. Ill., vol. 5, p. 412, Burlington Gr.

FIG. 326.—Graphiocrinus rudis.

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.

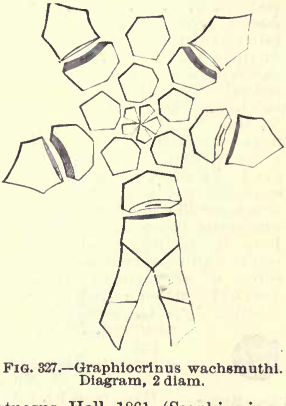


FIG. 327.—Graphiocrinus wachsmuthi. Diagram, 2 diam.

tortuosus, Hall, 1861, (Scaphiocrinus tortuosus,) Desc. New Crin., p. 7, and Bost. Jour. Nat. Hist., p. 309, Burlington Gr.

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 interradials; 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, Steininger, 1834, Bul. Soc. Geol. France, t. 8, 1st series, p. 232. [Ety. *haploos*, simple; *krinon*, lily.] Calyx small subturbinate; 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. sphæroideus.

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 excentric. Type H. parasiticus.

altus, syn. for H. granulatus.

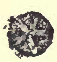


FIG. 328.—Hemicystites stellatus.

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 Ohiocrinus constrictus.

constrictus var. compactus, see Ohiocrinus 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.

inæqualis, see Calceocrinus inæqualis.

incurvus, see Anomalocrinus incurvus.

isodactylus, syn. for Ohiocrinus compactus.

juvenis, Hall, 1866, 24th Rep. N. Y. St. Nat. Hist., p. 212, Hud. Riv. Gr.

FIG. 329.—Heterocrinus juvenis.

laxus, see Ohiocrinus laxus.

milleri, Wetherby, 1880, Jour. Cin. Soc. Nat. Hist., vol. 3, p, 153, Trenton Gr.

œhanus, see Ohiocrinus œhanus.

pentagonus, Ulrich, 1882, Jour. Cin. Soc. Nat. Hist., vol. 5, Hud. Riv. Gr.

polyxo, syn. for Iocrinus subcrassus.

simplex, see Ectenocrinus simplex.

simplex var. grandis, see Ectenocrinus grandis.

subcrassus, see Iocrinus subcrassus.

tenuis, Billings, 1557, Rep. of Progr. Geo. Sur. Can., p. 273, and Can. Org. Rem., Decade 4, p. 50, Trenton Gr.

vaupeli, syn. for H. constrictus.

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 hydrospiral 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.

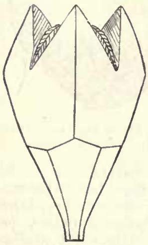


FIG. 330.—Heteroschisma gracile. Side view, 3 diam.

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.

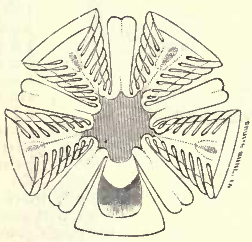


FIG. 331.—Heteroschisma gracile. Horizontal section of hydrospires, 5 diam.

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.

canneus n. sp. Niagara Gr. Body long, irregularly subcylindrical; 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 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;

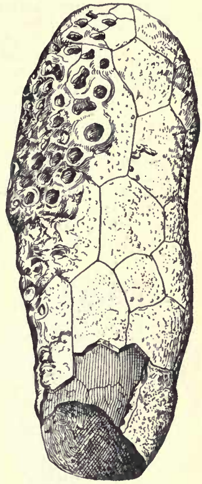


FIG. 332.—Holocystites canneus.

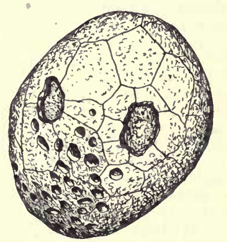


FIG. 333.—Holocystites canneus. Summit view.

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 anchylose 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 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.

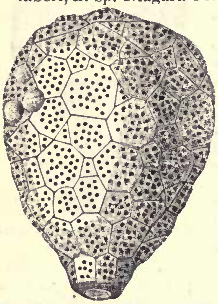


FIG. 334.—Holocystites faberi.

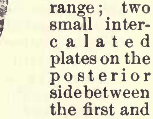


FIG. 335.—Holocystites faberi.

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.

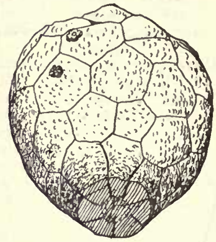


FIG. 336.—Holocystites hammelli. Anterior side.

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.

sphæricus, 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.

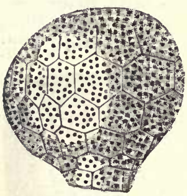


FIG. 338.—Holocystites subglobosus.

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.

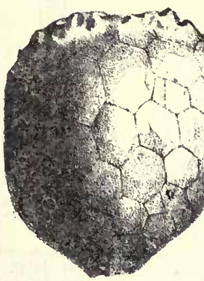


FIG. 339.—Holocystites turbinatus.

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 bifurcating; 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.

proboscidialis, Hall, 1859, Pal. N. Y., vol. 3. p. 38, Oriskany sandstone.

scoparius, Hall, 1859, Pal. N. Y., vol. 3, p. 102, Low. Held. Gr.

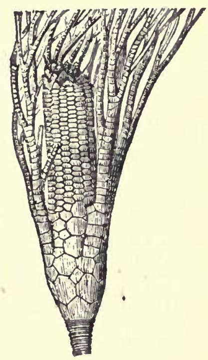


FIG. 340.—Homocrinus scoparius.

HYBOCHINUS, 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 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.

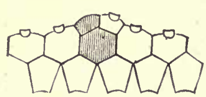


FIG. 341.—Hybocrinus conicus. Diagram.

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 over the top of them and extend downward upon the exterior; valvular opening between the upper azygous plate and the mouth. Type H. problematicus.

FIG. 342.—Hybocystites 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. Palæocrinoidea, 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.

FIG. 343.—Ichthyocrinus corbis.

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.

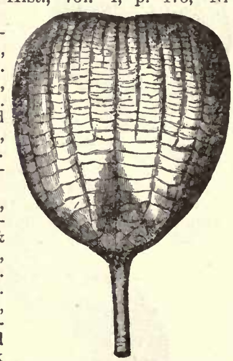


FIG. 344—Ichthyocrinus lævis.

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-

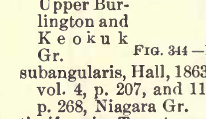


FIG. 345.—Iocrinus. Diagram; *b*, basals; *r*, radials; *a*, azygous plate; *t*, plates of tube.

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.

Fig. 346.– Iocrinus subcrassus.

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 radials 1 to 3 x 10; azygous interradials 2; arms as in Ichthyocrinus; column round. Type L. macropetalus.

Fig. 347.—Lampterocrinus tennesseensis.

caliculus, 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.

lævis, see Taxocrinus lævis.

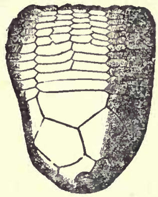


Fig. 348.—Lecanocrinus macropetalus.

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 Anatifa; *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.

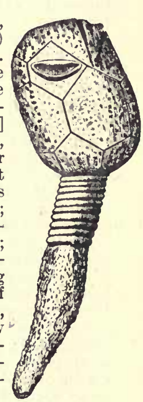


Fig. 349.—Lepadocrinus gebhardi.

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; 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.

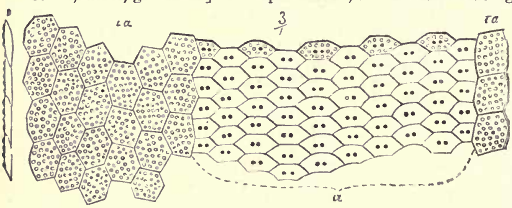


FIG. 350.—Lepidesthes coreyi. Diagram 3 diam.; (*a*.) ambulacrals; (*b*.) section of them; position of interambulacrals.

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.

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. 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.

LYRIOCRINUS, 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 inclosed above by the secondary radials;

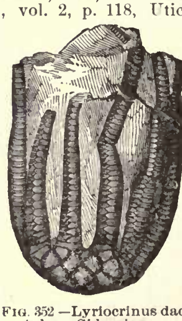


FIG. 352.—Lyriocrinus dactylus. Side view.

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.

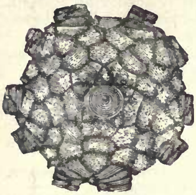


FIG. 353. — Lyriocrinus dactylus. Basal view.

dactylus, Hall, 1843, (Marsupiocrinites (?) dactylus,) Geo. Rep. 4th Dist. N. Y., p. 114, and Pal. N. Y., vol. 2, p. 197, Niagara Gr.

melissa, Hall, 1863, (Rhodocrinus melissa,) Trans. Alb. Inst., vol. 4, p. 198, and 11th Rep. Geo. and Nat. Hist. Ind., p. 269, Niagara Gr.

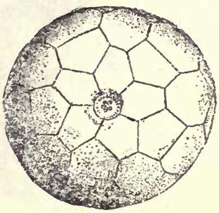


FIG. 354.—Lyriocrinus melissa. Basal view.

sculptilis, Hall, 1864, 20th Rep. N. Y. St. Mus. Nat. Hist., p. 368, Niagara Gr.

sculptus, see Archæocrinus sculptus.

LYSOCYSTITES, 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 Echinocystites, Hall, which was preoccupied. The genus is known only from casts.

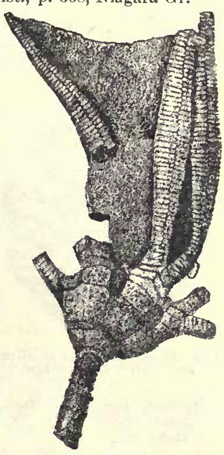


FIG. 355. — Macrostylocrinus fusibrachiatus.

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, Ringueberg, 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.

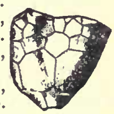


FIG. 356.—Macrostylocrinus striatus.

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. murchisoni.

barrandi, Billings, 1858, Can. Org. Rem., Decade 3, p. 67, Chazy Gr.

FIG. 357. — Malocystites murchisoni.

murchisoni, Billings, 1858, Can. Org. Rem., Decade 3, p. 66, Chazy Gr.

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.—Mariacrinus carleyi.

macropetalus, Hall, 1859, Pal. N. Y., vol. 3, p. 111, Low. Held. Gr.

nobillissimus, Hall, 1859, Pal. N. Y., vol. 3, p. 105, Low. Held. Gr.

pachydactylus, Conrad, 1841, (Astrocrinites pachydactylus,) Ann. Rep. N. Y., p. 34, and Pal. N. Y., vol. 3, p. 107, Low. Held. Gr. Syn. (?) for M. polydactylus.

paucidactylus, 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.

polydactylus, Bonny, 1837, (Actinocrinus polydactylus,) Am. Jour., vol. 31, syn. for M. pachydactylus?

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, Ringueberg, 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. cælatus.

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 3x5; secondary radials 1x10; tertiary radials 1 or more x 20; interradials 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.

concavus, 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.

necis, see Saccocrinus necis.

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.

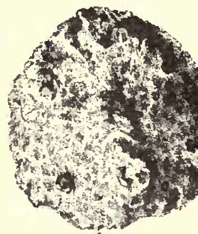


FIG. 359.—Megistocrinus pileatus. View of vault.

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.

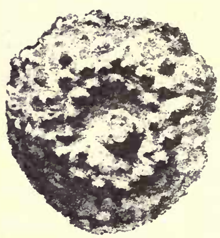


FIG. 360.—Megistocrinus pileatus. View from below.

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.] Body obconoidal; surface ornamented; interradial areas depressed; basals 4; radials 3 x 5; secondary radials 2 or 3 x 10; tertiary radials 2 or 3 x 20; interradials 8 to 12; azygous plates more numerous; vault convex, with orifice excentric. Type M. hieroglyphicus.

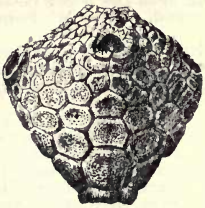


FIG. 361.—Melocrinus bainbridgensis.

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.

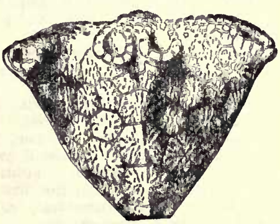


FIG. 363.—Melocrinus obconicus.

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.

MELONITES, 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

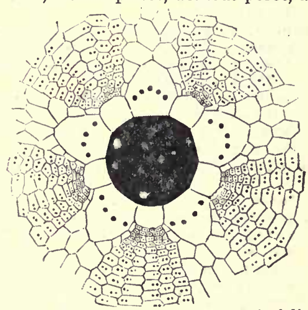


FIG. 364.—Melonites multiporus. Apical disk, genital and ocular pores.

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, 1884, Trans. St. Louis Acad. Sci., vol. 4, p. 548, St. Louis Gr.

danæ, see Oligoporus danæ.

irregularis, Hambach, 1884, Trans. St. Louis Acad. Sci., vol 4, p. 548, St. Louis Gr.

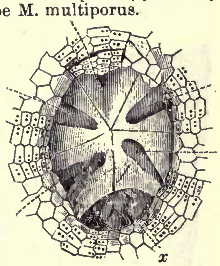


FIG. 365. — Melonites multiporus. Oral opening and jaws, displaced at *x* so as to leave an opening.

multiporus, Owen & Norwood, 1846, Am. Jour. Sci., 2d ser., vol. 2, p. 225, St. Louis Gr.

stewarti, Safford, 1869, Geo. of Tenn., p. 346, St. Louis Gr.

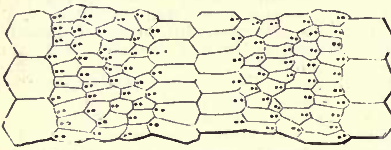


FIG. 366.—Melonites multiporus. Diagram, showing pores in ambulacral area, 2 diam.

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 Platycrinus. 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.

FIG. 367.—Merocrinus curtus.

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.

MESPILOCRINUS, 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.

MYRTILLOCRINUS, Sandberger, 1856, Verst. der 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.

NIPTEROCRINUS, 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.

NUCLEOCRINUS, 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 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.

hallii, 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.

meloniformis, Barris, 1883, (Eleacrinus meloniformis,) Geo. Sur. Ill., vol. 7, p. 361, Ham. Gr.

obovatus, Barris, 1883, (Eleacrinus obovatus,) Geo. Sur. Ill., vol. 7, p. 358, Ham. Gr.

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.

FIG. 370.—Nucleocrinus verneuili.

verneuili var. pomum, Etheridge & Carpenter, is simply a rounded form very common among other specimens, and without varietal characters.

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.

FIG. 372. Ohiocrinus constrictus.

laxus, Hall, 1866, (Heterocrinus laxus,) 24th Rep. N. Y. St. Mus. Nat. Hist., p. 211, Hud. Riv. Gr.

œhanus, Ulrich, 1882, (Heterocrinus œhanus,) Jour. Cin. Soc. Nat. Hist., vol. 5, p. 175, Hud. Riv. Gr.

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.

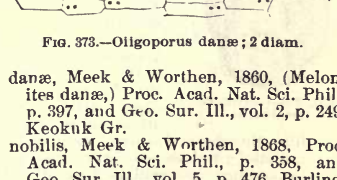


FIG. 373.—Oligoporus danæ; 2 diam.

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, nonporiferous, and surrounding a central anal opening; outside 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.

flexilis, Meek & Worthen, 1868, Geo. Sur. Ill., vol. 3, p. 526, Keokuk Gr.

ONYCHOCRINUS, Lyon & Casseday, 1859, Am. Jour. Sci., 2d series, vol. 29, p. 77. [Ety. *onyx*, claw; *krinon*, lily.] Calyx low, arms like the talons of a fowl; basals 3; subradials 5; radials 4 to 7 x 5; arms short, branching; interradials 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.

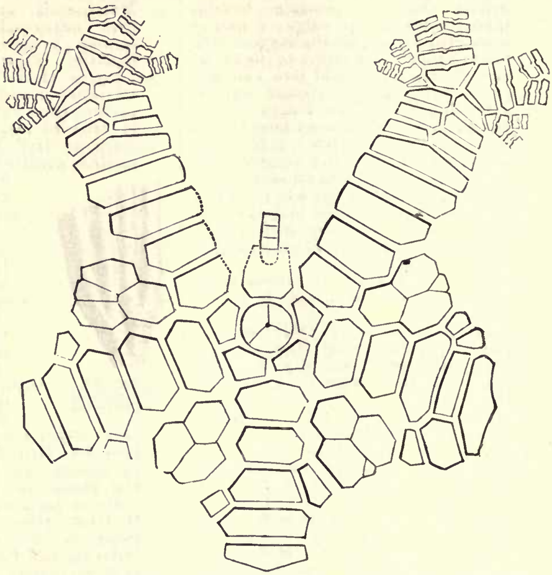


FIG. 375.—Onychocrinus diversus. Diagram.

diversus, Meek & Worthen, 1866, Proc. Acad. Nat. Sci. Phil., p. 256, and Geo. Sur. Ill., vol. 3, p. 492, Burlington Gr.

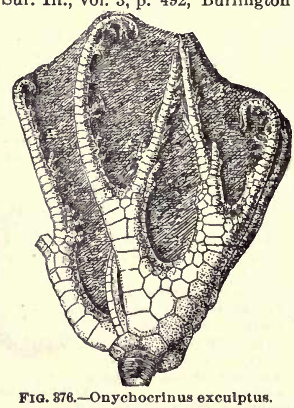


FIG. 376.—Onychocrinus exculptus.

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.

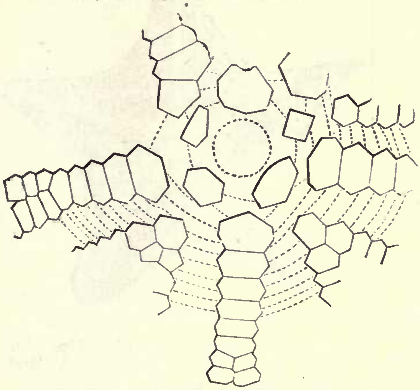


FIG. 377.—Onychocrinus exculptus. Diagram.

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. Wissench. Gottingen, 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.

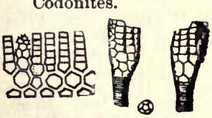


FIG. 378.—Ottawacrinus typus.

OTTAWACRINUS, W. R. Billings, 1887, Ottawa Nat. Club, vol. 1, p. 49. [Ety. propername; *krinon*, lily.] Calyx obconical, basals 5; subradials 1 x 5; radials 1 x 5; arms 5; azygous plate rests on a 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. *palaios*, 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.

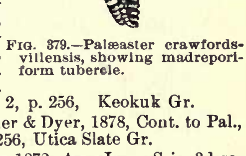


FIG. 379.—Palæaster crawfordsvillensis, showing madreporiform tubercle.

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.

exculptus, S. A. Miller, 1881, Jour. Cin. Soc. Nat. Hist., vol. 4, p. 69, Hud. Riv. Gr.
finii, 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.

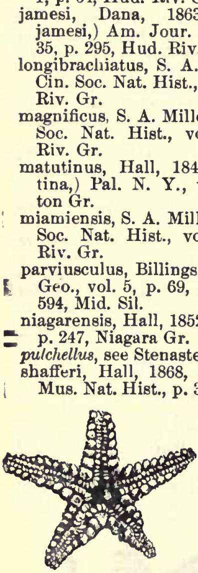


FIG. 380 —Palæaster simplex.

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.
wilberanus, 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.

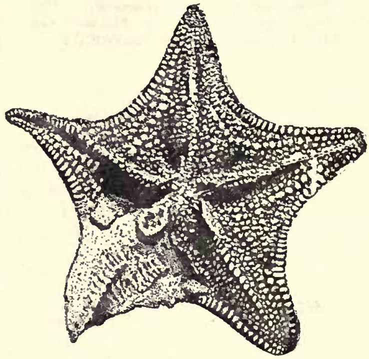


FIG. 381.—Palæasterina speciosa.

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.

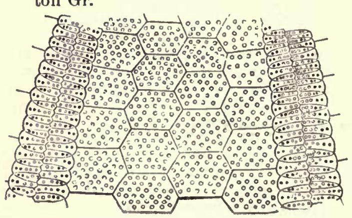


FIG. 382.—Palæchinus burlingtonensis, 2 diam.

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. *palaios*, 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.
rhombiferus, Billings, 1859, Can. Org. Rem., Decade 4, p. 45, Trenton Gr.

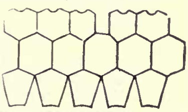


FIG. 384. — Palæocrinus striatus. Diagram.

striatus, Billings, 1859, Can. Org. Rem., Decade 4, p. 25, Chazy Gr.
sulcatus, Safford. Not defined.

PALÆOCYSTITES, Billings, 1858, Can. Org. Rem., Decade 4, p. 68. [Ety. *palaios*, 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. teniubrachiatus, 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, Say, 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; hydrospire or ambulacral pores partially excavated out of the sides of the sinuses; pinnules attached between the pores; hydrospires 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.
godoni, DeFrance, 1818, Dict. Sci. Nat., t. 14, p. 467, Kaskaskia Gr.

FIG. 385.—Pentremites godoni.

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 Tricœlocrinus 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.

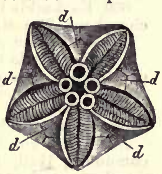


FIG. 386.—Pentremites pyriformis. Ventral surface; *d*, deltoid plates.

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.
spinosus, Hambach, 1880, Trans. St. Louis Acad. Sci., vol. 4, p. 145, Kaskaskia Gr.
stelliformis, see Orophocrinus stelliformis.
subconoideus, Meek, 1873, Hayden's Geo. Sur. Terr., p. 471, Subcarb.

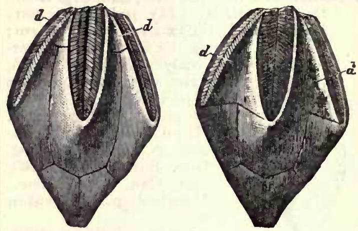


FIG. 387.—Pentremites pyriformis. One shows the deltoid plates extended to the summit.

subcylindricus, see Troostocrinus subcylindricus.
subtruncatus, see Troostocrinus subtruncatus.
sulcatus, Roemer, 1852, Monog. Blastoid., p. 354, Kaskaskia Gr.
symmetricus, Hall, 1858, Geo. Rep. Iowa, p. 694, Kaskaskia Gr.
tennesseeæ, 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 Tricœlocrinus varsouviensis.
verneuili, see Nucleocrinus verneuili.
whitii, Hall, 1862, 15th Rep. N. Y. St. Mus. Nat. Hist., p. 122, Ham. Gr.
woodmani, see Tricœlicrinus woodmani.
wortheni, see Tricœlicrinus wortheni.

PENTREMITIDEA 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.

FIG. 388.—Pentremitidea americana; 2 diam.

PERISCHODOMUS, McCoy, 1849, Ann. Nat. Hist., vol. 3, p. 251. [Ety. *perischos*, inclosing; *domus*, house.] Spheroidal, subpentagonal; ambulacra narrow, two rows of small plates imbricating downward, each pierced by one pair of simple pores; interambulacra wide, with five rows of 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, Kaskaskia Gr.

Pereiochocrinus, 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.

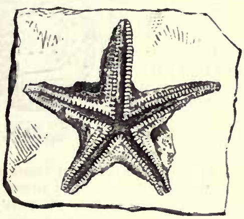


FIG. 389.—Petraster bellulus.

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.] Interambulacrals 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.

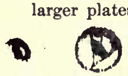


FIG. 391.—Pisocrinus gemmiformis. Natural size and magnified.

gemmiformis, 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.

pyriformis, Ringueberg, (Triacrinus pyriformis,) Proc. Acad. Nat. Sci. Phil., p. 145, Clinton Gr.

PLATYCRINUS, Miller, 1821, Nat. Hist. Crinoidea, p. 73. [Ety. *platys*, flat; *krinon*, lily.] Calyx bowl-shaped; basals 3; primary radials 2 x 5; regular interradials 1 x 4; 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.

anndixoni, Troost. Not defined.

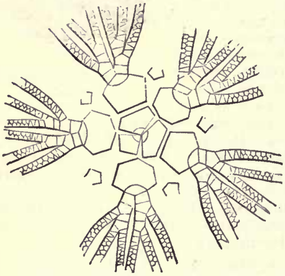


FIG. 392.—Platycrinus asper. Diagram.

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, Ringueberg, 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.

eboraceus, 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; subcylindrical 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 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.

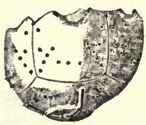


FIG. 393.—Platycrinus faberi, x 2.

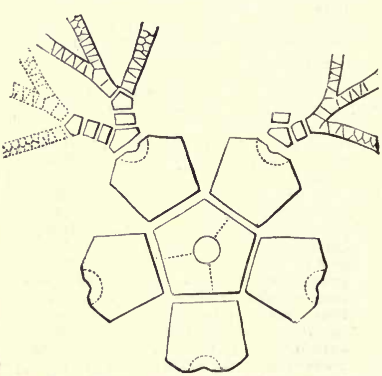


FIG. 394 —Platycrinus hemisphericus. Diagram.

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.—Platycrinus 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, p. 542, Burlington Gr.

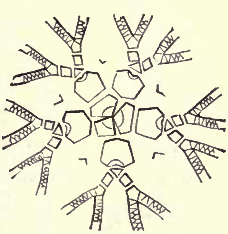


FIG. 396.—Platycrinus niotensis. Diagram.

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.

sbumardanus, 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.

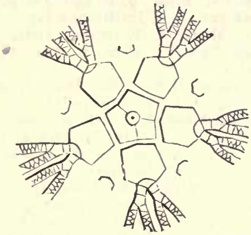


FIG. 397.—Platycrinus scobina. Diagram.

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 or 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.

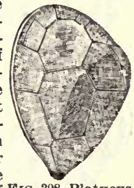


FIG. 398. Platycystites faberi.

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 poriferous areas similar to pectinated rhombs.] Calyx conical; basals 5; subradials 1 x 5; radials 1 x 5; azygous interradials 2; pectinated rhombs numerous. Type P. conicus.

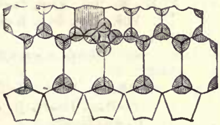


FIG. 400.—Porocrinus conicus. Diagram.

conicus, Billings, 1857, Rep. of Progr. Geo. Sur. Can., p. 279, and Can. Org. Rem., Decade 4, p. 34, Trenton Gr.

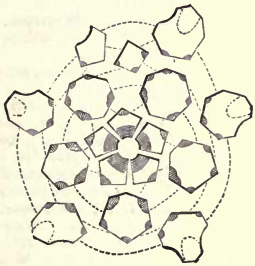


FIG. 401. -Porocrinus crassus. Diagram.

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.

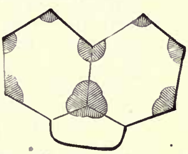


FIG. 402.—Porocrinus crassus. One basal and two subradials enlarged.

smithi, Grant, 1881, Trans. Ottawa Field Naturalists' Club, No. 2, p. 42, Trenton Gr.

POTERIOCRINUS, 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.

æqualis, 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.

burketi, see Scaphiocrinus burketi.

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.

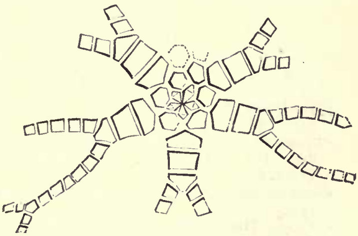


FIG. 403.—Poteriocrinos carinatus. Diagram.

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.

concinnus, 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.

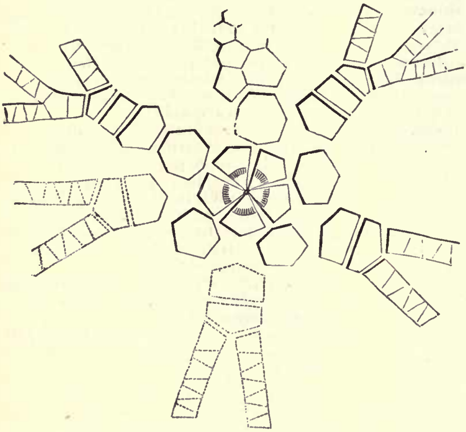


FIG. 404.—Poteriocrinus indianensis. Diagram.

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 Cœliocrinus 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.
gregarius, 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.
hoveyi, Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 516, Keokuk Gr.
illinoisensis, 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.
iowensis, see Scaphiocrinus iowensis.
jesupi, Whitfield, 1881, Bull. No. 1, Am. Nat. Hist., p. 7, syn. for P. swallovi.
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.
maniformis, see Zeacrinus maniformis.
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.
nauvooensis, see Scaphiocrinus nauvooensis.
nereus, Hall, 1862, 15th Rep. N. Y. St. Mus. Nat. Hist., p. 121, Ham. Gr.

FIG. 405. — Poteriocrinus missouriensis.

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.

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.
pisif rmis, 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 Dendrocrinus posticus.
proboscidialis, Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 518, St. Louis Gr.
propinquus, see Scaphiocrinus propinquus.
rhombiferus, see Barycrinus 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.
salignoides, 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.

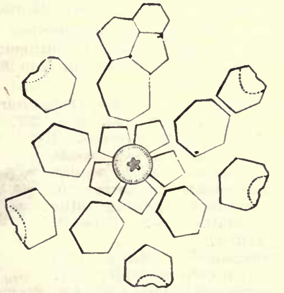


FIG. 406.—Poteriocrinus subimpressus.

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.
subtumidus, Meek & Worthen, 1865, Proc. Acad. Nat. Sci. Phil., p. 159, Kaskaskia Gr.
swallovi, 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.

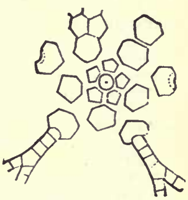


FIG. 407.—Poteriocrinus tenuibrachiatus. Diagram.

tenuidactylus, Worthen, 1882, Bull. No. 1, Ill. St. Mus. Nat. Hist., p. 6, and Geo. Sur. Ill., vol. 7, p. 271, Keokuk Gr. Wachsmuth says this is a Scaphiocrinus, and he has proposed to call it Scaphiocrinus obscurus.

FIG. 408.—Poteriocrinus ulrichi.

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.
varsoviensis, see Scaphiocrinus varsoviensis.
ventricosus, see Cœliocrinus ventricosus.
venustus, see Scaphiocrinus venustus.

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.

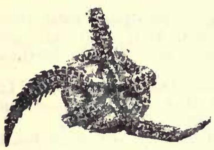


FIG. 409.—Protaster flexuosus.

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, Ringueberg, 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.

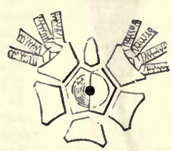


FIG. 410.—Pterotocrinus chesterensis. Diagram.

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.

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.

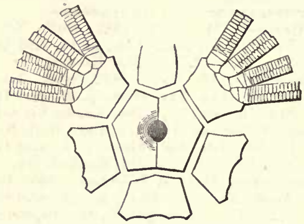


FIG. 411.—Pterotocrinus crassus. Diagram.

crassus, Meek & Worthen, 1860, (Dichocrinus 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, (Dichocrinus 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 Palæocoma.

princeps, see Palæocoma princeps.

Ptychocrinus, Wachsmuth & Springer, 1886, Revis. Palæocrinoidea, 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.

FIG. 412. Pycnocrinus germanus.

germanus, S. A. Miller, 1880, (Glyptocrinus shafferi var. germanus,) Jour. Cin. Soc. Nat. Hist., vol. 3, p. 233, Hud. Riv. Gr.

shafferi, S. A. Miller, 1875, (Glyptocrinus shafferi,) Cin. Quar. Jour. Sci., vol. 2,

p. 277, and Jour. Cin. Soc. Nat. Hist., vol. 3, p. 233, Hud. Riv. Gr.

FIG. 413.—Pycnocrinus shafferi.

FIG. 414.—Pycnocrinus shafferi. Enlarged $2\frac{1}{2}$ diam.

FIG. 415. Pycnocrinus 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 4 x 5; secondary radials 4 to 6 x 10; 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.

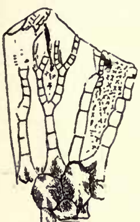


FIG. 416. — Retiocrinus stellaris.

stellaris, Billings, 1859, Can. Org. Rem., Decade 4, p. 64, Trenton Gr.

RHAPHANOCRINUS, Wachsmuth & Springer, 1885, Revis. Palæocrinoidea, pt. 3, p. 98. [Ety. *raphanos*, radish; *krinon*, lily.] Calyx short; basals 5, small; subradials 5; primary radials 3 x 5; 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 4 x 5; secondary radials 1 to 3 x 10; 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.

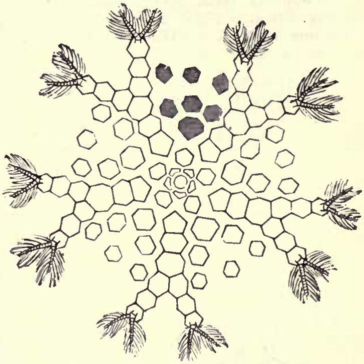


FIG. 417.—Rhodocrinus. Diagram.

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.

FIG. 418. -Rhodocrinus nanus.

nanus, Meek & Worthen, 1866, Proc. Acad. Nat. Sci. Phil., p. 254, and Geo. Sur. Ill., vol. 3, p. 476, Burlington Gr.

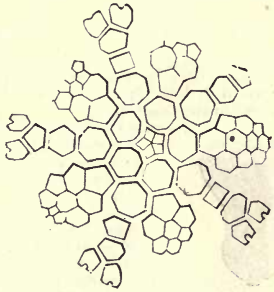


FIG. 419.—Rhodocrinus nanus. Diagram.

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. 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.
watersianus, wachsmuth & Springer, (in press,) Geo. Sur. Ill., vol. 8, p. 184, Kinderhook, Gr.

FIG. 421—Rhodocrinus watersianus.

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.
wortheni, Hall, 1858, Geo. Sur. Iowa, p. 556, Burlington Gr.

SACCOCRINUS, Hall, 1852, Pal. N. Y., vol. 2, p. 205. [Ety. *sakkos*, bag; *krinon*, 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.

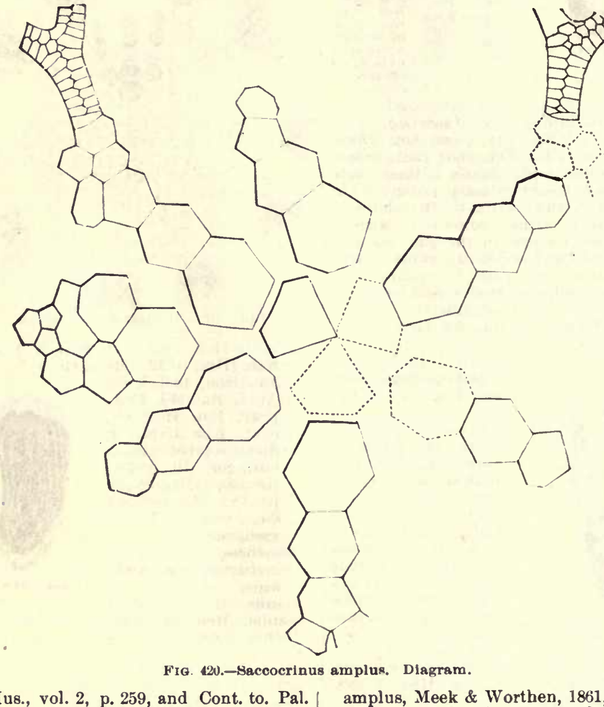


FIG. 420.—Saccocrinus amplus. Diagram.

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.

FIG. 422.—Saccocrinus christyi.

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.

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 obconoidal; basals 5; subradials 5; radials 2 x 5; 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.

FIG. 423.—Scaphiocrinus decadactylus. Diagram.

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.

FIG. 424—Scaphiocrinus elegantulus.

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.

FIG. 425.—Scaphiocrinus globosus.

halli, Hall, 1861, Desc. New Crin., p. 7, and Jour. Bost. Soc. Nat. Hist., vol. 7, p. 308, Burlington Gr.

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, (Poteriocrinus 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, (Poteriocrinus kaskaskiensis,) Bull. No. 1, Ill. St. Mus. Nat. Hist., p. 27, and Geo. Sur. Ill., vol. 7, p. 300, Kaskaskia Gr.
latidactylus, Worthen, 1882, (Poteriocrinus 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.
macadamsi, see Graphiocrinus macadamsi.
macrodactylus, Meek & Worthen, 1869, Proc. Acad. Nat. Sci. Phil., p. 140, and Geo. Sur. Ill., vol. 5, p. 415, Burlington Gr.
montanensis, Meek, 1872, (Poteriocrinus 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.
nauvooensis, Worthen, 1882, (Poteriocrinus nauvooensis,) 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, (Poteriocrinus occidentalis,) Bull. No. 1, Ill. St. Mus. Nat. Hist., p. 10, and Geo. Sur. Ill., vol. 7, p. 278, Keokuk Gr.
okawensis, Worthen, 1882, (Poteriocrinus 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, (Poteriocrinus 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, (Poteriocrinus popensis,) Bull. No. 1, Ill. St. Mus. Nat. Hist., p. 23, and Geo. Sur. Ill., vol. 7, p. 296, Kaskaskia Gr.
propinquus, Worthen, 1882, (Poteriocrinus 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 Graphiocrinus rudis.
rusticellus, White, 1863, Proc. Bost. Soc. Nat. Hist., vol. 7, p. 505, Burlington Gr.
salteri, Worthen, 1882, (Poteriocrinus 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 Graphiocrinus simplex.
spinifer, Wetherby, 1880, Jour. Cin. Soc. Nat. Hist., vol. 3, p. 157, Kaskaskia Gr.
spinobrachiatus, see Graphiocrinus spinobrachiatus.
spinobrachiatus, Worthen, 1882, (Poteriocrinus spinobrachiatus,) Bull. No. 1, Ill. St. Mus. Nat. Hist., p. 20, and Geo. Sur. Ill., vol. 7, p. 290, Kaskaskia Gr.
striatus, see Graphiocrinus striatus.
subcarinatus, Hall, 1863, 17th Rep. N. Y. Mus. Nat. Hist., p. 58, Waverly Gr.

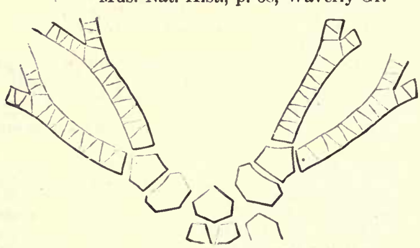


FIG. 426.—Scaphiocrinus tenuidactylus. Diagram.

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 hydrospire folds on each side of an ambulacrum; spiracles minute linear slits between the lancet-plate and the deltoid ridges; surface ornamented with striæ. Type S. sayi.

melonoides, Meek & Worthen, 1869, (Granatocrinu melonoideas,) 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.

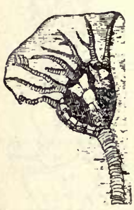


FIG. 427.—Schizocrinus nodosus.

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.

SCHŒNASTER, 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.

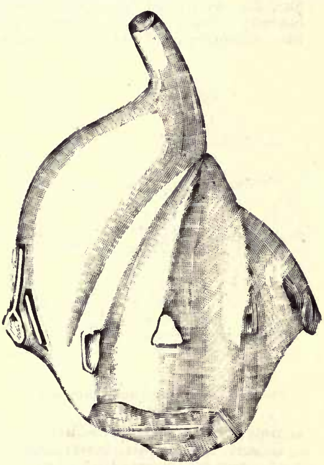


FIG. 428.—Siphonocrinus nobilis; lateral view of an internal cast.

Wachsmuth says there are 5; primary radials 3x5; 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.

Sphærocrinus, Meek & Worthen, 1866. The name was preoccupied, by Roemer. See Cœlocrinus.

SPHÆROCYSTITES, Hall, 1859, Pal. N. Y., vol. 3, p. 130. [Ety. *sphaira*, sphere; *kustis*, 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

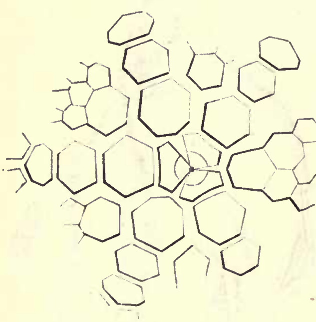


FIG. 429.—Steganocrinus concinnus.

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.

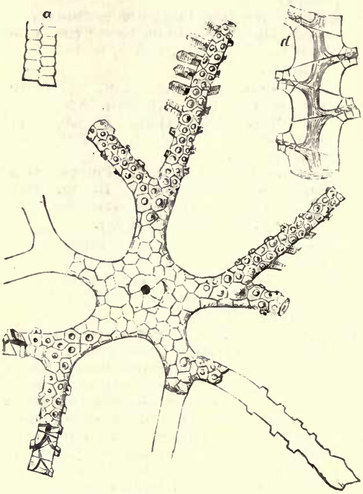


FIG. 430.—Steganocrinus pentagonus. Vault and part of the rays; *a* and *d* showing structure of the rays.

pentagonus, Hall, 1858, (Actinocrinus pentagonus,) Geo. Sur. Iowa, p. 577, Burlington Gr.

sculptus, Hall, 1858, (Actinocrinus sculptus,) Geo. Sur. Iowa, p. 582, Burlington Gr.

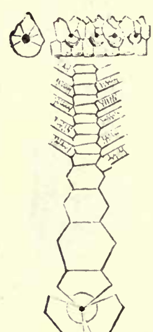


FIG. 431.—Steganocrinus sculptus. Diagram of a ray and transverse sections.

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 Erisocrinus and Eupachycrinus.

trautscholdi, Wachsmuth & 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 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; ambulacral 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.

gemmiformis, 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 2 x 5 instead of 3 x 5 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.

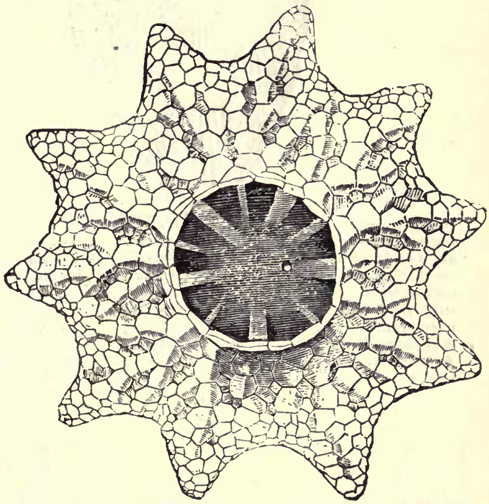


FIG. 435.—Strotocrinus perumbrosus. Under side of canopy with calyx broken away.

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; *kustis*, 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. 28, 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 3 x 5; secondary radials 1 or 2 x 10, succeeded by tertiary and other divisions, which, with the interaxillaries and interbrachials, unite to form the under side of a greatly expanded horizontal disk, completely isolating the azygous and interradial areas, from the vault, and supporting the free, ascend-

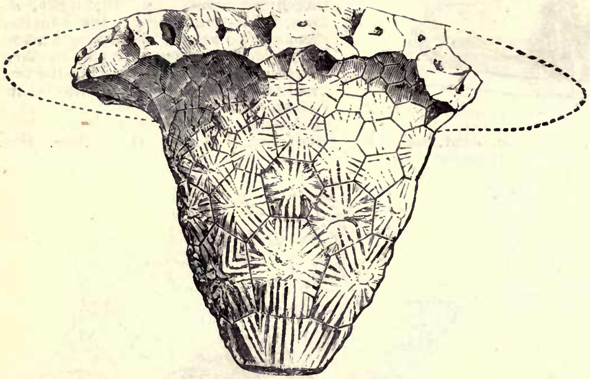


FIG. 436.—Strotocrinus regalis.

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.

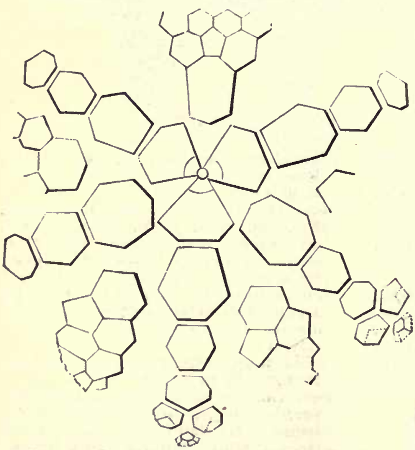


FIG. 437.—Strotocrinus regalis. Diagram, 1½ diam.

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.

ectypus, Meek & Worthen, 1869, Proc. Acad. Nat. Sci. Phil., p. 159, and Geo. Sur. Ill., vol. 5, p. 353, Burlington Gr.

glyptus, Hall, 1860, (Actinocrinus glyptus,) Supp. to Geo. Sur. Iowa, p. 2, Burlington Gr.

perumbrosus, Hall, 1860, (Actinocrinus perumbrosus,) Supp. to Geo. Sur. Iowa, p. 7, Burlington Gr.

regalis, Hall, 1860, (Actinocrinus regalis,) Supp. to Geo. Sur. Iowa, p. 8, and Geo. Sur. 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, 2 or more; arms simple and composed of plates in single series. Type S. conicus.

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.

FIG. 438. — Synbathocrinus granuliferus. Anterior and posterior views.

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.

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.
swallovi, 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, (Palæocoma 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, (Palæocoma spinosa,) Geo. Sur. Can., p. 292, and Can. Org. Rem., Decade 3, p. 80, Trenton Gr.

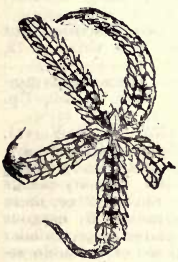


FIG. 439.—Tæniaster spinosus.

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.
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.


FIG. 440.—Taxocrinus (?) elegans.

giddingei, Hall, 1858, (Forbesocrinus giddingei,) Geo. Sur. Iowa, p. 633, Keokuk Gr.
gracilis, Meek & Worthen, 1865, Proc. Acad. Nat. Sci. Phil., p. 142, and Geo. Sur. Ill., vol. 3, p. 421, Ham. Gr.


FIG. 441.—Taxocrinus gracilis. Diagram.

intermedius, Wachsmuth & Springer, (in press,) Geo. Sur. Ill., vol. 8, p. 199, Kinderhook Gr.
interscapularis, 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.

lævis, 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. *techne*, 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, (Actinocrinus ægilops,) Supp. to Geo. Sur. Iowa, p. 5, Up. Burlington Gr.

althea, Hall, 1861, (Actinocrinus althea,) Desc. New Crin., p. 13, Up. Burlington Gr.

clivosus, Hall, 1861, (Actinocrinus clivosus,) Bost. Jour. Nat. Hist., vol. 7, p. 274, Up. Burlington Gr.

erodus, Hall, 1861, (Actinocrinus erodus,) Desc. New Crin., p. 12, Up. Burlington Gr.

insculptus, Hall, 1861, (Actinocrinus insculptus,) Desc. New Crin., p. 12, Up. Burlington Gr.

liratus, Hall, 1860, (Actinocrinus liratus,) Supp. to Geo. Sur. Iowa, p. 1, and Geo. Sur. Ill., vol. 5, p. 355, Burlington Gr.

rudis, Hall, 1860, (Actinocrinus rudis,) Supp. to Geo. Sur. Iowa, p. 33, Burlington Gr.

tenuiradiatus, Hall, 1861, (Actinocrinus tenuiradiatus,) Desc. New Crin., p. 12, Burlington Gr.

umbrosus, Hall, 1858, (Actinocrinus 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 contracting 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, Ringueberg, 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.

TRICŒLOCRINUS, 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, (Pentatrematites 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) Tricœlocrinus 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; hydrospiral canals 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 Tricœlocrinus varsouviensis.

FIG. 443. Troostocrinus wortheni.

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; azygous 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.] Basals 4; primary radials 3 x 5; secondary radials 4 to 6 x 10; interradial areas excavated and filled with numerous

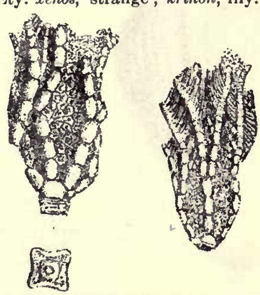


FIG. 444.—Xenocrinus penicillus. Azygous and opposite side views and end of column.

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.

arboreus, 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.

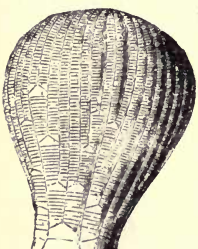


FIG. 445.—Zeacrinus elegans.

elegans, Hall, 1858, Geo. Sur. Iowa, p. 547, Burlington Gr.

florealis, Yandell & Shumard, 1847, (Cyathocrinus florealis,) Cont. to Geo. Ky., p. 24, Kaskaskia Gr.

formosus, see Eupachycrinus formosus.

intermedius, Hall, 1858, Geo. Sur. Iowa, p. 681, Kaskaskia Gr.

keokuk, Worthen, 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, (Poteriocrinus 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.

mucrospinus, see Hydreionocrinus mucrospinus.

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.

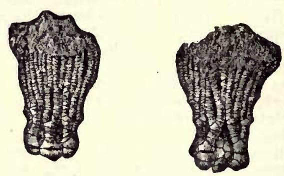


FIG. 446.—Zeacrinus spinuliferus.

sacculus var. concinnus, 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, Burlington Gr.

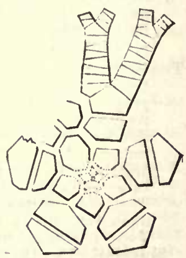


FIG. 447.—Zeacrinus troostanus. Diagram.

serratus, Meek & Worthen, 1861, Proc. Acad. Nat. Sci. Phil., p. 151, and Geo. Sur. Ill., vol. 5, p. 428, Burlington Gr.

spinosus, Owen & Shumard, 1852, (Poteriocrinus spinosus,) Jour. Acad. Nat. Sci. Phil., vol. 2, p. 91, Kaskaskia Gr.
spinuliferus, Worthen, (in press,) (Poteriocrinus spinuliferus,) Geo. Sur. Ill., vol. 8, p. 90, Kaskaskia Gr.
stimpsoni, Lyon, 1869, Trans. Am. Phil. Soc., vol. 13, p. 465, Subcarb.
subtumidus, see Eupachycrinus 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 zoœcium, 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 zoœcium, called the oœcium, or in an inflation of the surface of the zoarium, called a gonocyst. The gonœcium is a modified zoœcium. 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 zoœcium. 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, Coscinotrypa, 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 RHABDOMESONTIDÆ.—Acanthoclema, Anisotrypa, Bactropora, Cœloconus, Nemataxis, Rhombopora, Tropidopora.

FAMILY RHINOPORIDÆ.—Rhinopora.

FAMILY SPHRAGIOPORIDÆ.—Sphragiopora.

FAMILY STICTOPORIDÆ.—Acrogenia, Arthropora, Cystodictya, Dichotrypa, Dicranopora, Eurodictya, Euspilopora, Goniotrypa, Heliotrypa, Intrapora, Pachydictya, Phractopora, Phyllodictya, Prismopora, Rhinidictya, Scalaripora, Stictopora, Stictoporella, Stictoporina, Stictotrypa, Sulcopora, Tæniodictya, Tæniopora, Thamnotrypa.

FAMILY SUBRETIPORIDÆ.—Chainodictyon, Drymotrypa, Subretepora.

FAMILY THAMNISCIDÆ.—Criscinella, Diplopora, Thamniscus.

FAMILY THEONOIDÆ.—Scenellopora.

FAMILY TREMATOPORIDÆ.—Acanthoclema, Amplexopora, Atactopora, Atactoporella, Bactropora, Chilotrypa, Diamesopora, Homotrypa, Homotrypella, Nemataxis, Nicholsonella, Orthopora, Trematella, Trematopora, Tropidopora.

FAMILY TUBULIPORIDÆ.—Berenicea, Clonopora, Cystopora, Hederella, Hernodia, Stomatopora.

ACANTHOCLADIA, King, 1849, Ann. and Mag. Nat. Hist., 2d ser., vol. 3, p. 389. [Ety. *akantha*, spine; *klados*, 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. 882, 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 triserialis,) 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.

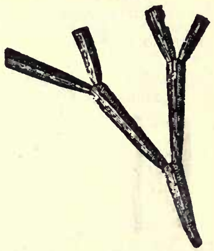


FIG. 448—Acrogenia prolifera.

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, Exposi. 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 Micropalæontology, p. 17, Trenton Gr.

cingulata, Ulrich, 1882, Jour. Cin. Soc. Nat. Hist., vol. 5, p. 254, Hud. Riv. Gr.

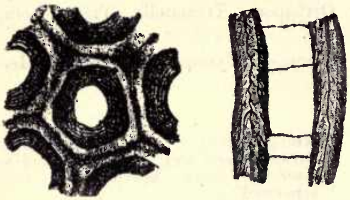


FIG. 449.—Amplexopora cingulata. Tangential section x 50, showing wall structure, and vertical section x 50.

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, (Atactopora septosa,) Jour. Cin. Soc. Nat. Hist., vol. 2, p. 125, Hud. Riv. Gr.

superba, Foord, 1883, Cont. to Micropalæontology, 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 flabelliform 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.

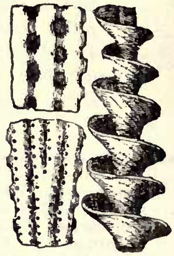


FIG. 451.—Archimedes reversus.

invaginatus, Ulrich, (in press), Geol. Sur. Ill., vol 8, pl. 63, Kaskaskia Gr.

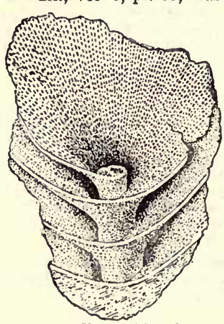


FIG. 452—Archimedes wortheni.

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.

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.

Archimedipora, D'Orb., 1850, Prod. de Pal., t. 1, p. 102, syn. for Archimedes. Archimedipora archimedes was too tautological, and by common consent Archimedes has become the generic name.

archimedes, see Archimedes.

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.

tenue, 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.

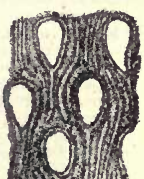


FIG. 455.—Arthropora shafferi. Tangential section x 50.

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. fusiforme. 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 maculæ; 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 maculæ; 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.—Atactoporella 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, (Monticulipora implicata,) Struct. and Affin. of Montic., p. 147, Hud. Riv. Gr.

irrasum, Ulrich, 1886, 14th Rep. Geo. Sur. Minn., p. 94, Trenton Gr.

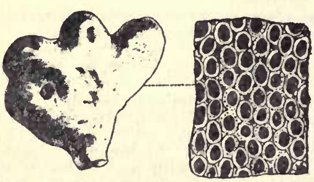


FIG. 457.—Batostoma jamesi. Natural size and magnified.

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.

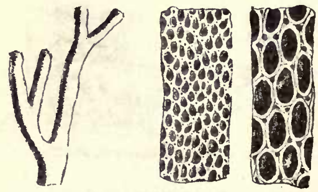


FIG. 458.—Batostomella gracilis. Natural size and enlarged.

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; nonporiferous space in the center of each disk, round which the radiating ridges occupy a slightly elevated zone. Type B. socialis.

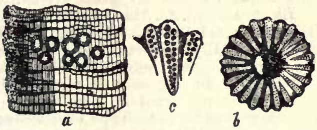


FIG. 459.—Botryllopora socialis. *a*, Group on coral natural size; *b*, enlarged specimen; *c*, enlarged ray to show pores.

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; zoœcia 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; zoœcial tubes, with diaphragms. Type B. lunata.

dentata, Ulrich, syn. for B. lunata.

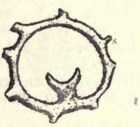


FIG. 460.—Buscopora lunata. Tangential section, showing aperture or lunarium.

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, (Lichenalia 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; cell apertures longer than wide, separated by impressed lines. Type B. fruticosa.

FIG. 461.—Bythopora 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,) Micropalæontology, p. 10, Hud. Riv. Gr.

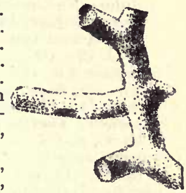


FIG. 462. — Bythopora nashvillensis. Magnified.

CALLOPORA, Hall, 1852, Pal. N. Y., vol. 2, p. 144. [Ety. *kallos*, beautiful; *poros*, pore.] Ramose, 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.

FIG. 463.— Callopora exsul.

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.

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 Leioclema 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.
oppleta, Hall, 1887, Pal. N. Y., vol. 6, p. 21, Low. Held. Gr.

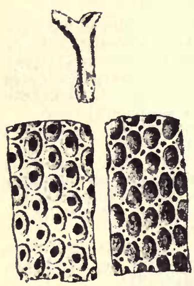


FIG. 464.—Callopora sigillarioides. Natural size and magnified.

parasitica, see Fistulipora parasitica.
perelegans, Hall, 1874, 26th Rep. N. Y. St. Mus. Nat. Hist., p. 102, Low. Held. Gr.
ponderosa, see Fistulipora ponderosa.
punctata, see Leioclema punctatum.
punctillata, Winchell, 1866, Rep. Low. Penin. Mich., p. 88, Ham. Gr.
sigillarioides, Nicholson, 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.

FIG. 465.—Callopora subnodosa. Tangential section x 50, showing amalgamation of walls.

unispina, see Callotrypa unispina.
venusta, see Cœlocaulis venusta.
CALLOPORELLA, 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; *trupa*, 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; maculæ 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.
labecula, 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 Catal. 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.

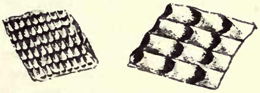


FIG. 466.—Ceramopora ohioensis. Fragment natural size and magnified.

ohioensis, Nicholson, 1875, Ohio Pal., vol. 2, p. 265, Hud. Riv. Gr.
orbiculata, Ringueberg, 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; zoœcial 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; zoœcia 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; zoœcial 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; *trupa*, opening.] Ramose, small central tube to which the zoœcia 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, (Trematopora 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. alcicornis.

FIG. 467.—Clathropora frondosa.

alcicornis, Hall, 1852, Pal. N. Y., vol. 2, p. 159, Niagara Gr.

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 striaturum.

CLONOPORA, Hall, 1881, Bryzoans 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.

CŒLOCAULIS, Hall, 1887, Pal. N. Y., vol. 6, p. 23. [Ety. *koilos*, hollow; *kaulos*, 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. Mus. Nat. Hist., p. 101, and Pal. N. Y., vol. 6, p. 23, Low. Held Gr.

CŒLOCONUS, 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 zoœcia 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 *Adeona 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.
striaturum, 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*, represent 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, maculæ of mesopores, appearing as minutely porous or subsolid elevations or depressions; zoœcia 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 maculæ; 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.

impressa, Ulrich, (in press,) Geo. Sur. Ill., vol. 8, pl. 40, Hud. Riv. Gr.

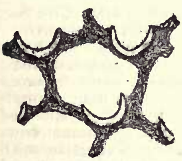


FIG. 468.—Crepipora simulans. Tangential section, showing lunarium.

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.

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; zoœcia 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.

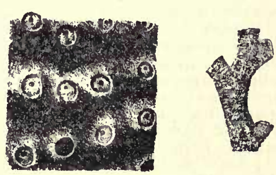


FIG. 469.—Cystodycta oceliata. Natural size and 18 diam.

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.

FIG. 470.—Cystodictya ocellata. Tangential section showing lunarium.

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.

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 maculæ; zoœcial 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.

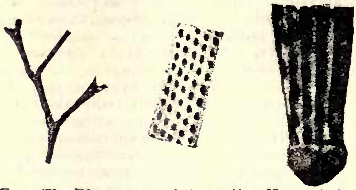


FIG. 471.—Dicranopora internodia. Natural size and magnified.

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; zoœcia 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 poriferous side, with two ranges of zoœcia 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. *enallos*, 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 Palæozoic.

? *concentrica*, Prout, Trans. St. Louis Acad. Sci., vol. 1, p. 234, Coal Meas. Not recognized.

ovatipora, Troost, 1840, 5th Geo. Rep. Tenn. Low. Sil. Not recognized.

reticulata, Troost, 1840, 5th Geo. Rep. Tenn. Low. Sil. Not recognized.

? *tuberculata*, Prout, 1858, 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. *eurys*, broad; *dictyon*, a net.] Broad, simple, or irregularly divided, bifoliate expansions, without nonporiferous parallel margins; surface with more or less conspicuous, small, solid maculæ or monticules; zoœcial structure very much as in Sulcopora, the differences being of small importance, and due to zoarial habit. Type E. montifera. Syn. (?) for Phænopora.

calhounensis, 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 zoœcia; 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.

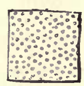


FIG. 472.—Evactinopora grandis. Pores 2 diam.

grandis, Meek & Worthen, 1868, Geo. Sur. Ill., vol. 3, p. 503, Burlington Gr.

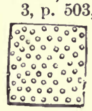


FIG. 473.—Evactinopora radiata. Pores 2 diam.

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, 1887, 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, 1881, (Thallostigma inclusa,) Trans. Alb. Inst., vol. 10, p. 188, and Pal. N. Y., vol. 6, p. 234, Ham. Gr.

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.

æqualis, Hall, 1881, Bryozoans of the Up. Held. Gr., p. 31, and Pal. N. Y., vol. 6, p. 112, Up. Held. Gr.

æsyle, 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.

althæa, 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. nododorsalis, 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.

delicata, Meek, 1871, Proc. Acad. Nat. Sci. Phil., vol. 23, p. 159, and Ohio Pal., vol. 1, p. 273, Waverly Gr.

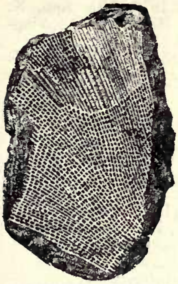


FIG. 474.—Fenestella delicata. Part of a frond.

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.

filitexta, Winchell, 1866, Rep. Low. Penin. Mich., p. 92, Ham. Gr.

fistulata, 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.
parallella. 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.
pertenuis, Hall, 1879, Desc. New Spec. Foss., p. 6, and 11th Rep. Geo. Ind. and Nat. Hist., p. 251, Niagara Gr.
pertenuis, 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. pertenuis, Hall, 1881, Bryzoans 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.
semirotunda, 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. 28, 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.
subtortilis, 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. stludovici.

stludovici, Prout, 1858, Trans. St. Louis Acad. Sci., vol. 1, p. 235, St. Louis Gr.

stludovici var. compacta, Ulrich, (in press,) Geo. Sur. Ill., vol. 8, pl. 59, St. Louis Gr.

FENESTRAPORA, Hall, 1885, Rep. St. Geol., p. 36. [Ety. *fenestra*, opening; *poros*, pore.] Forms of Fenestellidæ having the branches connected by dissepiments, two ranges of cell apertures, separated by a carina bearing pores; noncelluliferous side with conspicuous pores. Type F. biperforata.

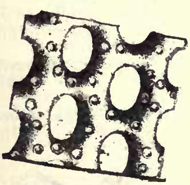


FIG. 475.—Fenestrapora biperforata. Magnified nonporiferous side.

biperforata, Hall, 1885, Rep. St. Geol., pl. 2, fig. 17, Up. Held. Gr.

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; tabulæ 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.

FIG 476.—Fistulipora astricta. Tangential section, showing lunarium.

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.

decipiens, Hall, 1881, (Thallostigma decipiens,) 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.

eriensis, 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.

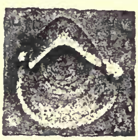


FIG. 477.—Fistulipora foordi. Opercular cover x 50.

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.

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.
micropora, 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.
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.

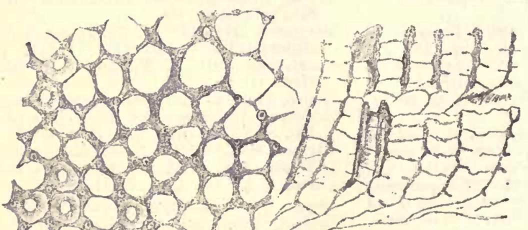


FIG. 478.—Flustra (?) tuberculata. Sections x 50.

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.
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.
prolifica, Ulrich, 1884, Jour. Cin. Soc. Nat. Hist., vol. 7, p. 45, St. Louis Gr.
proporoides, Nicholson, 1879, Pal. Tab. Corals, p. 310, Ham. Gr.
variopora, Hall, 1884, (Thallostigma variopora,) Rep. St. Geol., p. 18, Ham. Gr.

Flustra, Linnæus, 1745, Amænitates academicæ. Not Palæozoic.
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.

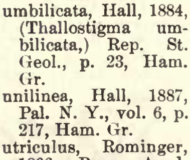


FIG. 479.—Flustra (?) tuberculata. Aperture x 50.

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.

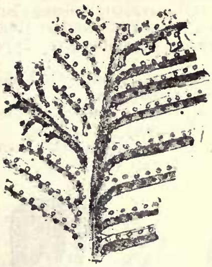


FIG. 480.—Glauconome nereidis.

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 cylindrical 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 small, each face with a central ridge; cells in longitudinal rows; apertures oval, directed obliquely outward. Type G. bilateralis. Syn. (?) for Dicranopora.

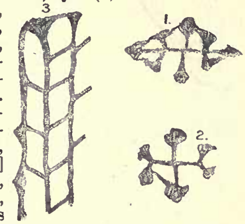


FIG. 481.—Goniotrypa bilateralis. 1, Transverse section; 2, transverse section lower down; 3, tangential section of the upper part.

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.

archimediformis, Claypole, syn. for Archimedes laxus.

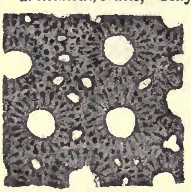


FIG. 484.—Heliotrypa bifolia. Tangential section x 50.

latispiralis, Claypole, 1883, Quar. Jour. Geo. Sci., p. 32, Niagara Gr.

ulrichi, Claypole, 1883, Quar. Jour. Geo. Soc., p. 33, Up. Held. Gr.

HELIOTRYPA, Ulrich, 1883, Jour. Cin. Soc. Nat. Hist., vol. 6, p. 277. [Ety. *helios*, sun; *trupa*, opening.] Bifoliate, interstitial cells developed from the prostrate portion of the zoœcia; 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.

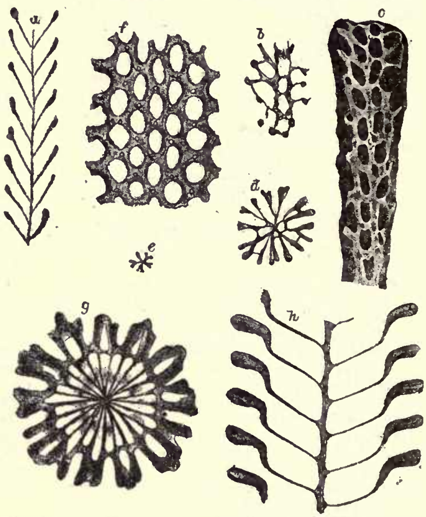


FIG. 485.—*a-l*, Helopora fragilis; *f-h*, Helopora lindstromi, sections x 50.

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.

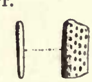


FIG. 486. — Helopora fragilis. Natural size and magnified.

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.

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 carinæ, which are elevated, widened at the summit, and connected by scalæ, which meet midway and coalesce, forming pseudocarinæ. 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; tabulæ 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.

Hippothoa, Lamouroux, 1821, Expos method. Not Palæozoic.
inflata, see Stomatopora inflata.
HOMOTRYPA, Ulrich, 1882, Jour. Cin. Soc. Nat. Hist., vol. 5, p. 240. [Ety. *homos*, similar; *trupa*, perforation.] Ramose 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 maculæ; 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.

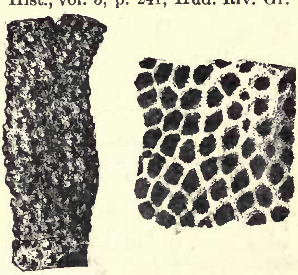


FIG. 489.—Homotrypa obliqua. Natural size and magnified.

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; zoœcia 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.

IDIOTRYPA, 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 connected by dissepiments, and with two ranges of cell apertures, separated by carinæ, 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.

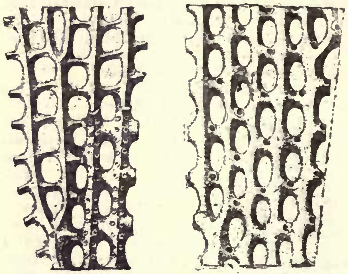


FIG. 490.—Isotrypa conjunctiva. Celluliferous side and noncelluliferous side, with pores on the dissepiments.

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.

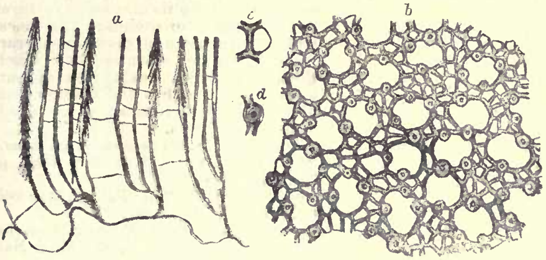


FIG. 491.—Leioclema foliatum. *a*, Vertical section x 28, showing entire thickness of zoarium, tabulation of zoœcia and mesopores, and structure of the acanthopores; *b*, tangential section x 28, showing distribution of acanthopores, mesopores, and zoœcia; *c*, small portion of wall x 50; *d*, acanthopore 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.
wilmingtonense, 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; interapertural 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.

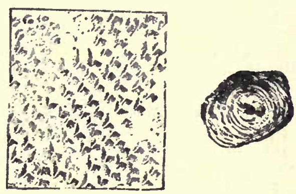


FIG. 492.—Lichenalia concentrica. Under surface and upper surface magnified.

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. Geo., 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 zoœcia, 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; carinæ 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.

FIG. 493.—Lyropora cinctura. Noncelluliferous side.

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 laminæ thin, flexuous; cells arranged with their oblique apertures directed toward the distal margin of the expansion; lunarium moderate or obsolete; zoœcial tubes oblique, the anterior walls thinnest and flexuous; diaphragms numerous, often recurved; oœcium 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.

approximata, Ulrich, (in press,) Geo. Sur. Ill., vol. 8, pl. 77, Kaskaskia Gr.

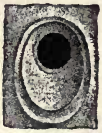


FIG. 494.—Meekopora clausa. Apercular cover x 50.

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; zoœcia 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; zoœcia 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 zoœcia; walls of both the zoœcia and mesopores thin, and in the mature region traversed longitudinally by tubuli; the interzoœcial 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 epithecal plates perforated by minute foramina. Type P. robusta.

conciliatrix, 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; maculæ present; no spiniform tubuli or diaphragms. Type P. incrustans.

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.

FIG. 495.—Paleschara offula.

pertenuis, Hall, 1884, Rep. St. Geol., p. 7, Ham. Gr.
radiata, Hall, 1883, Rep. St. Geol., p. 16, fig. 13–14, Low. Held. Gr.
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.
variacella, 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.

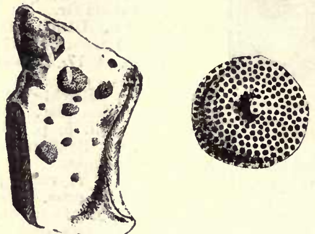


FIG. 496.—Petigopora petechialis on a Monticulipora; also, specimen greatly enlarged.

PHACELOPORA, 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.
constricta, 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; maculæ often developed; distinguished from Ptilodictya and Stictopora by the absence of a nonporiferous, striated edge. Type P. explanata.

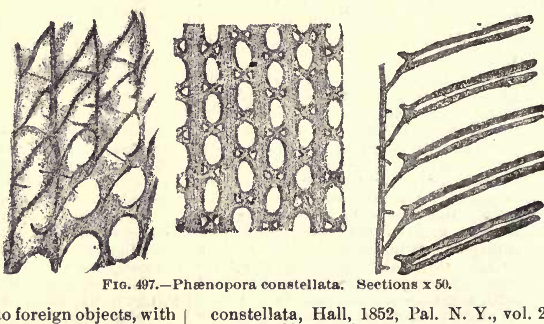


FIG. 497.—Phænopora constellata. Sections x 50.

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.

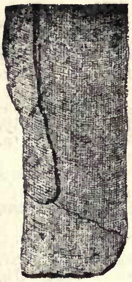


FIG. 498.—Phænopora expansa.

explanata, Hall, 1852, Pal. N. Y., vol. 2, p. 46, Clinton Gr.

multipora, 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 lipped; interstitial spaces minutely granular or punctate. Type P. frondosa.

FIG. 499.—Phyllodictya 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; zoœcia 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 zoœcial 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 vinii.

whitei, 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.

FIG. 500.—Polypora biseriata. Aperture having the central perforation of the cover closed, x 50.

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. 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.

corticosa, 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, Toula, 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.

imbricata, Prout, 1866, Trans. St. Louis Acad. Sci., vol. 2, p. 412, Devonian.

impressa, Ulrich, 1888, Bull. Denison Univ., vol. 4, p. 72, Cuyahoga 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.

lævinodata, Hall, 1881, (Fenestella lævinodata,) Trans. Alb. Inst., vol. 10, p. 28, and Pal. N. Y., vol. 6, p. 169, Up. Held. Gr.

lævistriata, 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.

lilæa, 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. Geo. 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.

FIG. 501.—Polypora shumardi. Enlarged.

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 zoœcia, 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.

Proutella, Ulrich, (in press,) Geo. Sur. Ill., vol. 8, p. 403. [Ety. proper name.] Discoid, thin, free, lower surface convex and lined with a concentrically wrinkled epitheca; primary zoœcia subtubular, 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 zoœcia are developed directly over the first, so that they gradually form a zoœcial 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, celluliferous on both faces, divided by a mesial lamina; margin without cells; apertures circular or subquadrate; no intercellular tissue. Type P. lanceolata.

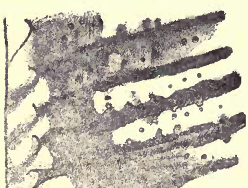


Fig. 502.—Ptilodictya maculata. Vertical section x 35, showing spinous process.

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, Niara 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.

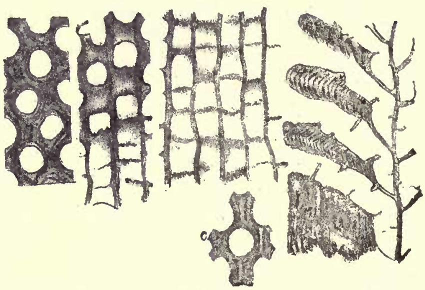


Fig. 503.—Ptilodictya magnifica. Sections x 50.

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, Ringueberg, 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.

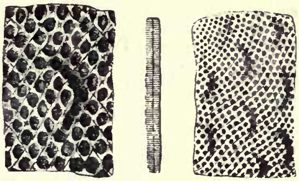


FIG. 504.—Ptilodictya pavonia. Natural size, and magnified.

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 zoœcia, 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,) Micropalæontology, 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.

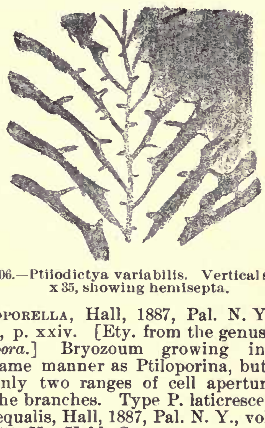


FIG. 506.—Ptilodictya variabilis. Vertical section x 35, showing hemisepta.

PTILOPORELLA, Hall, 1887, Pal. N. Y., vol. 6, p. xxiv. [Ety. from the genus *Ptilopora*.] Bryozoum growing in the same manner as Ptiloporina, but with only two ranges of cell apertures on the branches. Type P. laticrescens.
inæqualis, 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. Zoœcial 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 Palæozoic 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.

RHINIDICTYA, 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.

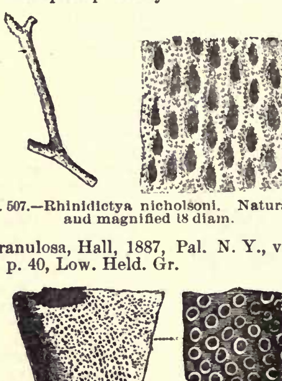


FIG. 507.—Rhinidictya nicholsoni. Natural size and magnified 18 diam.

granulosa, Hall, 1887, Pal. N. Y., vol. vi, p. 40, Low. Held. Gr.

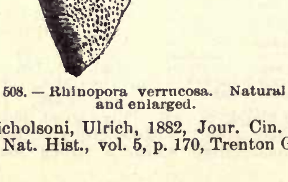


FIG. 508. — Rhinopora verrucosa. Natural size and enlarged.

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; celluliferous 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.

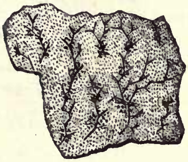


FIG. 509.—Rhinopora frondosa.

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.

(?) asperrima, 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 Acanthoclema 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.

gracilis, Ulrich, (in press,) Geo. Sur. Ill., vol. 8, pl. 70, Burlington Gr.

incrassata, Ulrich, 1888, Bull. Denison Univ., p. 89, Cuyahoga shales.

FIG. 510.—Rhombopora lepidodendroidea.

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 dragnet.] 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 laminæ at regular distances; celluliferous on each face; cells radiating from the center to each angle of the branch; margins and summit of laminæ 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.

subconcava, 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. 158, Trenton Gr.

SCEPTROPORA, Ulrich, 1888, Am. Geo., vol. 1, p. 228. [Ety. *skeptron*, staff; *poros*, pore.] Zoarium articulated; segments short, numerous, club-shaped, lower half striated, noncelluliferous; upper half expanded, celluliferous, and having one or more articulating sockets; zoœcia subtubular, radially arranged about a central axis; apertures subovate. Type S. facula.

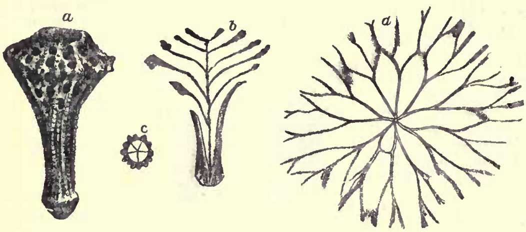


FIG. 513.—Sceptropora facula, x 18. *a*, Segment; *b*, vertical section; *c*, transverse section; *d*, transverse section of expanded part.

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.

SEMICOSCINIUM, Prout, 1859, Trans. St. Louis Acad. Sci., vol. 1, p. 443. [Sig. somewhat like *Coscinium*.] 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 net-work 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.

planodorsatum, 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.

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.
SPATIOPORA, 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 epithecal 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 S. subcarinata.

FIG. 515.—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.

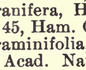


FIG. 516.—Stictopora gilberti. Tangential section, showing lunarium.

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.

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.

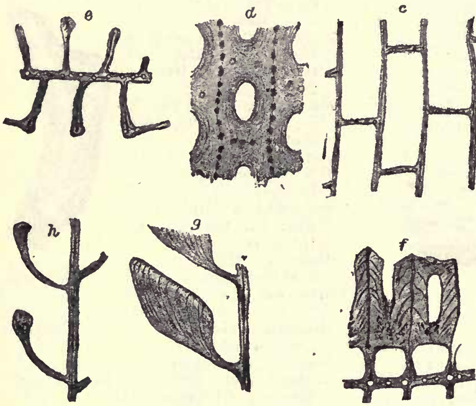


FIG. 517.—Stictopora mutabilis. Deep tangential section x 50, showing the primitive portion of the zoœcia and the median tubuli in their walls; *d*, tangential section x 50; *e*, transverse section x 50, showing median tubuli; *f*, transverse section x 50; *g*, vertical section x 50; *h*, vertical section 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.

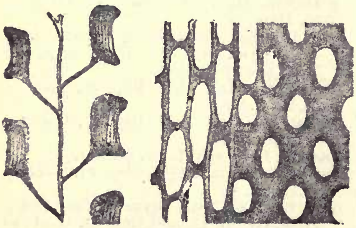


FIG. 518.—Stictopora ovatipora.

orbipora, Hall, 1879, Desc. New Spec. Foss, p. 5, and 11th Rep. Ind. Geo. and Nat. Hist., p. 248, Niagara Gr.

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, 23*a*, 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.
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. Antic., 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.

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.

vanclevei, 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.

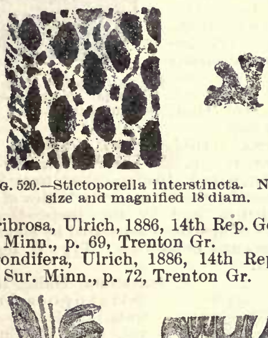


FIG. 520.—Stictoporella interstincta. Natural size and magnified 18 diam.

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. Pflanzenthiere. [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, (Alecot 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.

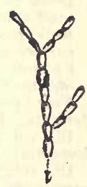


FIG. 522.—Stomatopora inflata. Natural size and magnified.

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.

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 oœcia, are distributed among the ordinary zoœcia; 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.

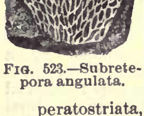


FIG. 523.—Subretepora angulata.

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, (Phyllopora corticosa,) 14th Rep. Geo. Sur. Minn., p. 61, Trenton Gr.

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, (Retopora 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, (Phyllopora variolata,) Jour. Cin. Soc. Nat. Hist., vol. 5, p. 160, Hud. Riv. Gr.

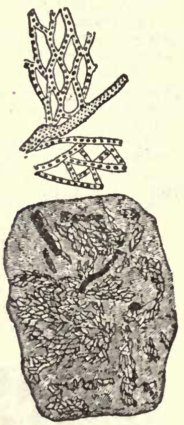


FIG. 524.—Subretepora reticulata. Natural size and magnified.

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.

TÆNIODICTYA, Ulrich, (in press,) Geo. Sur. Ill., vol. 8. [Ety. *tainia*, ribbon; *dictuon*, 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 x 50, showing a transverse lining of the central region of the walls, a character often present among the Ptilodictyonidæ.

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.

TÆNIOPORA, 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.

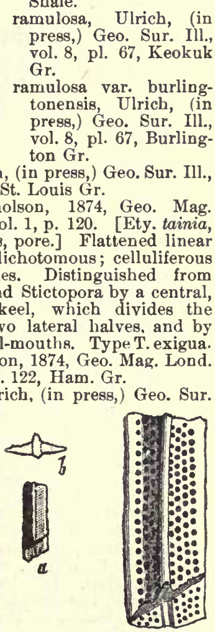


FIG. 527.—Tæniopora penniformis. *a*, Natural size; *b*, transverse section enlarged; *c*, fragment enlarged.

Thallistigma, Hall, syn for Fistulipora.

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; cellules 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.

FIG. 528.—Thamniscus niagarensis.

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.

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 Stictoporina 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.
crebipora, 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.

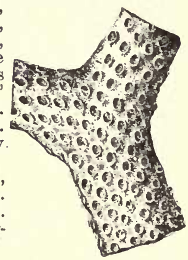


FIG. 529. — Trematopora infrequens. Much enlarged.

hexagona. Hall, 1887, Pal. N. Y., vol. 6, p. 178, Ham. Gr.
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.

ovatipora, Hall, 1883, Rep. St. Geo., 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.

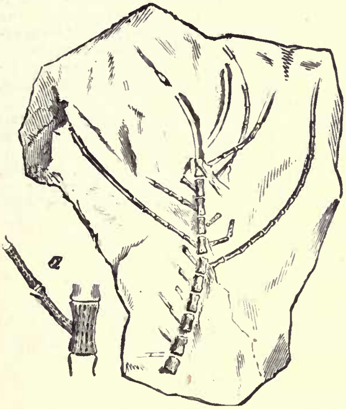


FIG. 530.—Arthroclema pulchellum. *a*, Magnified view. (See page 293.)

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.
tortalinea, 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 carinæ, 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.

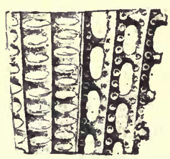


FIG. 531.—Unitrypa lata

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. 66, 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, subtubular 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.—Meekella, Orthis, Orthisina, Skenidium, Vitulina.

Family Pentameridæ.—Amphigenia, Anastrophia, Gypidula, Pentamerella, Pentamerus, Stenoschisma.

Family Pholidopidæ.—Pholidops.

Family Porambonitidæ.—Porambonites.

Family Productidæ.—Aulosteges, Chonetes, Productella, Productus, Strophalosia.

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 TRIPLESIIDÆ.—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.

FIG. 532.—Acrothele subsidua. Interior of dorsal valve enlarged.

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.

subsidua, White, 1874, (Acrotreta subdsidua,) Rep. Invert. Foss., p. 6, and Geo. Sur. W. 100th Mer., vol. 4, p. 34, Up. Taconic.

Acrotreta, Kutorga, 1848, Uber die Siphonotretæ aus den Verhandlungen der Kaiserlichen Mineralogischen Gesellscaft fur Jahr., p. 260, and Davidson's Brachiopoda, vol. 1, p. 133. [Ety. *akros*, the top or summit; *tretos*, perforated.] Shell triangular, 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.

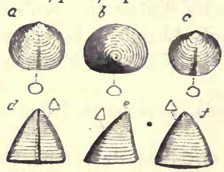


FIG. 533. — Acrotreta gemma. Small outline figures natural size; *a* and *c*, dorsal valves; *b*, ventral valve; *d*, area of ventral valve, which shows a central groove; *f*, area of another specimen having no groove; *e*, side view.

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.

gulielma, 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.

subsidua, see Acrothele subsidua.

Ægilops, Hall, 1850, 3d Rep. N. Y. St. Mus. Nat. Hist., p. 179. The name was preoccupied for a genus in botany; beside it was founded on the cast of a Lamellibranch.

subcarinata. Name not to be retained.

AMBOCŒLIA, Hall, 1860, 13th Rep. N. Y. St. Mus. Nat. Hist., p. 71. [Ety. *ambon*, umbo; *koilos*, 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 depressed 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 planoconvexa.

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 Ambocœlia 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.

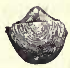


Fig. 534–Ambocœlia umbonata.

umbonata, Conrad, 1842, (Orthis umbonata,) Jour. Acad. Nat. Sci., vol. 8, p. 264, and Pal. N. Y., vol. 4, p. 259, Marcellus Shale and Ham. Gr.

unbonata var. gregaria, see A. gregaria.

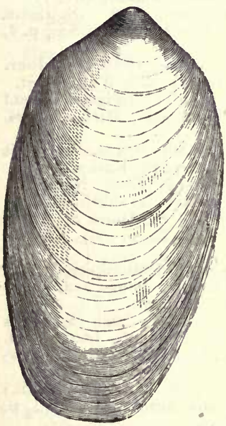


Fig. 535.—Amphigenia elongata.

Amphigenia, Hall, 1867, Pal. N. Y., vol. 4, p. 382. [Ety. *amphi*, on both sides; *genea*, growth.] Inequivalve, oval, ovoid, or subtriangular, more or less convex, without mesial fold or sinus; valves articulating by teeth and sockets, without area; dental lamellæ, in the ventral valve, conjoined 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 anchylosed 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, and Pal. N. Y., vol. 4, p. 383, Schoharie grit and Up. Held. Gr.

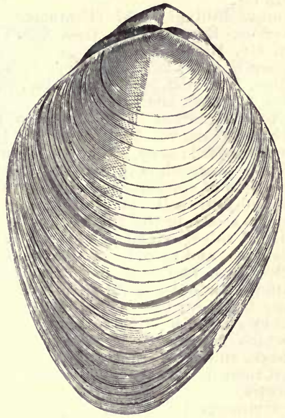


Fig. 536.—Amphigenia elongata.

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.

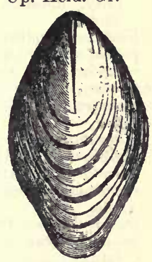


Fig. 537.—Amphigenia elongata.

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; hingeplate 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.

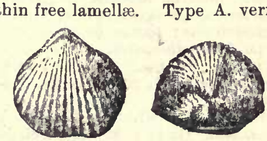


Fig. 538.—Anastrophia internascens.

internascens, Hall, 1879, 28th Rep. N. Y. St. Mus. Nat. Hist., p. 168, Niagara Gr.

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 Palæozoic.

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.

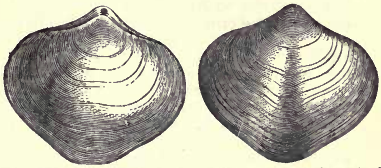


FIG. 539.—Athyris spiriferoides. Dorsal and ventral view.

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.

FIG. 540. Athyris spiriferoides. Side view.

subtilita, Hall, 1852, Stansbury's Exped. to Great Salt Lake, p. 409, Coal Meas.
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 Leptocœlia acutiplicata.
acutirostra, see Rhynchonella acutirostra.
æquiradiata, Conrad, 1842, Jour. Acad. Nat. Sci., vol. 8, p. 266, Low. Held. Gr.
æquiradiata, see Rhynchonella æquiradiata.
affinis, syn. for Atrypa reticularis.
altilis, see Rhynchonella altilis.
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 brevirostris 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.
crassirostra, 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 Cœlospira 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 Rensselæria ovoides.
emacerata, see Rhynchonella emacerata.
exigua, Hall, 1847, Pal. N. Y., vol. 1, p. 141, Trenton Gr.
eximia, see Stenochisma eximium.
extans, see Triplesia extans.
flabella, syn. for Leptocœlia hemispherica.
flabellites, see Leptocœlia 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 Leptocœlia 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.

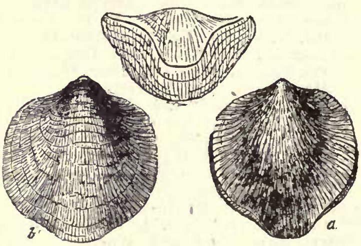


FIG. 541.—Atrypa reticularis. *a*, Dorsal valve; *b*, ventral valve; *c*, anterior view.

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.
mansoni, Salter, 1852, (Rhynchonella mansoni,) Sutherland's Jour., vol. 2, p. ccxxi, 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.
nodostriata, 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.

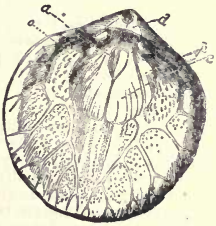


FIG. 542.—Atrypa reticularis. Interior of ventral valve; *a*, impression of adductor muscle; *c*, cardinal muscle; *p*, pedicle muscle; *o*, ovarian sinus; *d*, deltidium.

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.
planoconvexa, see Leptocœlia 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, (?) Linnæus, 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.
quadricostata, see Leiorhynchus quadricostatum.
quadricostata, Hall, 1852, see Rhynchonella quadricostata.
rectiplicata, Conrad, 1842, Jour. Acad. Nat. Sci., vol. 8, p. 265, Low. Held. Gr.
recurvirostra, see Anazyga recurvirostra.

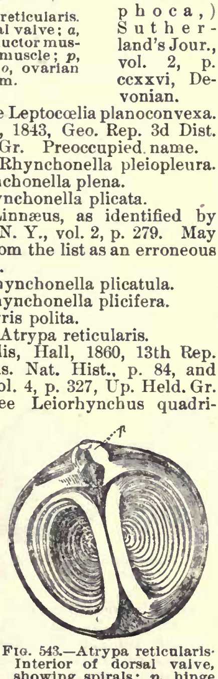


FIG. 543.—Atrypa reticularis. Interior of dorsal valve, showing spirals; *p*, hinge plate.

reticularis, Linnæus, 1767, (Anomia reticularis,) Syst. Nat., ed. 12, p. 1132, and Pal. N. Y., vol. 2, p. 72. It 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 consimilis*, etc.
robusta, see Rhynchonella robusta.
rostrata, see Meristella rostrata.
rugosa, see Rhynchonella rugosa.
scitula, see Meristella scitula.
semiplicata, see Rhynchonella semiplicata.
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 Merista sulcata.
tenuilineata, Hall, 1843, Geo. 4th Dist. N. Y., p. 272, Chemung Gr.
tribulis, syn. for Atrypa reticularis.
tumida, see Athyris tumida.
unguiformis, syn. for Orthis proximus.
unisulcata, see Meristella unisculcata.
AULOSTEGES, Helmerson, 1847, Bull. de la Classe Physi. Math. Acad. Sci. St. Petersburg, vol. 6, p. 135. [Ety. *aulos*, tube; *stege*, chamber.] Shell subpentagonal; ventral valve most convex, 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 trifid 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-

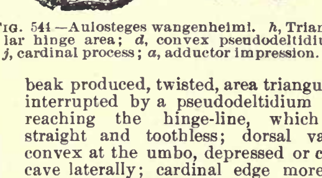


FIG. 544.—Aulosteges wangenheimi. *h*, Triangular hinge area; *d*, convex pseudodeltidium; *j*, cardinal process; *a*, adductor impression.

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.

spondyliformis, 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 striæ are more or less numerous, while above concentric striæ 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, Calcif. 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 ortoni.

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.

FIG. 546.—Camarella volborthi. Dorsal, ventral, and side views.

volborthi, Billings, 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 typus.

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.

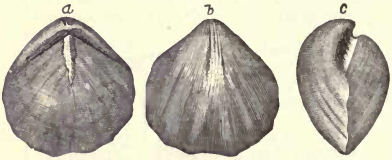


FIG. 547.—Camarophoria giffordi. *a*, Dorsal view; *b*, ventral valve; *c*, profile view.

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 uta.

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. 138, 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.
swallovana, 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.

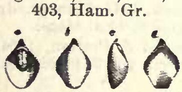


FIG. 548.—Centronella hecate. *a*, Showing loop; *b*, *c*, and *d*, different views.

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 orgrooved 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

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, Gaspe limestone No. 8, Devonian.
mesolobus, Norwood & Pratten, 1854, Jour. Acad. Nat. Sci., vol. 3, p. 27, Coal Meas.

FIG. 549.—Chonetes mesolobus. Ventral valve.

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.
minimus, 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.
novascoticus, 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.
setigerus, 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.
syrtalis, 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.

CŒLOSPIRA, Hall, 1858, Trans. Alb. Inst., vol. 4, p. 146. [Ety. *koilos*, hollow; *speira*, 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.

concava, Hall, 1857, (Leptocœlia concava,) 10th Rep. N. Y. St. Mus. Nat. Hist., p.

FIG. 550.—Cœlospira concava. Magnified view of spirals.

107, and Pal. N. Y., vol. 3, p. 245, Corniferous Gr.

dichotoma, Hall, 1859, (Leptocœlia dichotoma,) Pal. N. Y., vol. 3, p. 452, Oriskany sandstone.

FIG. 551.—Cœlospira disparilis. Dorsal and ventral views.

disparilis, Hall, 1852, (Atrypa disparilis,) 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.

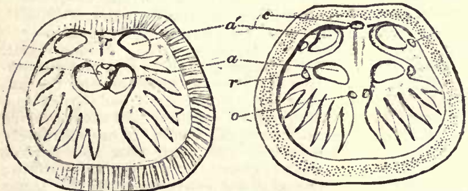


FIG. 552. — Crania anomala, 2 diam. *a*, Anterior adductors; *á* posterior adductors; *c*, protractor sliding muscles; *ć*, cardinal muscle; *r*, *o*, retractor sliding muscles.

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.

FIG. 553. Crania dyeri.

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.

hamiltoniæ, 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.

FIG. 554.—Crania multipunctata.

pannosa, Ringueberg, 1886, Bull. Buf. Soc. Nat. Sci., vol. 5, p. 17, Niagara Gr.

parallella, 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.

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. 280, Hud. Riv. Gr.

FIG. 555.—Crania reticularis.

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, 1878, 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 striæ; 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.

FIG. 556. — Cryptonella lincklæni. Dorsal and profile views.

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.

eudora, 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. 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.

biplicata, see Cyrtina biplicata.

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.

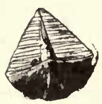


FIG. 557.—Cyrtia exporrecta.

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, Monog. Brit. Carb. Brach., p. 66. [Ety. the diminutive of *Cyrtia* is *Cyrtidium*, but the author said he preferred bad Greek to a long name.] Spirifera-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, Gaspe No. 8, Devonian.

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.

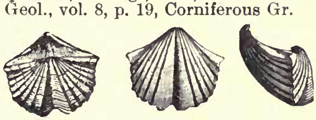


FIG. 558.—Cyrtina hamiltonensis. Dorsal, ventral, and side views.

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.
deltoidea, syn. for Orthis lynx.
disjuncta, see Spirifera disjuncta.
duodenaria, see Spirifera duodenaria.
dupliplicata, see Spirifera dupliplicata.
euruteines, see Spirifera euruteines.
expansa, see Pterotheca expansa.
fimbriata, see Spirifera fimbriata.
granulifera, see Spirifera granulifera.
granulosa, see Spirifera granulosa.
inermis, see Spirifera disjuncta.
lævis, see Spirifera lævis.
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; *dis*, 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, (Obolellina 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. Anim. sans 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 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.

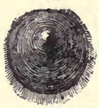


FIG. 559.—Discina ostreoides.

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.

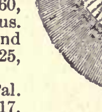


FIG. 560.—Discina circe.

clara, Spencer, 1884, Bull. No. 1, Mus. Univ. St. Mo., p. 56, Niagara Gr.

connata, 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.

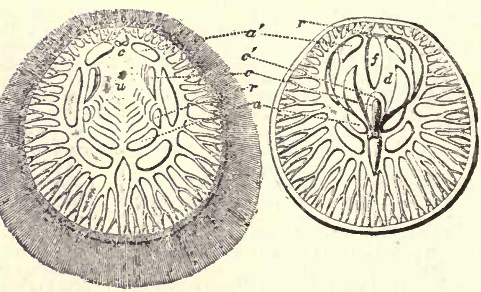


FIG. 561.—Discina ostreoides, 2 diam. *u*, Umbo; *f*, foramen; *d*, disk; *a*, anterior adductors; *á*, posterior adductors; *c*, *c*, protractor sliding muscles; *r*, retractor muscles.

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.

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.

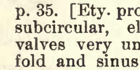


FIG. 562.—Eatonia medialis. Anterior view.

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.

FIG. 563.—Eatonia singularis.

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.

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.

FIG. 564.—Eichwaldia reticulata.

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 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. Davidson said a syn. for E. capewelli.

FIG. 565.—Eichwaldia subtrigonalis. Dorsal, ventral, side, front, and apex views.

subtrigonalis, Billings, 1858, Rep. of Progr. Geo. Sur. Can., p. 192, Black Riv. Gr.

ELKANIA, Ford, 1886, Am. Jour. Sci. and Arts, 3d ser., vol. 32, p. 325. [Ety. proper name.] Shell thin, calcareous, inarticulate, longitudinally ovate or subcircular, convex; ventral válve, 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.

FIG. 566.—Eumetria verneuilana.

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.

GLASSIA, Davidson, 1881, Lond. Geo. Mag., vol. 8, 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.

Goniocœlia, 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., Brachiopoda, 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.

Hipparionyx, 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.

IPHIDEA, 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.

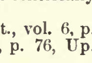


FIG. 567—Iphidea bella.

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 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.

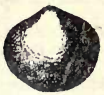


FIG. 568.—Kutorgina pannula. Enlarged 6 diam.

cingulata, Billings, 1861, Pal. Foss., vol. 1, p. 8, Up. Taconic.

labradorica, Billings, 1861, (Obolus labradoricus,) Pal. Foss., vol. 1, p. 6, Up. Taconic.

latourensis, 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, (Iphidea sculptilis,) 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.

FIG. 569.—Leiorhynchus quadricostatum.

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.

LEPTÆNA, 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.

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.
deltoidea, see Strophomena deltoidea.
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.

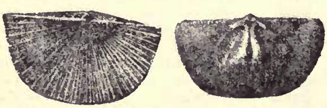


FIG. 570.—Leptæna sericea. Dorsal view, and interior of dorsal valve.

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.
tranversalis, 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.

LEPTOBOLUS, 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.

LEPTOCŒLIA, 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.

FIG. 571.—Leptocœlia flabellites.

flabellites, Conrad, 1841, (Atrypa flabellites,) Ann. Rep. N. Y., p. 55, and Pal. N. Y., vol. 3, p. 449, Oriskany sandstone.

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 laminæ; 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 Palæozoic 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.

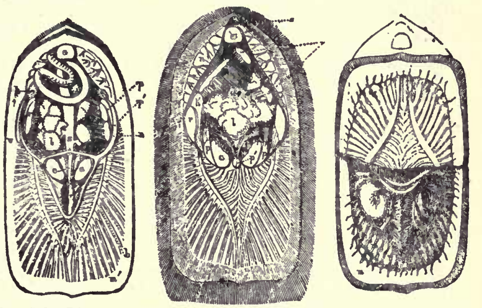


FIG. 573.—Lingula anatina. *aa*, Anterior adductors; *a*, posterior adductor; *pp*, external protractors; *pṕ*, central protractors; *rr*, anterior retractors; *r*, posterior retractors; *c*, capsule of pedicel; *n*, visceral sheath; *o*, œsophagus; *s*, stomach; *l*, liver; *v*, vent; *h*, auricles, etc.

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.

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, Gurley, 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.
huronensis, 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.


FIG. 574.—Lingula norwoodi.

nuda, Hall, 1863, 16th Rep. N. Y. St. Mus. Nat. Hist., p. 22, Ham. Gr.
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.

paliformis, 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.

rectilatera, 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, 1885, 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.


FIG. 575.—Lingula vanhorni.

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; *elasma*, 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 detidium 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.

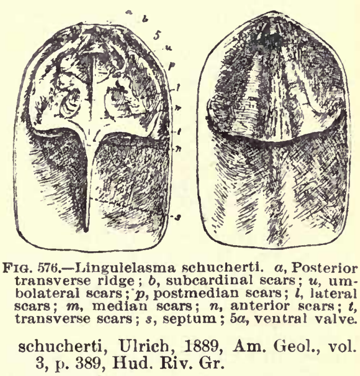


FIG. 576.—Lingulelasma schucherti. *a*, Posterior transverse ridge; *b*, subcardinal scars; *u*, umbolateral scars; *p*, postmedian scars; *l*, lateral scars; *m*, median scars; *n*, anterior scars; *t*, transverse scars; *s*, septum; 5*a*, ventral valve.

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.] 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. davisi.


FIG. 577.—Lingulella cincinnatiensis.

?affinis, Billings, 1874, Pal. Foss., vol. 2, p. 67, Up. Taconic.
aurora, Hall, 1861, (Lingula aurora,) Geo. Rep. Wis., p. 24, Potsdam Gr.
cælata, Hall, 1847, (Orbicula cælata,) 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.


FIG. 578.—Lingulella cuneata.

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.

LINGULOPS, 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 limestone.

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.

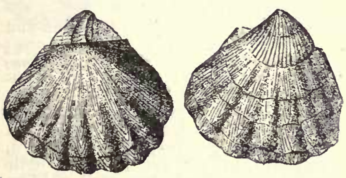


FIG. 580.—Meekella striatocostata. Dorsal and ventral view.

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.

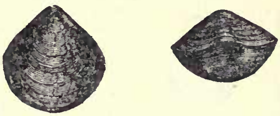


FIG. 581. — Merista bella. Dorsal and anterior view.

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.

meeki, 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, recurving upon themselves, are reunited laterally. Type M. lævis.

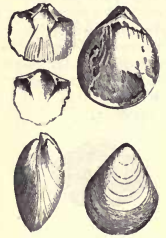


Fig. 582. — Meristella circe. Showing remains of spiral appendages in the dorsal valve.

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.

Fig. 583.—Meristella rostrata. Side view.

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.

unisulcata, Conrad, 1841, (Atrypa unisulcata,) 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.

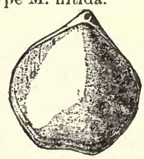


Fig. 584. — Meristina nitida. Dorsal view.

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.

Fig. 585.—Monomerella 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.

NUCLEOSPIRA, Hall, 1859, Pal. N. Y., vol. 3, p. 219. [Ety. *nucleus*, kernel; *speira*, 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.

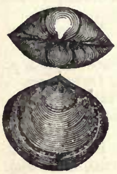


FIG. 586. — Nucleospira concinna.

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.

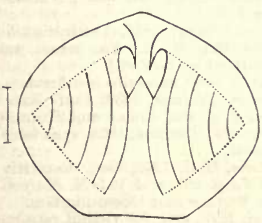


FIG. 587.—Spiral coils of Nucleospira pisiformis.

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.

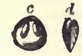


FIG 588.—Obolella chromatica c, Showing muscular impressions; d, side view.

desiderata, see Elkania desiderata.

discoidea, Hall & Whitfield, 1877, U. S. Geo. Expl. 40th parallel, vol. 4, p. 205, Potsdam Gr.

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.

galtensis, see Dinobolus galtensis.

magnifica, see Dinobolus magnificus.

OBOLUS, 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-corneous. Type O. apollinis.

canadensis, see Dinobolus canadensis.
conradi, see Dinobolus conradi.

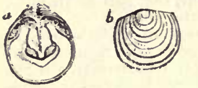


FIG. 589.—Obolus apollinis. *b*, Dorsal valve; *a*, interior of ventral valve.

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, Tabe. 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 Prodr. 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.

ORTHIS, 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, Ringueberg, 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 porcata.
apicalis, Billings, 1865, Pal. Foss., vol. 1, p. 301, Quebec Gr.
armanda, 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 Leptæna barabuensis.
battis, Billings, 1865, Pal. Foss., vol. 1, p. 185, Quebec Gr.
bellarugosa, 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, Schlotheim, 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 multisecta.
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 redescribed 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.
eurekensis, 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.
interstrialis, 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.
iphigenis, 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.
michelini, (Terebratula michelini,) L'Eveille, 1835, Mem. Soc. Geol. France, vol. 2, p. 39, Subcarboniferous.
michelini 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.

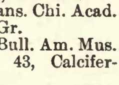


FIG. 591.—Orthis lynx. Small Trenton specimen.

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.
multisecta, 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 Ambocœlia 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.

oblata var. emarginata, Hall, 1859, Pal. N. Y., vol. 3, p. 164, Low. Held. Gr.
occasus, 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.
pratteni, 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.
quadricostata, see Leiorhynchus quadricostatum.
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.
richmondi, 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 Schlotheim.
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.
swallovi, 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.

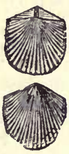


FIG. 592.—Orthis tricenaria. Half natural size.

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.
tritonia, 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 Ambocœlia umbonata.
umbraculum, DeKoninck, see Orthis keokuk and Streptorhynchus umbraculum.
unguiculus, Phillips, as identified by Hall in 1843, see Ambocœlia 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 trifid rostral tooth, from which a small mesial septum extends toward the margin; lateral cardinal teeth as in Orthis. Tpye O. verneuili.

FIG. 593.—Orthisina grandæva. 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, Calcif. 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.

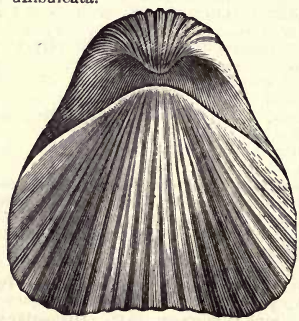


FIG. 594.—Pentamerella arata. Dorsal view.

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.

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.

FIG. 595.—Pentamerella arata. Side view.

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, Castelnau, 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, Castelnau, 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.

FIG. 596.—Pentamerus knighti.

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.

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. crassicostus 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, (Spirifera 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.


FIG. 597.—Pholidops cincinnatiensis.

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 Leptæna transversalis.

glabra, syn. for Leptæna sericea.

tenera, syn. for Leptæna transversalis.

Plicatula, Lamarck, 1809. Not Palæozoic.

striatocostata, see Meekella striatocostata.

PORAMBONITES, Pander, 1830, Beitrage zur Geog. des Russichen Reiches, p. 99. [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. æquirostris.

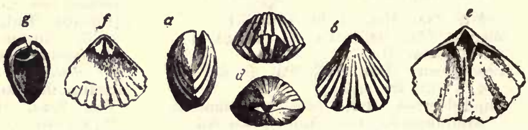


FIG. 598.—Porambonites ottawensis. *a*, *b*, *c*, *d*, Different views; *e*, interior of ventral valve; *f*, interior of dorsal valve; *g*, showing oral arms.

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.

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.

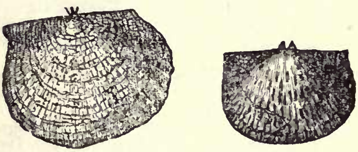


FIG. 599.—Productella hirsuta.

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.

rarispina, 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 shumardanus,) 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.

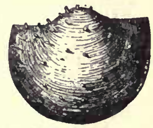


FIG. 600.—Productella subalata. Ventral valve.

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.

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 subquadrate 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. nebraskensis.

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.

fentonensis, 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.

lævicostus, 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.
pectenoideus, 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.
pocillum, 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 rarispina.
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.

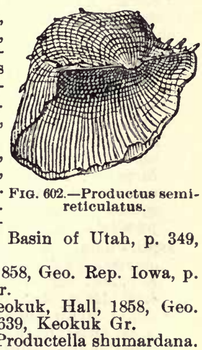


FIG. 602.—Productus semireticulatus.

semistriatus, Meek, 1860, Proc. Acad. Nat. Sci., vol. 12, p. 309, and Simpson's Rep. Gt. Basin of Utah, p. 349, Coal Meas.
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.

RENSSELÆRIA, 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.
æquiradiata, Conrad, 1842, (Atrypa æquiradiata,) Jour. Acad. Nat. Sci., vol. 8, p. 266, and Pal. N. Y., vol. 3, p. 255, Low. Held. Gr.
condoni, McChesney, 1861, New Pal. Foss., p. 85, Oriskany sandstone.
cumberlandiæ, Hall, 1857, (Meganteris cumberlandiæ,) 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.

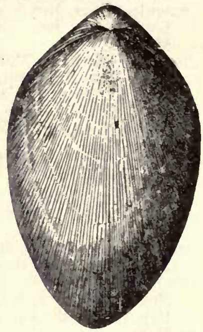


FIG. 603.—Rensselæria ovoides.

ovoides, Eaton, 1832, (Terebratula ovoides,) Geo. Text-book, 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.

FIG. 604. Retzia evax.

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.
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.

meekana, 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, Linnæus, as identified by Geinitz, syn. for Syntrielasma hemiplicatum.

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 Rhynchotreta cuneata var. Americana.
dawsonana, Davidson, 1863, Quar. Jour. Geo. 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, Gaspe limestone No. 8, Devonian.
dubia, Hall, 1847, (Atrypa dubia,) Pal. N. Y., vol. 1, p. 21, Chazy Gr.
duplicata, syn. for Stenoschisma contractum.
eatoniiformis, 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.
emmonsi, 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.
eurekensis, 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, Gaspe limestone No. 8, Devonian.
eximia, see Stenoschisma eximium.
explanata, McChesney, 1860, Desc. New Pal. Foss., Kaskaskia Gr. Not recognized.
fitchana, 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.
glansfagea, see Centronella glansfagea.
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.
guadalupæ, 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.
huronensis, Winchell, 1862, Proc. Acad. Nat. Sci., 2d ser., vol. 6, p. 409, Portage Gr.
hydraulica, 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.
inæquiplicata, 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.
nucula, Sowerby, 1839, (Terebratula nucula,) 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 Camerophoria 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, Kaskaskia 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.
pleiopleura, Conrad, 1841, (Atrypa pleiopleura,) 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.
prolifica, 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 Camerophoria subtrigona.
subtrigonalis, Hall, 1847, (Atrypa subtrigonalis,) Pal. N. Y., vol. 1, p. 145, Trenton Gr.
sulcoplicata, 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.
tetraptyx, 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; *tretos*, with a hole in it.] Distinguished from Rhynchonella by the straight, produced, perforated beak of the ventral valve and divided deltidium, and by the cruræ which rise near the dorsal beak, curve into the ventral cavity, and recurve to the dorsal side. Type R. cuneata.

FIG. 607.—Rhynchotreta cuneata var. americana

cuneata var. americana, Hall, 1879, 28th Rep. N. Y. St. Mus. Nat. Hist., p. 167, Niagara Gr.

FIG. 608.—Rhynchotreta quadriplicata.

quadriplicata, S. A. Miller, 1875, (Trematospira quadriplicata,) 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; *Crania*, a genus.] Shell parasitic inequivalve, inarticulated, surface of the upper valve finely striated; interior with six muscular scars. Type S. filosa.

FIG. 609.—Schizocrania 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; *tretos*, 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 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.

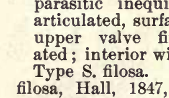


FIG. 610.—Siphonotreta unguiculata. *a*, Ventral valve; *b*, interior of same.

scotica, Davidson, 1877, Geol. Mag., new ser., vol. 4, p. 13, Utica slate.

SKENIDIUM, Hall, 1860, 13th Rep. N. Y. St. Mus. Nat. His., p. 70. [Ety. *skenidion*, 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. Geo. 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. Geo. 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. Geo. 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.
bidorsalis, 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.
corticosa, 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, pl. 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.
dupliplicata, Conrad, 1842, (Delthyris dupliplicata,) 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 Prog. 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. 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.
grandæva, 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. His., 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.
inæquivalvis, 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.
inæquicostata, 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.
lævigata, Swallow, 1853, Trans. St. Louis Acad. Sci., vol. 2, p. 86, Keokuk Gr.
lævis, Hall, 1843, (Delthyris lævis,) 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.
latior, Swallow, 1863, Trans. St. Louis Acad. Sci., vol. 2, p. 86, Waverly or Choteau Gr.
leidyi, Norwood & Pratten, 1855, Jour. Acad. Nat. Sci., 2d series, vol. 3, p. 72, Kaskaskia Gr.
leidyi var. chesterensis, Swallow, 1866, Trans. St. Louis Acad. Sci., vol. 2, p. 409, Kaskaskia Gr.
leidyi 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.
lonsdalii, 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. 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.
meristoides, 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.
opima, 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.
perplexa, 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.
raricosta, Conrad, 1842, (Delthyris raricosta,) 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.

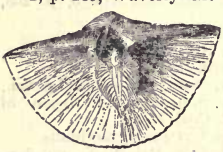


FIG. 613.—Spirifera striata. Interior of ventral valve.

striata, Martin, 1809, (Anomites striatus,) Petrif. Derb., tab. 23, Carb.

striata var. triplicata,) Marcou, 1858, Geol. North America, p. 49, Subcarboniferous.

substriatulus, as identified by d'Archiac & Verneuil. Not American.

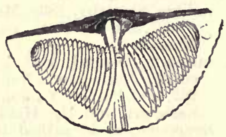


FIG. 614.—Spirifera striata. Interior of dorsal valve.

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.

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.

tullia, 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 Choteau Gr.
verneuili, syn. for S. disjuncta.
? *waldronensis*, see Triplesia 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.] Writtten *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. pelargonatum.
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 arctostriata,) 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.

FIG. 617.—Streptorhynchus crassum. Dorsal view.

crenistriatum, Phillips, 1836, (Spirifera crenistria,) 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, (Leptæna filitexta,) Pal. N. Y., vol. 1, p. 111, Trenton and Hud. Riv. Grs.
flabellum, Whitfield, 1882, Desc. New Spec. Foss., from Ohio, p. 200, Up. Held. Gr.

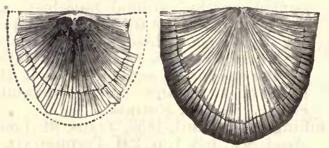


FIG. 618.—Streptorhynchus hallanum. Exterior and interior of dorsal valve.

hallanum, S. A. Miller, 1874, Cin. Quar. Jour. Sci., vol. 1, p. 148, Hud. Riv. Gr.

FIG. 619.—Streptorhynchus hallanum. Interior of ventral valve.

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.

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, (Leptæna planoconvexa,) Pal. N. Y., vol. 1, p. 114, Hud. Riv. Gr.

planumbonum, Hall, 1847, (Leptæna 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.

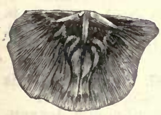


FIG. 620.—Streptorhynchus sulcatum. Interior of dorsal valve.

sulcatum, Verneuil, 1848, (Leptæna sulcata,) Bull. Geol. Soc. France, vol. 5, p. 350, and Ohio Pal., vol. 1, p. 85, Hud. Riv. Gr.

tenue, 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 Leptæna, 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 nebraskensis.

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 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.

æquicostata, 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 perplana.

geniculata, 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.

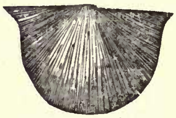


FIG. 621.—Strophodonta inæquistriata.

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.

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. 412, 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 con cave, with a thin space between them for the animal; surface with radiating striæ; 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 perforated; 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. loxorhytis, Meek, 1873, Ohio Pal., vol. 1, p. 91, Hud. Riv. Gr.

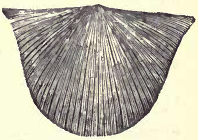


FIG. 622.—Strophomena alternata.

ampla, see Strophonella ampla.

analoga, Phillips, 1836, Geol. Yorkshire, vol. 2, pl. 7, fig. 10, Subcarb.

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 Tropidoleptus 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 Strophodonta 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 Strophodonta crebristriata.
crenistria, syn. for Strophodonta perplana.
declivis, James, syn. for Strophomena 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 Strophodonta perplana.
demissa, see Strophodonta 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 Strophomena 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.
filitexta, see Streptorhynchus filitextum.
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 Strophodonta 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 Strophodonta 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 Strophodonta varistriata.
incrassata, Hall, 1847, (Leptæna incrassata,) Pal. N., vol. 1, p. 19, Chazy to Hud. Riv. Gr.
inæquiradiata, see Strophodonta inæquiradiata.
inæquistriata, see Strophodonta inæquistriata.
interstrialis, Phillips, in Geo. 4th Dist. N. Y., see Strophodonta 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 Strophodonta nacrea.
lima, see Productella lachrymosa var. lima.
lineata, see Chonetes lineatus.
macra, syn. for Strophodonta semifasciata.
magniventra, see Strophodonta 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 Strophodonta mucronata.
nacrea, see Strophodonta nacrea.
nasuta, Conrad, 1842, Jour. Acad. Nat. Sci., vol. 8, p. 260, Trenton and Hud. Riv. Grs.
nassula, 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 Strophodonta perplana var. nervosa,
niagarensis, Winchell & Marcy, syn. for Strophodonta 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 Strophodonta patersoni.
pecten, Linnæus, 1758, (Anomia pecten,) Syst. Nat., Niagara Gr. Not American.
pectinacea, see Streptorhynchus pectinaceum.
perplana, see Strophodonta 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, Wilckins, 1769, (Conchites rhomboidalis,) Nachrict 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.

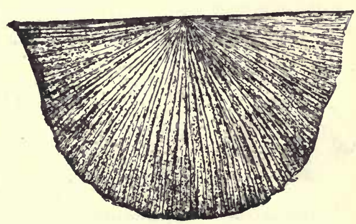


FIG. 624.—Strophonella punctulifera.

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.

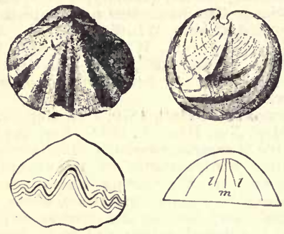


FIG. 625.—Syntrielasma hemiplicatum. *l*, Dental laminæ; *m*, mesial septum.

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. *syrinx*, 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 pseudodeltidium, beneath which, and diverging from it, is another transverse plate, connecting the vertical dental lamellæ, arched above, and beneath giving off a couple of median parallel lamellæ, 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.

TEREBRATULA, Llhwyd, 1699, Lith. Brit. Ichn. [Ety. diminutive of *terebratus*, perforated.] Shell variable in form, oval, elongated or transverse; smooth or plicated; valves unequally convex; hinge-line curved; beak 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 lamellæ 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.

bisacula, 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.

burlingtonensis, 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.
michelini, see Orthis michelini.
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 rockymontana.
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.
valenciennei, 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.
cælata, see Obolella cælata.
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.

FIG. 628.—Trematis dyeri.

huronensis, Billings, 1862, Pal. Foss., vol. 1, p. 53, Black Riv. Gr.
montrealensis, Billings, 1862, Pal. Foss., vol. 1, p. 52, Trenton Gr.

FIG. 629. — Trematis millepunctata.

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, 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 acadiæ.

acadiæ, 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,(Waldheimiaglobosa,)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, (Leptocœlia 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 Rhynchotreta 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.

Trigonotreta, Konig, 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 Trigonotreta 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;

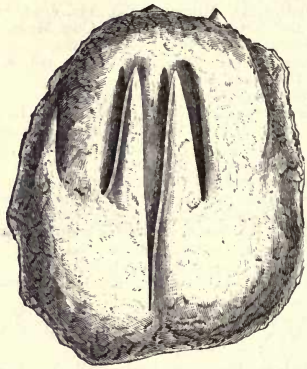


FIG. 631.—Trimerella grandis. Cast of dorsal valve.

shell thick, and surface concentrically striated; area of pedicle valve longer than wide; deltidium large; hinge thick, elevated, rudely or slightly dentary; 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.

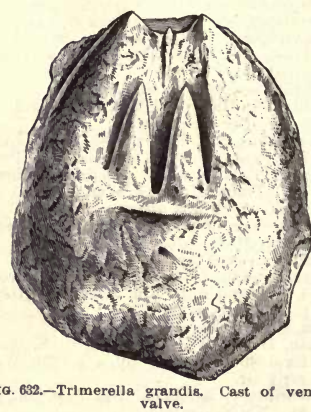


FIG. 632.—Trimerella grandis. Cast of ventral valve.

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.

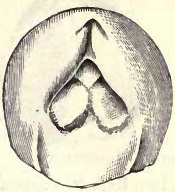


FIG. 633. — Trimerella galtensis.

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.

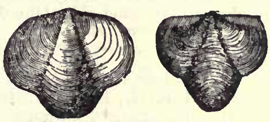


FIG. 634.—Triplesia extans.

Mus. Nat. Hist., p. 44. [Ety. *triplasios*, 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.

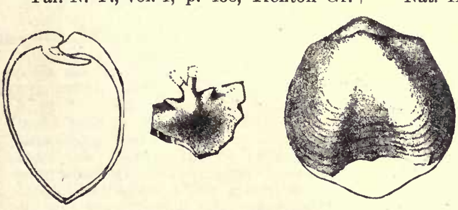


FIG. 635.—Triplesia ortoni.

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.

ortoni, Meek, 1872, (Dicraniscus ortoni,) 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.

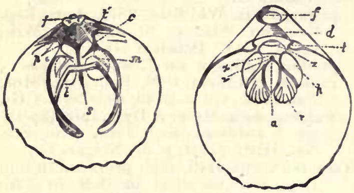


FIG. 637.—Waldheimia australis. Dorsal valve; *j*, cardinal process; *t*, dental sockets; *p*, hinge plate; *s*, septum; *c*, crura of the loop; *l*, reflected portion of the loop; *m*, quadruple adductor impression. Ventral valve; *f*, foramen; *d*, deltidium; *t*, teeth; *a*, single adductor impression; *r*, cardinal muscle; *x*, 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.

rectirostra, see Trematospira rectirostra.

FIG. 638.—Waldheimia 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.

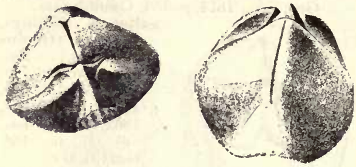


FIG. 639.—Whitfieldia maria. Internal casts.

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.

FIG. 640.—Zygospira modesta.

pauper, Billings, 1866, Catal. Sil. Foss. Antic., p. 46, Anticosti Gr.

subconcava, Meek & Worthen, 1868, Geo. Sur. Ill., vol. 3, p. 380, Low. Held. Gr.

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 CLATHROCŒLIIDÆ—Clathrocœlia.
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.

CLATHROCŒLIA, Hall, 1879, Pal. N. Y., vol. 5, pt. 2, p. 203. [Ety. *clathro*, latticed; *koilia*, 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.

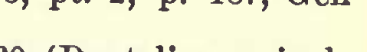


FIG 642.—Coleolus acicula.

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.

tenue, 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.

micronema, Meek, 1871, Proc. Acad. Nat. Sci. Phil., p. 84, and Ohio Pal., vol. 2, p. 316, Waverly Gr.

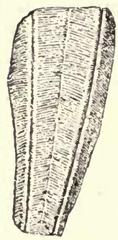


FIG. 643.—Conularia micronema.

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.

FIG. 644.—Conularia quadrisulcata.

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, Min. 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.

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 Hyolithes 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 Hyolithes.] Distinguished from Hyolithes by its long, slender form and structure of the operculum. Type H. micans.

FIG. 645.—Hyolithellus micans. Terminal portion enlarged.

micans, Billings, 1871, Can. Nat. and Geol., vol. 6, p. 240, and Am. Jour. Sci. and Arts., 3d ser., vol. 3, p. 354, Up. Taconic.

micans var. rugosa, Walcott, 1887, Am. Jour. Sci. and Arts, 3d ser., vol. 34, p. 191, Up. Taconic.

HYOLITHES, Eichwald, 1840, Sil. Schicht. Syst. in Ehstl., p. 97. Apparently the internal casts of tubes forming an elongate, subtriangular pyramid; lateral margins acute and tapering from 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 striæ. Type H. acutus.

aclis, 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.

emmonsi, 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, (Camerotheca 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 Hyolithellus 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 parviuscula,) 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.

FIG. 646. — Hyolithes primordialis.

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.

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 imperforate septum; surface papillose; operculum calcareous, nucleus excentric, lines of growth concentric. Type M. variabilis.

FIG. 647.—Matthevia variabilis.

variabilis, Walcott, 1885, Am. Jour. Sci. and Arts, 3d ser., vol. 30, p 18, Calciferous Gr.

PHARETRELLA, Hall, 1888, Pal. N. Y., vol. 7, p. 7. Shell large, elongate, Hyolithes-like in outline; apex acute; surface ornamented with transverse, undulating striæ. 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 calyptræform, 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, (Clioderma 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 Hyolithes 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.

FIG. 648.—Scenella conica. Side view.

conula, Walcott, 1885, Monogr. U. S. Geo. Sur., vol. 8, p. 15, Up. Taconic.

reticulata, Billings, 1872, Can. Nat. and Geo., 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 Geo., 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, (Metoptoma 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, Niagara 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 undersurface, 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 mantel. 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 Palæozic shells of this Class.

FAMILY BELLEROPHONTIDÆ.—Bellerophon, Bucanella, Bucania, Phragmostoma, Porcellia, Tremanotus.

FAMILY BULIMORPHIDÆ.—Bulimorpha.

FAMILY CALYPTRÆIDÆ.—Capulus, Conchopeltis, Metoptoma, Platyceras.

FAMILY CHITONIDÆ.—Chiton.

FAMILY CLISOSPIRIDÆ.—Billingsia, Clisospira.

FAMILY CODONOCHILIDÆ.—Codonochilus.

FAMILY CYCLONEMIDÆ.—Cyclonema, Eunema, Holopea, 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, Zaptychius.

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.
swallovana, see Aclisina swallovana.

ACLISINA, DeKoninck, 1881, Faune du Calcaire Carbonifere 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.
swallovana, Geinitz, 1866, (Turbonilla swallovana,) Carb. und Dyas in Neb., p. 5, Coal Meas.

FIG. 651. Aclisina swallovana.

Acroculia, Phillips, 1841, Pal. Foss. Cornwall, Devon, and W. Somerset, p. 93, syn. for Platyceras.
angulata, see Platyceras angulatum.

erecta, see Platyceras erectum.
ovalis, see Platyceras ovale.
niagarensis, see Platyceras niagarense.
trigonalis, see Platyceras trigonale.
Ampullaria, Lamarck, 1801, Syst. An. sans Vert. [Ety. *ampulla*, a flask.] Not a Palæozoic genus.
helicoides, see Soleniscus helicoides.
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 helicoid 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.
ANTHRACOPUPA, 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.
BELLEROPHON, Montfort, 1808, Conch. Syst., vol. 1, p. 50. [Ety. mythological name.] Shell thick, symmetrical, globose, involute; sinus in the middle of the outer lip, from which a band extends backward along the outer surface of the volution; inner lip thickened, expanded on the inrolled spire. Type B. vasulites.
acutilira, Hall, 1862, 15th Rep. N. Y. Mus. Nat. Hist., p. 56, Ham. Gr.
acutus, Sowerby, 1839, Murch. Sil. Syst., p. 643, Low. Silurian.
allegoricus, White, 1874, Rep. Invert. Foss., p. 10, and Geo. Sur. W. 100th Mer., vol. 4, p. 55, Quebec Gr.
alternodosus, Whitfield, 1882, Ann. N. Y. Acad. Sci., vol. 2, p. 225, Kaskaskia Gr.
angustata, see Bucania angustata.
antiquatus, Whitfield, 1878, Ann. Rep. Geo. Sur. Wis., p. 52, and Geo. Wis., vol. 4, p. 176, Potsdam Gr.
apertus, Sowerby, 1825, Min. Conch., vol. 5, p. 108, Subcarboniferous.
argo, Billings, 1860, Can. Nat. and Geol., vol. 5, p. 167, Black Riv. and Trenton Gr.
auriculatus, Hall, 1852, Pal. N. Y., vol. 2, p. 334, Coralline limestone.
barquensis, Winchell, 1862, Proc. Acad. Nat. Sci., p. 425, Marshall Gr.
bidorsatus, see Bucania bidorsata.
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.

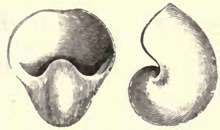


FIG. 652.—Bellerophon bilobatus.

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, Birdseye 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.
crenistria, 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 Geo., 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.

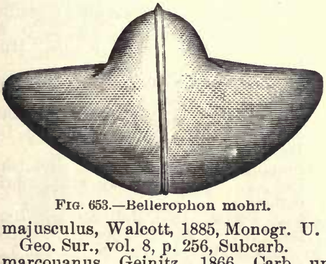


FIG. 653.—Bellerophon mohri.

majusculus, Walcott, 1885, Monogr. U. S. Geo. Sur., vol. 8, p. 256, Subcarb.
marcouanus, Geinitz, 1866, Carb. und 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, Gaspe 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.
repertus, Hall, 1879, Pal. N. Y., vol. 5, pt. 2, p. 128, Ham. Gr.
rotalinea, 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.
sublævis, 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. 5, 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, Cephal., 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.
vittatus, 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.

FIG. 655.—Billingsia saratogensis.

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, (Cyrtolites 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.

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.

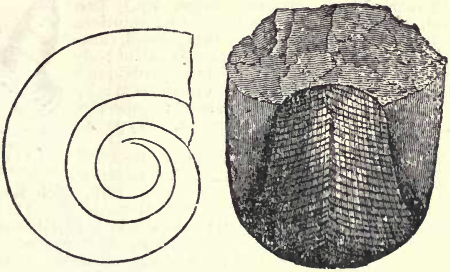


FIG. 656.—Bucania sulcatina.

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.

stigmosa, 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.

BULIMORPHA, 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 from the outer lip by a notch, as in Achatina; outer lip slightly notched near the upper end; surface smooth. Type B. bulimiformis.

FIG. 657—Bulimorpha 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 striæ 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 Palæozoic 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 Palæozoic genus.

attenuata, see Loxonema attenuatum.

parva, see Loxonema parvum.

swallovana, see Loxonema swallovanum.

tenuilineata, see Loxonema tenuilineatum.

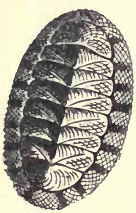


FIG. 660. — Chiton squamosus.

Chiton, Linnæus, 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 Palæozoic genus.

canadensis, see Metoptoma 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.

FIG. 661.—Clisospira 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.

occidentalis, Whitfield, 1878, Ann. Rep. Geo. Sur. Wis., p. 75, and Geo. Wis., vol. 4, p. 222, Trenton Gr.

CODONOCHILUS, Whiteaves, 1884, Pal. Foss., vol. 3, p. 17. [Ety. *kodon*, a trumpet; *cheilos*, lip.] Turreted, 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.—Codonochilus striatum.

striatum, Whiteaves, 1884, Pal. Foss., vol. 3, p. 17, Guelph Gr.

CONCHOPELTIS, 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, striæ 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.

cancellatum, 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.

crenistria, 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.

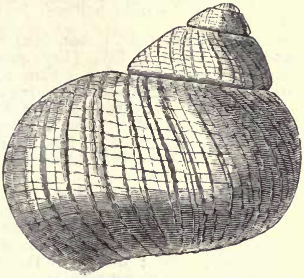


FIG. 664.—Cyclonema hageri.

hageri, Billings, 1862, Pal. Foss., vol. 1, p. 29, Trenton Gr.
hallanum, Salter, 1859, Can. Org. Rem., Decade 1, p. 26, Black Riv. Gr.
hamiltoniæ, 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.

FIG. 666.—Cyclora hoffmanni.

minuta, Hall, 1845, Am. Jour. Sci., vol. 48, p. 294, Utica Slate and Hud. Riv. Gr.
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, Lamarck, 1801, Syst. An. sans Vert. [Ety. *kuklos*, circle; *stoma*, mouth.] Not a Palæozoic genus.
pervetusta, see Pleurotomaria pervetusta.

FIG. 667.—Cyrtolites carinatus.

CYRTOLITES, 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 Cyrtonella 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 Cyrtonella pileolus.


FIG. 669.—Cyrtolites ornatus.

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.] 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.

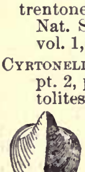


FIG. 670.—Cyrtonella pileolus.

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, (Crytolites 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, Linnæus, 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., p. 45, and Geo. Sur. Ill., 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.


FIG. 671.—Dentalium elephantinum.

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. und 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. *ecculiomphalus*, unrolled umbilicus.] Shell discoid, a few 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.

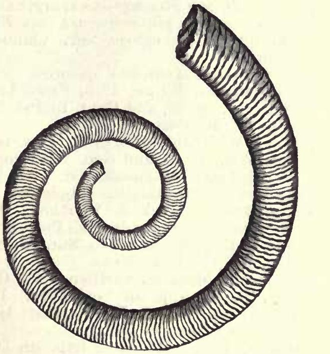


FIG. 672.—Eccyliomphalus distans.

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 Palæozoic 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.

FIG. 674.—Eunema cerithioides.

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.

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.

FIG. 675.—Euomphalus 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.

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, Birdseye 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 Eccyliomphalus eboracensis.
exortivus, Dawson, 1868, Acad. Geol., p. 308, Carboniferous.
expansus, Conrad, 1842, Jour. Acad. Nat. Sci., vol. 8, p. 273, Niagara Gr.
gyroceras, see Eccyliomphalus 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 Eccyliomphalus laxus.
lens, see Straparollus lens.
luxus, White, 1875, Expl. W. 100th Meridian, vol. 4, p. 94, Subcarboniferous.
macrolineatus, 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, Castelnau, 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.
quadrivolvis, see Straparollus quadrivolvis.
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 spergensis.
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 Raphistoma trochiscum.
umbilicatus, see Straparollus umbilicatus.
uniangulatus, see Ophileta uniangulata.
utahensis, see Straparollus utahensis.
vaticinus, Hall, 1863, 16th Rep. N. Y. Mus. Nat. Hist., p. 136, Potsdam Gr.
verneuili, Castelnau, 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. for Macrochilina primigenia.

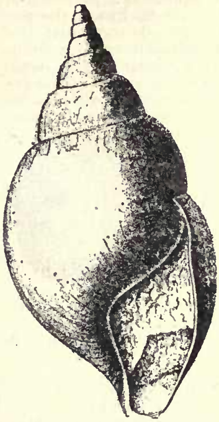


FIG. 676.—Fusispira ventricosa.

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.

naresi, 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.

FIG. 678. Holopea dilucula.

eriensis, 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.

ovalis, Billings, 1859, Can. Nat. and Geo., vol. 4, p. 351, Calciferous Gr.
paludiniformis, 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 striæ; 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.

depressum, Meek & Worthen, 1865, Proc. Acad. Nat. Sci. Phil., p. 251, and Geo. Sur. Ill., vol. 3, p. 443, Ham. Gr.
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.

FIG. 680.—Lepetopsis levettii.

Littorina, Ferussac, 1821, Tab. Syst. An. Mollusques, etc.
antiqua, see Holopea antiqua.
cancellata, see Cyclonema cancellatum.
wheeleri, see Naticopsis wheeleri.

LOPHOSPIRA, Whitfield, 1886, Bull. Am. Mus. Nat. Hist., vol. 1, p. 312. [Ety. *lophos*, the keel; *speira*, a whorl.] Spire elevated, strongly keeled, and axis minutely perforate, when whorls are not disconnected. The types are Murchisonia milleri, Hall, and M. helicteres; 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.

cara, Dawson, 1883, Rep. on Redpath Museum, No. 2, p. 11, Subcarboniferous.

carinatum, see Macrochilina carinata.

cerithiforme, 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.

FIG. 681.—Loxonema hamiltoniæ.

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 & Whitfield, 1872, 24th Rep. N. Y. Mus. Nat. Hist., p. 193, and Pal. N. Y., vol. 5, pt. 2, p. 44, Ham. Gr.

inornata, see Polyphemopsis inornata.

kanii, 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, Haughton, 1857, Jour. Roy. Dub. Soc., 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.

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, Illust. Devonian Foss., pl. 13, and Pal. N. Y., vol. 5, pt. 2, p. 43, Up. Held. Gr.

planogyratum, 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, Haughton, 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. attenuatum 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.

subattenuatum, 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.
swallovanum, Shumard, 1859, (Chemnitzia swallovana,) 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.

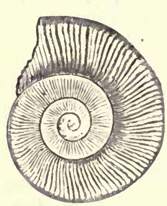

FIG. 682.—Loxonema yandellanum.

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.
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, Monrgr. 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.

Macrocheilus, 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.
hamiltoniæ, see Macrochilina hamiltoniæ.
hebe, see Macrochilina hebe.
hildrethi, see Macrochilina hildrethi.
humile, see Machrochilina humilis.
inhabile, syn. for Macrochilina primigenius.
intercalare, see Macrochilina intercalaris.

kansasense, see Macrochilina kansasensis.
klipparti, see Soleniscus klipparti.
macrostomum, see Macrochilina macrostomus.
mediale, see Macrochilina medialis.
missouriense, see Macrochilina missouriensis.
newberryi, see Soleniscus newberryi.
paludinæformis, see Soleniscus paludiniformis.
pingue, see Macrochilina pinguis.
ponderosum, see Macrochilina ponderosus.
primævum, see Macrochilina primævus.
primigenium, see Macrochilina primigenius.
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.


FIG. 684. — Macrochilina littonana.

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.

METOPTOMA, 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.

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.

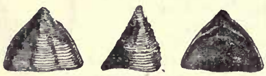


FIG. 685. — Metoptoma canadensis. *a*, Upper side; *b*, side view; *c*, under side.

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.

MICROCERAS, 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.

MICRODOMA, 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.

FIG. 686. Murchisonia bilineata.

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.
archimedea, 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.

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.


FIG. 687.—Murchisonia gracilis.

hebe, Billings, 1874, Pal. Foss., vol. 2, p. 57, Gaspe 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.
hespelerensis, 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.
kansasensis, 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.

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. Paléont, 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.
sumnerensis, Safford, 1869, Geo. of Tenn., p. 288, Nashville Gr.
sylvia, Billings, 1865, Pal. Foss., vol. 1, p. 190, Quebec Gr.
terebra, White, 1879, Bull. U. S. Geo. Sur. Terr., vol. 5, No. 2, p. 219, and Cont. to Pal., No. 6, p. 139, Carboniferous.
terebralis, Hall, 1852, Pal. N. Y., vol. 2, p. 334, Coralline limestone.
terebriformis, Hall, 1858, Trans. Alb. Inst., vol. 4, p. 28, and Bull. Am. Mus. Nat. Hist., p. 86, Warsaw Gr.
teretiformis, 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.
vincta, Hall, 1858, (Loxonema vincta,) 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 striæ. Type N. phillipsi.
æquistriata, 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, Chemung 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.


FIG. 688.—Naticopsis lævis.

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.

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.

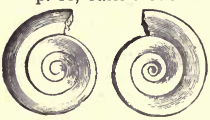


FIG. 689.—Ophileta nerine.

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, (Straparollus 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 uniangulatus,) Pal. N. Y., vol. 1, p. 9, Calcifer. Gr.

ORMATHICHNUS, 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.

ORTHONEMA, Meek & Worthen, 1861, Proc. Acad. Nat. Sci., Phil., p. 146. [Ety. *orthos*, straight; *nema*, thread.] elongate, many whorled, ornamented with revolving carinæ, 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. Orthonema 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.

subtæniatum, Geinitz, 1866, (Murchisonia subtæniata,) 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.

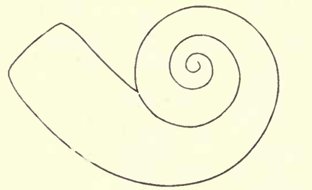


FIG. 691.—Orthostoma commune.

commune, Conrad, 1838, Ann. Rep. N. Y., p. 119, figured in 1841, Ann. Rep. pl. 2, fig. 16, Birdseye Gr.

PALÆACMÆA, Hall & Whitfield, 1873, 23d Rep. N. Y. Mus. Nat. Hist., p. 242. [Ety. *palaios*, ancient; *Acmæa*, 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.—Palæotrochus 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.

PALÆOTROCHUS, Hall, 1879, Pal. N. Y., vol. 5, pt. 2, p. 133. [Ety, *palaios*, ancient; *Trochus*, a genus.] Conical, trochiform; spire elevated; volutions 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 Palæzoic genus.
levettei, see Lepetopsis levetti.
Phanerotinus, 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.

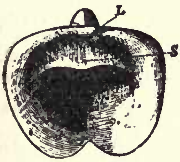


FIG. 693.—Phragmostoma cymbula. View of aperture; *L*, lamina; *S*, septum.

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 Carinaropsis 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*, Castelnau, 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.
auriculatum, 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.

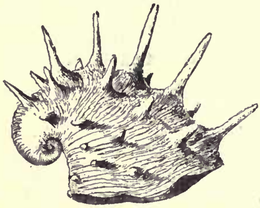


FIG. 694.—Platyceras dumosum.

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.
laciniosum, Ringueberg, 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.
magnificum, Hall, 1859, Pal. N. Y., vol. 3, p. 476, Oriskany sandstone.
membranaceum, Ringueberg, 1886, Bull. Buf. Soc. Nat. Sci., vol. 5, p. 15, Niagara Gr.
minutissimum, Walcott, 1879, Desc. New Spec. Foss., p. 1, Calciferous Gr.
multisinuatum, 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.
niagarense, 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.
occidens, 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.

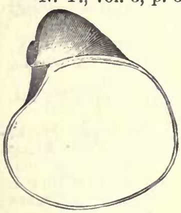


FIG. 695.—Platyceras reversum.

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. Grs.
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.
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. subsinuosum.
sulcatum, Conrad, 1841, Ann. Rep. N. Y., p. 56, Oriskany sandstone.
sulcoplicatum, 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.
uncum, 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.

mccoyi, 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.

niagarense, Hall, 1852, Pal. N. Y., vol. 2, p. 287, Niagara Gr.

FIG. 697.—Platystoma niagarense.

peoriense, McChesney, 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.

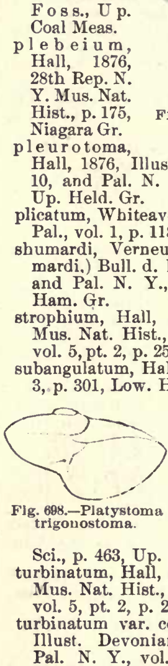


Fig. 698.—Platystoma trigonostoma.

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.

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.

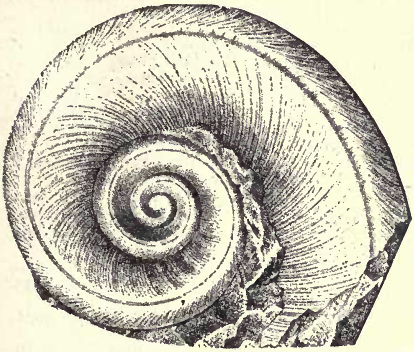


Fig. 699.—Pleuronotus decewi.

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; *tome*, 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 striæ, nodes, granulations, or carinæ; 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.

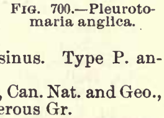


FIG. 700.—Pleurotomaria anglica.

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.

beekmanensis, 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.

bonbarborensis, 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 Eotrochus 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. sphærulata.
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, Gaspe 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 Geo., 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 Geo., 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.
hoyi, 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. 138, Keokuk Gr.
isaacsi, 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, Gaspe limestone, No. 8, Devonian.
marcouana, Geinitz, 1866, Carb. und Dyas in Neb., p. 10, and Pal. E. Neb., p. 233, Coal Meas.
meekana, 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.
misera, 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.
nauvooensis, 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 halii.
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.
quadricarinata, 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.

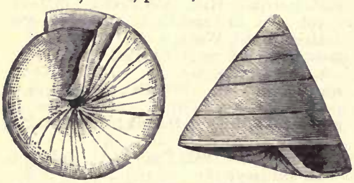


FIG. 701.—Pleurotomaria ramsayi.

regulata, Hall, 1860, 13th Rep., p. 108, Ham. Gr.
riddelli, Shumard, 1860, Trans. St. Louis Acad. Sci., vol. 1, p. 625, Coal Meas.
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.
sphærulata, 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.

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.
textiligera, 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.

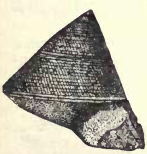


FIG. 702. — Pleurotomaria turbiniformis.

turbiniformis, 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 Trochonema umbilicatum.
unisulcata, 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, Gaspe limestone No. 8, Devonian.
whitii, Winchell, 1862, Proc. Acad. Nat. Sci., p. 423, Marshall Gr.
wortheni, 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.


FIG. 703.—Polyphemopsis nitidula.

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.

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.

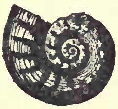


FIG. 704.—Porcellia puzosi.

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. *pseudes*, 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 Calonnianum, 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.

bigsbyi, 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, Birdseye Gr.

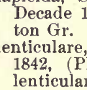


FIG. 707. — Raphistoma halli.

halli, S. A. Miller, 1874, (Pleurotomaria halli,) Cin. Quar. Jour. Sci., vol. 1, p. 318, Hud. Riv. Gr.

labiatum, Emmons, 1842, (Maclurea labiata,) Géo. Rep. N. Y., p. 312, Calciferous and Birdseye Gr.

lapicida, 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.

niagarense, 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.

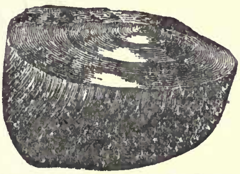


FIG. 709.—Raphistoma striatum.

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.

FIG. 710. -Rotella vestiaria.

verruculifera, White, 1882, Rep. Invert. Foss., New Mexico, p. xxxi, Coal Meas.

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, turrited, produced 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.

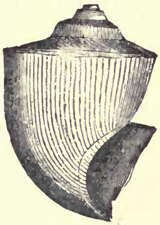


FIG. 711.—Scalites angulatus.

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.

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 hallanum,) 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.

paludiniformis, Hall, 1858, (Macrocheilus paludiniformis,) Geo. of Iowa, p. 719, Coal Meas.

planus, White, syn. for S. newberryi.

texanus, Shumard, 1859, (Macrocheilus texanum,) 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 ventricosum,) 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.

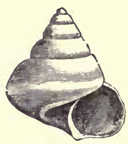


FIG. 714.—Straparollina pelagica.

pelagica, Billings, 1865, Pal. Foss., vol. 1. p. 223, Quebec Gr.

remota, Billings, 1874, Pal. Foss., vol. 2, p. 70, Up. Taconic.

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.


FIG. 715.—Straparollus hippolyta.

lens, Hall, 1860, (Euomphalus lens) 13th Rep. N. Y. Mus. Nat. Hist., p. 109, Kinderhook Gr.

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.

mopsus, 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, Ham. Gr.

sanctisabæ, Roemer, 1852, (Euomphalus sanctisabæ,) 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, subhemispherical, 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 Palæozoic 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, 1868, Geo. Sur. Ill., vol. 3, p. 404, Oriskany sandstone.

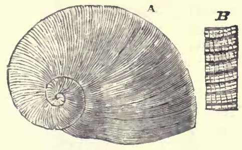


FIG. 716.—Strophostylus cancellatus. *B*, Surface markings enlarged.

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.

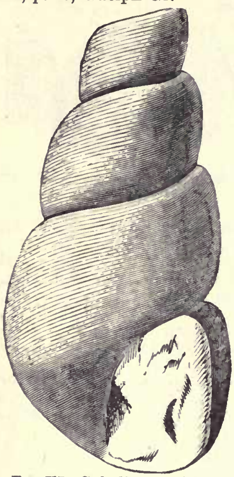


FIG. 717.—Subulites calciferus.

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.

terebriformis, 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.

meekanum, n. sp. Up. Held. Gr. at Marblehead, Ohio. Proposed instead of T. tricarinatum, 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. halii.
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 meekanum.

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.

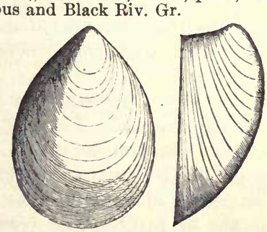


FIG. 720.—Tryblidium nycteis.

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 Platystoma shumardi.
tabulata, see Pleurotomaria tabulata.
tennesseensis, see Cyclonema tennesseense.
texanus, Shumard, 1859, Trans. St. Louis Acad. Sci., vol. 1, p. 400, Coal Meas.

Turbonilla, Leach, 1826, Risso Eur. Merid. 4. [Ety. diminutive of *Turbo*, a genus.] Not a Palæzoic genus.
swallovana, see Aclisina swallovana.

FIG. 722.—Turritella imbricata.

TURRITELLA, Lamarck, 1801, Syst. An. sans Vert., p. 89. Not a Palæozoic genus. Type T. imbricata.

schohariensis, Castelnau, 1843, Syst. Sil., p. 35. Not recognized.

stevensana, Meek & Worthen, 1866, Geo. Sur. Ill., vol. 2, p. 382, Up. Coal Meas.

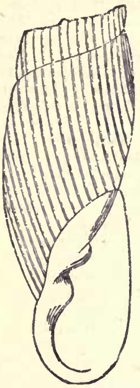


FIG. 723.—Zaptychius carbonarius.

Xenophora, Fischer, 1806, Museum Demidovianum, p. 213. Not an American Palæozoic genus.

antiqua, see Pseudophorus antiquus.

ZAPTYCHIUS, 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. Type Z. carbonarius.

carbonarius, Walcott, 1884, Monogr. U. S. Geo. Sur., vol. 8, p. 263, Subcarboniferous.

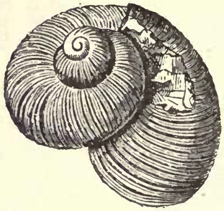


FIG. 724.—Zonites priscus.

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, Pteronautilus, 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, Systéme Silurien, p. 31. Not recognized.

beaumonti, Castelnau, 1843, Systéme Silurien, p. 32. Not recognized.

bigsbyi, Stokes, 1840, Trans. Geo. Soc., 2d series, vol. 5, p. 707, Chazy Gr.

blainvillei, Castelnau, 1843, Systéme Silurien, p. 31. Not recognized.

cordieri, Castelnau, 1843, Systéme Silurien, p. 31. Not recognized.

deshayesi, Castelnau, 1843, Systéme Silurien, p. 32. Not recognized.

dufresnoyi, Castelnau, 1843, Systéme 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., 2d series, vol. 5, p. 708, Black Riv. Gr.

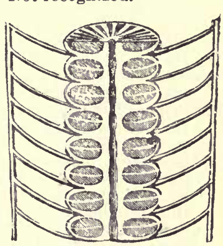


FIG. 725.—Actinoceras richardsoni.

simmsi, Stokes, 1840, Trans. Geo. 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.

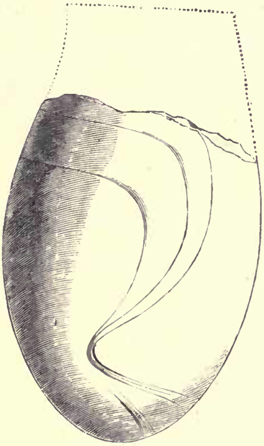


FIG. 726.—Ascoceras canadense.

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.

FIG. 727.—Colpoceras clarkii.

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.

Conilites, Schlotheim, 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.

Conulites, 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 preoccuppied 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. Dechen, 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.

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 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.

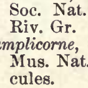


FIG. 728.—Cyrtoceras ashmanni. The two section views are natural size.

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.
boycii, 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.
brevicorne, 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.
constrictostriatum, Hall, 1847, Pal. N. Y., vol. 1, p. 195, Trenton Gr.
corniculum, Hall, 1862, Geo. Rep. Wis. The name was preoccupied by Barrande 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.
filosum, 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.

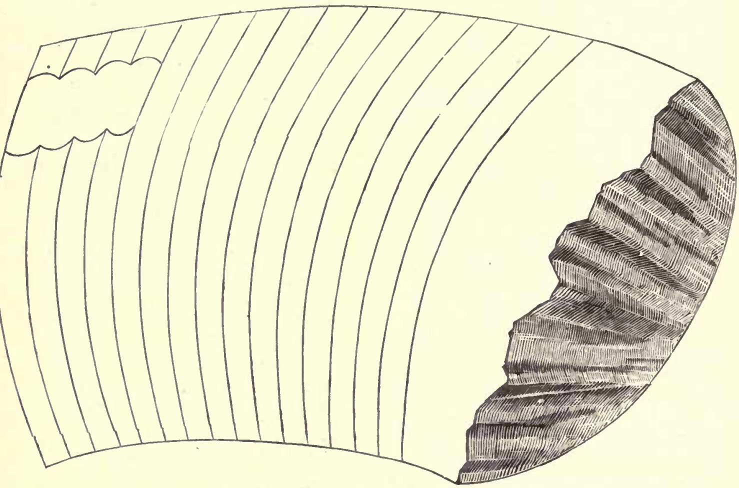


FIG. 729.—Cyrtoceras magister.

hector, Hall, 1879, Pal. N. Y., vol. 5, pt. 2, p. 364, Up. Chemung Gr.
hercules, Winchell & Marcy, 1865, (Lituites hercules,) Mem. 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.
irregulare, 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.
markœi, 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 Cyrtocerina 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.
opimum, 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.
subturbinatum, 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.
trivolvi, see Gyroceras trivolve.
typicum, see Cyrtocerina typica.
undulatum, Hall, 1876, see C. alternatum.
undulatum, Vanuxem, see Gyroceras undulatum.
unicorne, 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.

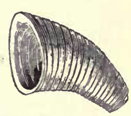


FIG. 730.—Cyrtoceras vallandighami.

vassarinum, Dwight, 1884, Am. Jour. Sci. and Arts., 3d ser., vol. 27, p. 254, Calciferous Gr.

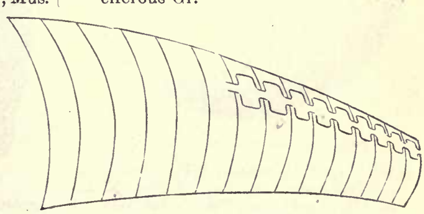


FIG. 731.—Cyrtoceras ventricosum.

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. Type C. typica.

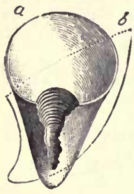


FIG. 732.—Cyrtocerina typica. *a*, Dorsal view, showing cavity of siphuncle; *b*, outline, side view.

mercurius, 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.] Foundedupon 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.

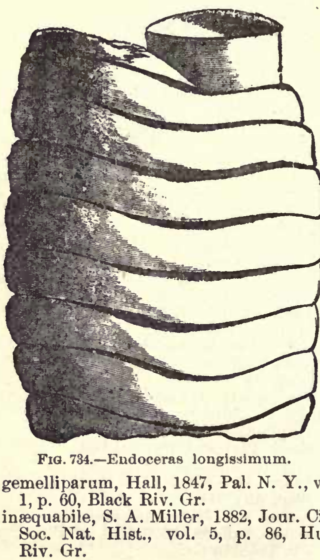


FIG. 734.—Endoceras longissimum.

gemelliparum, Hall, 1847, Pal. N. Y., vol. 1, p. 60, Black Riv. Gr.

inæquabile, 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*.
peramplus, see Temnochilus peramplum.
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 Y-shaped aperture. It is not known as an American genus.

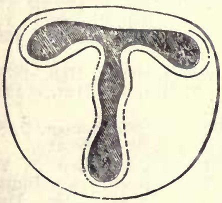


FIG. 735.—Aperture of Gomphoceras.

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.

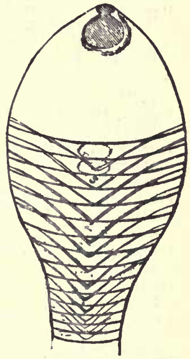


FIG. 736.—Gomphoceras pyriforme.

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.

gomphus, 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.
illænus, 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, Birdseye 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.
poculum, 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.
sciotoense, 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 Gonialites.] Discoid; whorls embracing, 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, 1885, 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.

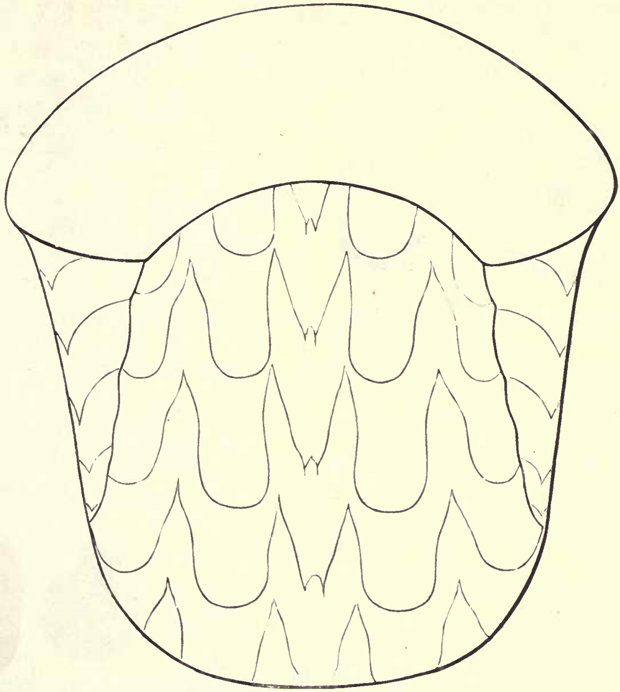


FIG. 738.—Goniatites globulosus.

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 preoccupied by Von Buch in 1838. See G. vanuxemi.

globulosus, Meek & Worthen, 1860, Proc. Acad. Nat. Sci. Phil., p. 471, and Geo. Sur. Ill., vol. 2, p. 390, Up. Coal Meas.

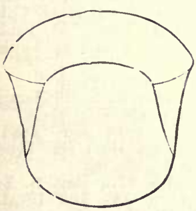


FIG. 739.—Goniatites globulosus. Outline.

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.

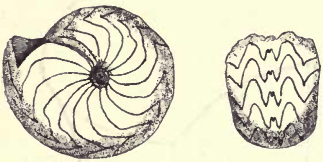


FIG. 740.—Goniatites kentuckiensis. The saddles are generally more angular than they appear in the figure.

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, Marhall 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.

pygmæus, 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. sp. Shell small, circular; outer volution embracing the inner ones; umbilicus does not expose any of the inner volutions; 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.

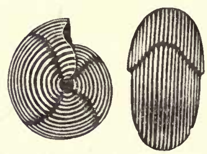


FIG. 741.—Goniatites subcircularis. Lateral and dorsal views magnified 2 diam.

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.

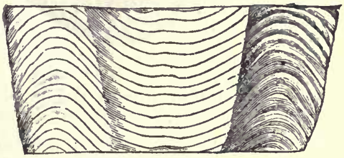


FIG. 742.—Gonioceras anceps.

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, DeKoninck, 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, Palæontographica, vol. 4. See Nautilus buccinum.
gracile, Hall, 1860, 13th Rep. N. Y. Mus. Nat. Hist., p. 105, Kinderkook 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 trivolvis,) 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, Schoharie grit.

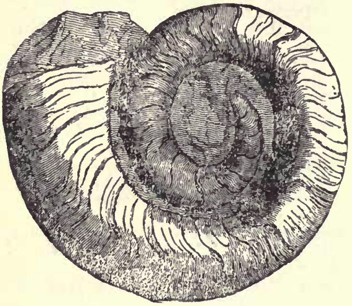


FIG. 743.—Gyroceras undulatum.

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.

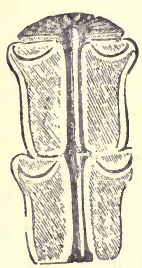


FIG. 744. — Huronia vertebralis.

portlocki, Stokes, 1840, Trans. Geo. Soc., 2d series, vol. 5, p. 710, Clinton Gr.
sphæroidalis, Stokes, 1840, Trans. Geo. Soc., 2d series, vol. 5, p. 710, Clinton Gr.
stokesi, Castelnau, 1843, Syst. Sil., p. 33, Schoharie 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.

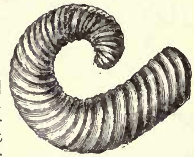


FIG. 745.—Lituites giganteus. Quarter size.

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.
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.
eatoni, Whitfield, 1886, Bull. Am. Mus. Nat. Hist., vol. 1, p. 331, Birdseye Gr.
eatoni var. cassinensis, Whitfield, 1886, Bull. Am. Mus. Nat. Hist., vol. 1, p. 332, Birdseye Gr.
farnsworthi, 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 & Marcy, 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.

ortoni, 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.

Melia cancellatus, Emmons, 1856, Am. Geol. Not defined so as to be recognized.

cincinnatiæ, 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. *Nautilos*, 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.

acræus, 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 coxanum.

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.

divisus, 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.

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.

ingentior, 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 latum.

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 Geo., vol. 4, p. 466, Chazy Gr. Type of Hyatt's genus Barrandoceras.

niotensis, see Temnochilus niotense.

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.

permianus, 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.

planovolvis, 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 Pteronautilus 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.
brevicurvatum, 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.
orcas, 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.

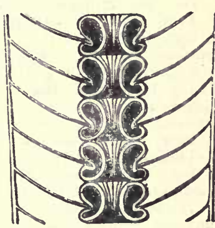


FIG. 749.—Ormoceras bayfieldi.

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.

ORTHOCERAS, Breynius, 1732, Dissertatio physica de Polythalamiis. [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, subcentral 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.

æquale, 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.
amplicameratum, Hall, 1847, Pal. N. Y., vol. 1, p. 205, Black Riv. and Trenton Grs.
amycus, 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.
antenor, Billings, 1859, Can. Nat. and Geo., vol. 4, p. 463, Chazy Gr.
anticostiense, 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. 198, 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.
atreus, 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.
autolycus, 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, Birdseye Gr.
brongniarti, Troost, 1838, (Conotubularia brongniarti,) 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.

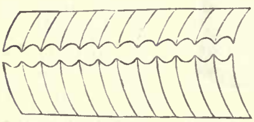


FIG. 750.—Orthoceras byrnesi.

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.
cælamen, Hall, 1879, Pal. N. Y., vol. 5, p. 298, Ham. Gr.
cameolare, 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 Huronia vertebralis for the reason that Huronia 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. choteauense,) 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.
clouei, 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.
dagon, Beecher, 1888, Pal. N. Y., vol. 7, p. 28, Up. Held. Gr.
darwini, Billings, 1868, Pal. Foss., vol. 1, p. 161, Guelph Gr.
dawsonanum, 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.
deparcum, 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.

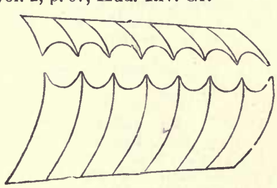


FIG. 751.—Orthoceras dyeri.

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.
eurekense, 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.
foxense, 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.
gracilium, 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.

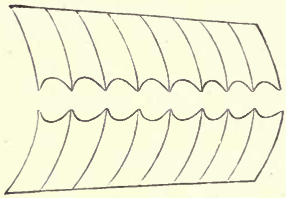


FIG. 752.—Orthoceras hallanum.

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.
harttanum, 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 Tripteroceras.
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.
herculaneum, Verneuil, 1846, Bull. de la Soc. Geol. de France, vol. 4, Low. Sil.
hercules, Castelnau, 1843, Syst. Sil., p. 29, Up. Sil. Not recognized.
heterocinctum, 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.
illinoisense, 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.

irregulare, 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.

kickapooense, 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.

læve, Hall, 1843, Geo. Rep. 4th Dist. N. Y. The name was preoccupied by Fleming in 1825. See O. sublæve.

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. Harttanum.

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.

magnisulcatum, 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.

meeki, 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.

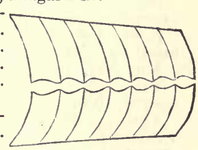


FIG. 753.—Orthoceras meeki.

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. multicinctum, 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.

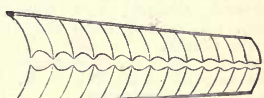


FIG. 574.—Orthoceras mohri.

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. swallovanum.

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.

niagarense, 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 Prog. 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. dawsonanum.

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.

piso, 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.
rectiannulatum, 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.
striælineatum, 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.
sublæve, 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.
swallovanum, 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.

tenere, 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.
thoas, 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.

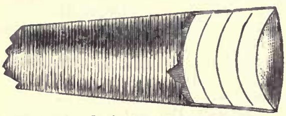


FIG. 755.—Orthoceras transversum.

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.
vertebrale, 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. cxiii, 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.

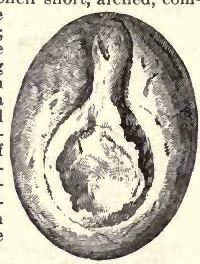


FIG. 756.—Phragmoceras hector. Cast of interior.

byronense, Worthen, 1875, 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.
præmaturum, Billings, 1866, Can. Nat. and Geo., vol. 5, p. 173, Black Riv. and Trenton Grs. Type of Hyatt's genus Mælnoceras.

FIG. 758. — Piloceras wortheni.

spinosum, 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.
Polycronites 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.

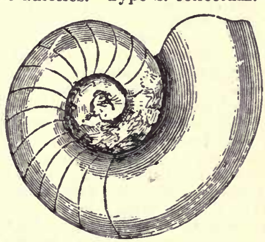


FIG. 759.—Solenochilus avonense.

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 leidyi,) 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.

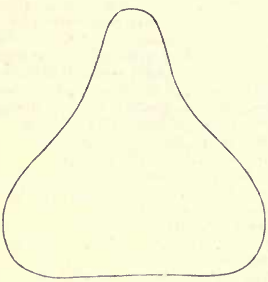


FIG. 760.—Aperture of Streptoceras janus.

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.

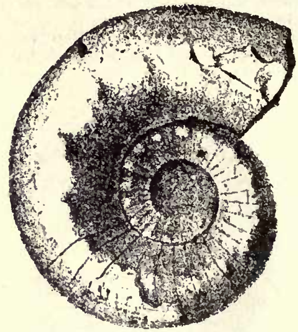


FIG. 761.—Temnochilus coxanum.

peramplum, Meek & Worthen, 1865, (Endolobus peramplus,) 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 Orthroceras 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 striæ; 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.

æneas, 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 Sphyradoceras.

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.

FIG. 763.—Trochoceras waldronense.

waldronense, Hall, 1876, 28th Rep. N. Y. Mus. Nat. Hist., p. 179, Niagara Gr.

TROCHOLITES, Conrad, 1838, Ann. Geo. Rep. N. Y., p. 119. [Ety. *trochos*, hoop; *lithos*, stone.] 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.

FIG. 764.—Trocholites 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.

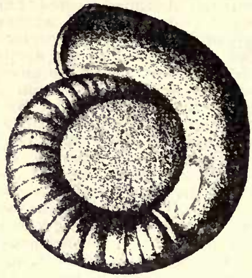


FIG. 765.—Trocholites circularis.

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 anterior 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, Amphicœliidæ, Anodontopsidæ, Arcidæ, Aviculidæ, Aviculopectenidæ, Cytherodontidæ, Modiomorphidæ, Mytilidæ, Nuculidæ, Nyassidæ, Orthonotidæ, 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 Amphicœliidæ.—Amphicœlia.

Family Anodontopsidæ.—Anodontopsis, Cycloconcha.

Family Arcidæ.—Carbonarca, Clinopistha, Macrodon, Megalomus, Ptychodesma.

Family Aviculidæ.—Actinodesma, Avicula, Aviculopinna, Bakevellia, 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, Cuneamya, Grammysia, Leptodomus, 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, Pyrenomœus, 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.—Pinna.

Family Prothyridæ.—Prothyris.

Family Pteriniidæ.—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,? Ischyrinia.?

Family Unionidæ.—Anthracosia, Prisconaia.

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.

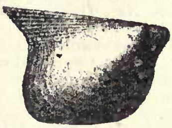


FIG. 766.—Actinopteria boydi. Right valve.

auriculata, Hall, 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.

FIG. 767.—Actinopteria boydi. Left valve.

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.

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 Sedgwickia 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, 1858, (Leptodomus granosus,) Trans. St. Louis Acad. Sci., vol. 1, p. 207, and Pal. E. Neb. p. 220, Coal Meas.

hannibalense, see Grammysia hannibalensis.

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.

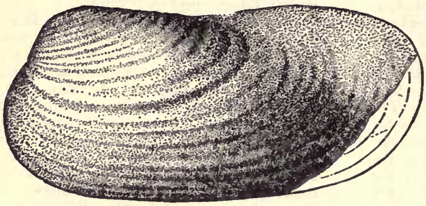


FIG. 768.—Allorisma subcuneatum.

marionense, White, 1876, Proc. Acad. Nat. Sci., p. 31, and Cont. to Pal., No. 8, p. 167, St. Louis Gr.

maxvillense, 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.

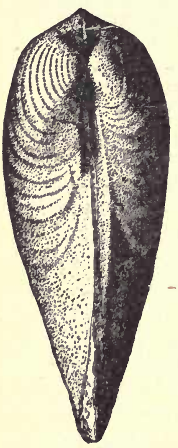


FIG. 769.—Allorisma subcuneatum.

subcuneatum, Meek & Hayden, 1858, Proc. Acad. Nat. Sci. Phil., p. 263, and Pal. E. Neb., p. 221, Coal Meas.

subelegans, Meek, 1872, Pal. E. Neb., p. 220, Coal Meas.

terminale, Hall, 1852, Stans. Ex. to Gt. Salt Lake, p. 413, Coal Meas.

ventricosum, Meek, 1871, Proc. Acad. Nat. Sci. Phil., p. 168, and Ohio Pal., vol. 2, p. 312, Waverly Gr.

winchelli, Meek, 1871, Proc. Acad. Nat. Sci. Phil., p. 167, and Ohio Pal., vol. 2, p. 311, Waverly Gr.

worthenanum, n.sp. Keokuk Gr. Proposed instead of A. elongatum in 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 posteriorly, 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.

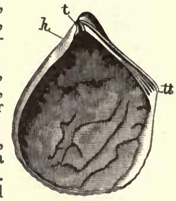


FIG. 770.—Ambonychia bellistriata. *h*, Byssal sinus; *t*, cardinal teeth; *tt*, lateral teeth.

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 Amphicœlia neglecta.

nitida, Billings, 1866, Catal. Sil. Foss. Antic., p. 50, Anticosti Gr.

obtusa, see Cypricardites obtusus.

orbicularis, Emmons, 1842, (Pterinea orbicularis,) Geo. Rep. N. Y., p. 397, and Pal. N. Y., vol. 1, p. 164, Trenton Gr.

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.

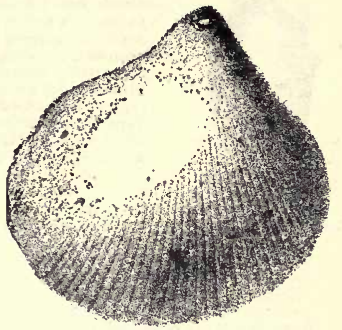


FIG. 773.—Amphicœlia costata.

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.

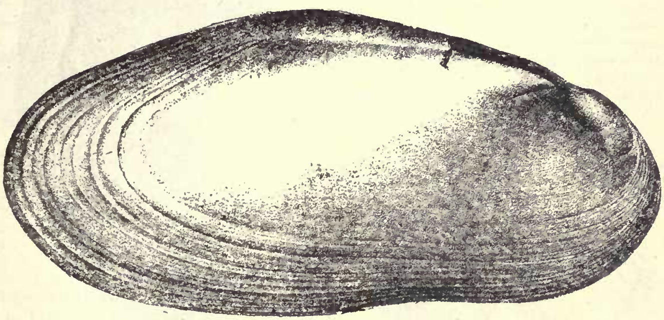


FIG. 772.—Amnigenia catskillensis.

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.

AMPHICŒLIA, Hall, 1868, 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 delafieldi, 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, winged posteriorly; concentrically lined. Type A. cuneatum.

FIG. 774.—Angellum cuneatum.

cuneatum, S. A. Miller, 1878, Jour. Cin. Soc. Nat. Hist. vol. 1, p. 106, Hud. Riv. Gr.

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-quadrate 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.

amygdaliformis, Walcott, 1885, Monogr. U. S. Geo. Sur., vol. 8, p. 180, Devonian.

concinna, Whiteaves, 1884, Pal. Foss., vol. 3, p. 12, Guelph Gr.

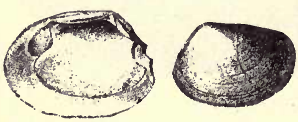


FIG. 775.—Anodontopsis milleri.

(?) 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, Gaspe 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

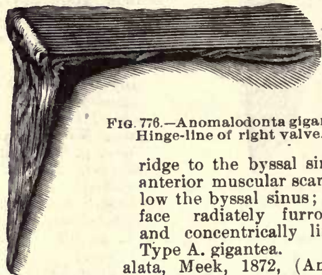


FIG. 776.—Anomalodonta gigantea. Hinge-line of right valve.

ridge to the byssal sinus; anterior muscular scar below the byssal sinus; surface radiately furrowed and concentrically lined. Type A. gigantea.

alata, Meek, 1872, (Ambonychia alata,) Proc. Acad. Nat. Sci. Phil., p. 319, and Ohio Pal., vol. 1, p. 131, Hud. Riv. Gr.

FIG. 777.—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.

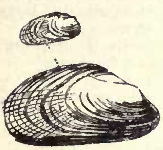


FIG. 779.—Anthracomya elongata.

lævis, Dawson, 1860, (Naiadites lævis,) Acadian Geology, p. 204, Coal Meas.

obtusa, Dawson, 1860, (Naiadites obtusus,) Acadian Geology, p. 205, Coal Meas.

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.

lævis, see Anthracomya lævis.

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.

FIG. 780.—Anthracosia bradorica.

carbonaria, Cox. See Macrodon 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, Schlotheim, as identified by Geinitz, is Macrodon 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 Euthydesma 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.

æsopus, 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.
damnoniensis, 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. und 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.
protexta, see Leptodesma protextum.
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.
schohariæ, 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, see 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.
triplistriata, 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.
crassicostatus, 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.
eurekensis, 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.

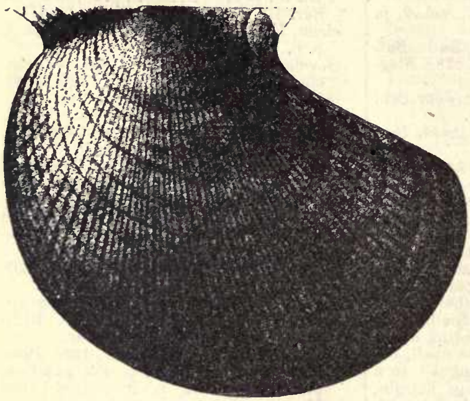


FIG. 782.—Aviculopecten princeps.

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.
occidaneus, 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.

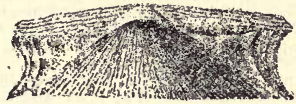


FIG. 783.—Aviculopecten princeps. Cardinal part showing ligamental area.

princeps, Conrad, 1838, (Monotis princeps,) Ann. Rep. N. Y., p. 117, and Pal. N. Y., vol. 5, pt. 1, p. 1, Ham. Gr.

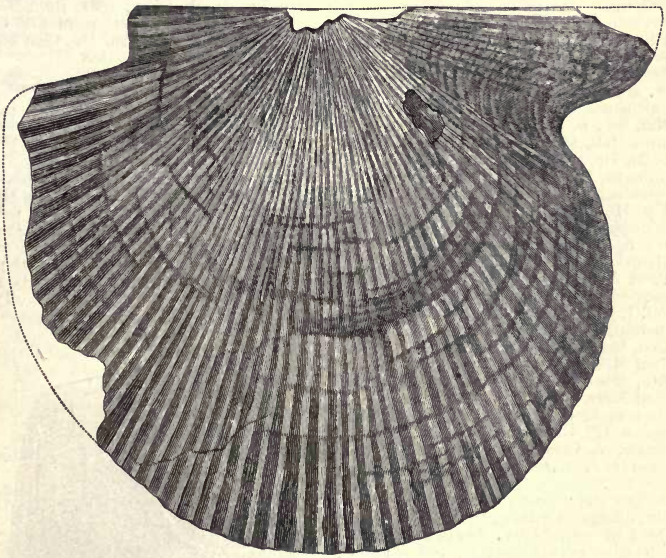


FIG. 784.—Aviculopecten varsoviensis.

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.

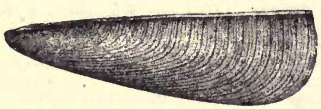


FIG. 785.—Aviculopinna americana.

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 striæ; 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.

FIG. 786. Bakevellia parva.

(?) 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.

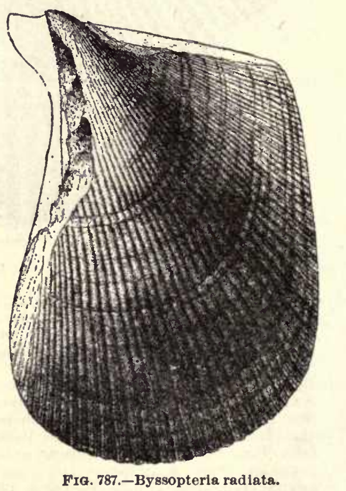


FIG. 787.—Byssopteria radiata.

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.
antigonesensis, Dawson, 1868, Acad. Geo., 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.

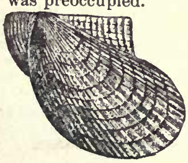


FIG. 789.—Cardiola interrupta.

CARDIOLA, Broderip, 1844, Trans. Geo. Soc. [Ety. *kardia*, the heart.] Obliquely oval or subcircular, tumid, equivalve, inequilateral; 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.
equilatera, see Panenka equilatera.
dichotoma, see Panenka dichotoma.
doris, see Paracardium doris.
elevata, see Panenka ventricosa.
erecta, see Pararca erecta.
filicostata, 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, Haughton, 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. Louia 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.
iowensis, see Cypricardites iowensis.
lexingtonensis, Swallow, 1858, Trans. St. Louis Acad. Sci., vol. 1, p. 207, Mid. Coal Meas.
nautiloides, 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. *chaino*, to gape; *kardia*, the heart.] Ovate, ventricose, gaping anteriorly, edge truncated, hinge-line short, beaks small, incurved; surface concentrically marked. Type C. ovata.

FIG. 791.—Chænocardia 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. *chaino*, 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 granulose 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 maria. 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.

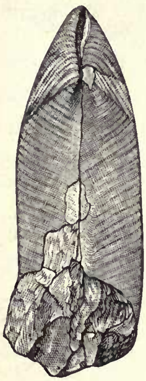


FIG. 793.—Chænomya maria. Dorsal view.

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 depression 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 proccupied.

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.

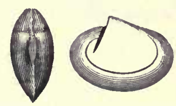


FIG. 795.—Clidophorus faberi. Mag. 5 diam.

fabula, Hall, 1845, (Nucula fabula,) Am. Jour. Sci. and Arts, vol. 48, p. 295, and Ohio Pal., vol. 1, p. 138, Hud. Riv. Gr.

FIG. 796.—Clidophorus fabula. Right side and dorsal view of a cast magnified 10 diameters.

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.

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.

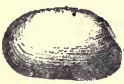


Fig. 797.—Clinopistha antiqua.

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.


Fig. 798.—Clinopistha radiatia.

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.

niagarense, 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.

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.

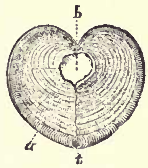


FIG. 800. — Conocardium subtrigonale. *b*, Broken end; *t*, opening; *a*, connection of the alations.

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.

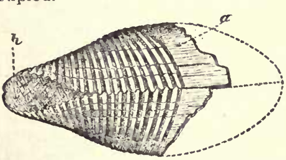


FIG. 801.—Conocardium subtrigonale. *a*, Shows part of the alation; *h*, points to the posterior hiatus.

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.

CRENIPECTEN, 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.

FIG. 802.—Crenipecten crenulatus.

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. 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 sulcatinus.

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; 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-

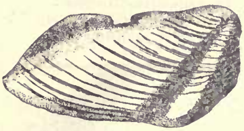


FIG. 805.—Cuneamya coriformis. Right valve, below medium size.

tinct 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. 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. 806.—Cuneamya coriformis. Anterior view, showing lunule.

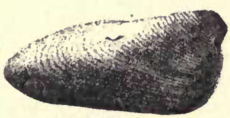


FIG. 807.—Cuneamya miamiensis. Right valve.

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.—Cuneamya 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, subcircular, concentrically lined; cardinal teeth near the middle, with a long lateral tooth on each side. Type C. mediocardinalis.

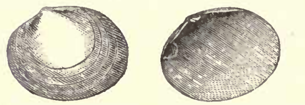


FIG. 809.—Cycloconcha mediocardinalis.

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 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.

FIG. 810.—Cypricardella bellistriata.

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, Lamarck, 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.


FIG. 811.—Cypricardia obesa.

indianensis, see Cypricardinia indianensis.
insecta, Dawson, 1868, Acad. Geol., p. 303, Carboniferous.
leidyi, Lea, see Leaia, leidyi.
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 preoccupied. 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, 1883, 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.

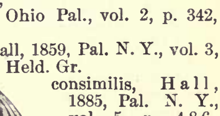


FIG. 812.—Cypricardinia distincta. Left valve, long specimen.

carbonaria, Meek, 1871, 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.

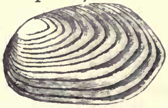


FIG. 813.—Cypricardinia distincta. Left valve, short specimen.

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, Billings, 1874, Pal. Foss., vol. 2, p. 56, Gaspe limestone, No. 8, Devonian.

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. subæquivalvis, 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 sulciferus,) 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.

acutumbonus, 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 breviuscula,) 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, (Cyrotodonta 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.

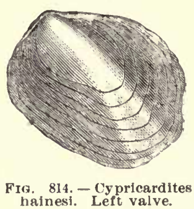


FIG. 814. — Cypricardites hainesi. Left valve.

huronensis, Billings, 1858, (Cyrtodonta huronensis,) Can. Nat. and Geo., vol. 3, p. 432, Black Riv. and Trenton Grs.
indentus, see Cypricardinia indenta.

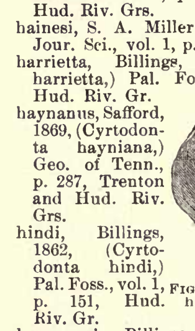


FIG. 815. — Cypricardites hainesi. Interior of left valve, two teeth injured at *t*.

inflatus, Conrad, 1842, Jour. Acad. Nat. Sci., vol. 8, p. 246, syn. for Cypricardinia 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.

iowensis, 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 marcellense.
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, Trenton Gr.
obliquus, Meek & Worthen, 1868, Geo. Sur. Ill., vol. 3, p. 311, Galena Gr.
oblongus, Conrad, syn. for Modiomorpha concentrica.
obsoletus, Hall, 1843, (Cypricardia obsoleta,) Geo. Rep. 4th Dist. N. Y., pl. 8, fig. 3, Clinton Gr.
obtusus, Hall, 1847, (Ambonychia obtusa,) Pal. N. Y., vol. 1, p. 167, Black Riv. and Trenton Gr.
ovata, syn. for Modiolopsis modiolaris.
plebeius, Billings, 1866, (Cyrtodonta plebeia,) 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 rugosa,) 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 spinifera,) 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 subangulata,) 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 ungulata,) Catal. Sil. Foss. Antic., p. 15, Hud. Riv. Gr.
ventricosus, Hall, 1847, (Edmondia ventricosa,) Pal. N. Y., vol. 1, p. 155, Trenton Gr.
ventricosus, Hall, 1859, (Palæarca ventricosa,) Pal. N. Y., vol. 3. This name was preoccupied. See Cypricardites islandicus.
vetustus, Hall, 1847, (Cardiomorpha vetusta,) Pal. N. Y., vol. 1, p. 154, Trenton Gr.
winchelli, Safford, 1869, (Cyrtodonta winchelli,) Geo. Tenn., p. 287, Trenton and Hud. Riv. Grs.

Cyrtodonta, syn. for Cypricardites.
acutumbona, see Cypricardites acutumbonus.
anticostiensis, see C. anticostiensis.
breviuscula, see C. breviusculus.
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; *odous*, 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 crenulations 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.

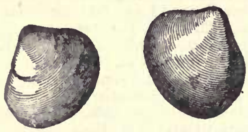


FIG. 816.—Cytherodon rhombeus.

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.—Dexiobia 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; beak incurved forward; left valve less inflated; hinge-line having a thickened cartilage plate, bearing a linear posterior groove. Type D. ovata.

halli, Winchell, 1863, Proc. Acad. Nat. Sci., p. 11, Marshall Gr.
ovata, Hall, 1858, (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.

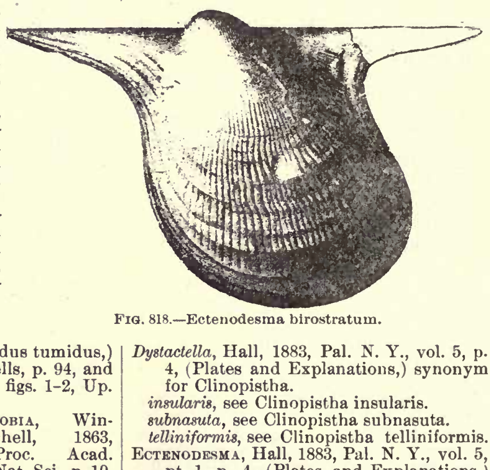


FIG. 818.—Ectenodesma birostratum.

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.

æquimarginalis, Winchell, 1862, (Cardinia æquimarginalis,) Proc. Acad. Nat. Sci., p. 413, Marshall Gr.

anomala, Dawson, 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.

FIG. 820. — Edmondia aspenwallensis. Cardinal view.

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.

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, Choteau 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 Palæozoic 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.

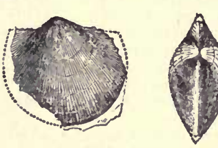


FIG. 821.—Eopteria richardsoni.

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, inequilateral, 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.

FIG. 822.—Euchondria neglecta. Right valve enlarged two diameters.

neglecta, Geinitz, 1866, (Pecten neglectus,) Carb. und Dyas in Neb., p. p. 33, and Geo. Sur. Ill., vol. 5, p. 589, Coal Meas.

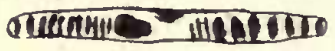


FIG. 823.—Euchondria neglecta. Hinge-line enlarged.

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 cardinal expansion; cardinal line straight; anterior end short; surface concentrically lined; hinge-line marked by a continuous ligamental groove. Type E. subtextile.

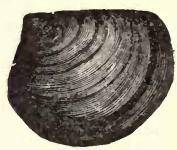


FIG. 824.—Euthydesma subtextile.

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.

FORDILLA, Barrande, 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.

FIG. 825.—Fordilla troyensis.

troyensis, Barrande, 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 striæ; 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.

FIG. 827. Glyptodesma erectum.

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.

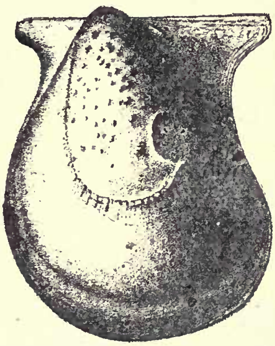


FIG. 828.—Glytodesma erectum. Mold of left valve, showing pallial line, muscular scar, tubercles in the interpallial area representing points of muscular attachment.

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.

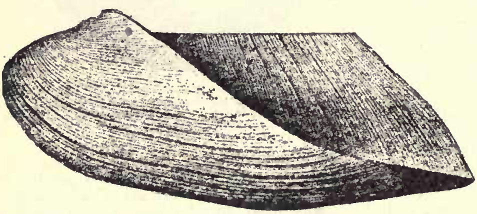


FIG. 829.—Goniophora chemungensis.

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, subalate posteriorly; ligamental area wide, longitudinally striate; cardinal teeth below the beak strong; lateral teeth elongate; surface with concentric striæ.

retusa, Hall, 1883, Pal. N. Y., vol. 5, pt. 1, p. 266, Ham. Gr.

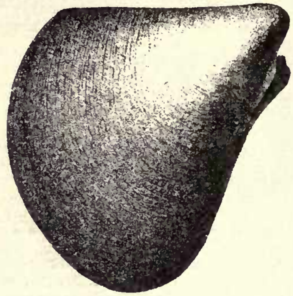


FIG. 830.—Gosselettia triquetra. Right valve.

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, Gaspe 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.

hannibalensis, Shumard, 1855, (Allorisma hannibalense,) Geo. Sur. Mo., p. 206, Choteau and Kinderhook Grs.
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.

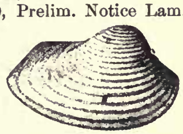


FIG. 832.—Grammysia hannibalensis. Right side view.

minor, Walcott, 1885, Monogr. U. S. Geo. Sur., vol. 8, p. 174, Up. Devonian.
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.
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., 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; subovate 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.

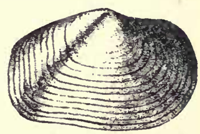


FIG. 833.—Ilionia galtensis.

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.—Ischyrinia 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, Choteau 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 brevirostris.
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. dekayi.
bigsbyi, 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 dekayi. Cast showing vertical plate anterior to the beaks.

dekayi, 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.
lævis, Hall, 1843, (Avicula lævis,) 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.
savi, Hall, 1884, Pal. N. Y., vol. 5, pt. 1, p. 162, Ham. Gr.

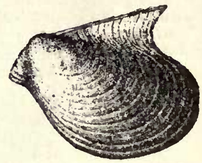


FIG. 836.—Liopteria rafinesquii.

torreyi, Hall, 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.
agassizi, 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.

liopteroides, Simpson, 1889, Dict. of Pa. Foss., p. 331, Chemung Gr.
lepidum, Hall, 1884, Pal. N.Y., vol. 5, pt. 1, p. 195, Chemung Gr.
lesleyi, Hall, 1884, Pal. N. Y., vol. 5, pt. 1, p. 223, Up. Chemung Gr.
lichas, Hall, 1884, Pal. N. Y., vol. 5, pt. 1, p. 232, Chemung Gr.

FIG. 838.—Leptodesma hector.

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.
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. 198, 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.

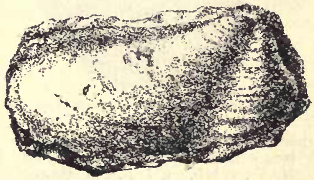


FIG. 839.—Leptodomus canadensis.

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.
pembrokensis, 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.
rugœstriata, 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; interpallial 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, 1838, (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, Bruguiere, 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, pl. 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.

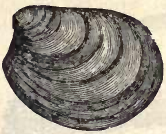


Fig. 842.—Lunulicardium marcellense.

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 fascicululatus,) 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.

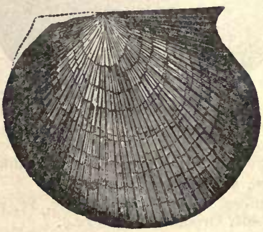


Fig. 843.—Lyriopecten orbiculatus.

macrodontus, 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. *macros*, 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.

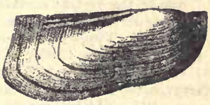


Fig. 845.—Macrodon obsoletus.

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.

hamiltoniæ, 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.

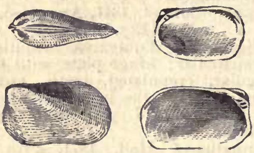


FIG. 846.—Matheria tener.

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.

tenuistriatus, 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 striæ. Type M. suborbicularis.

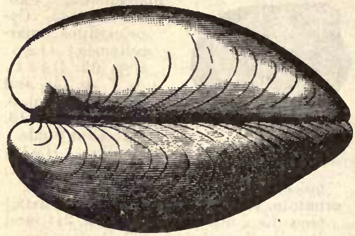


FIG. 847.—Megalomus canadensis.

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.

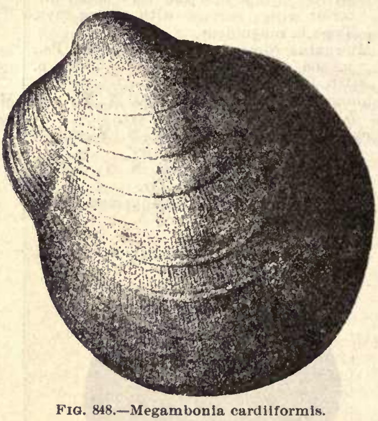


FIG. 848.—Megambonia cardiiformis.

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.
occidualis, 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.
subcardiformis, Hall, syn. for M. cardiiformis.
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 Cyricardella tenuistriata.


FIG. 849. — Modiella pygmæa.

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 striæ. Tppe 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.

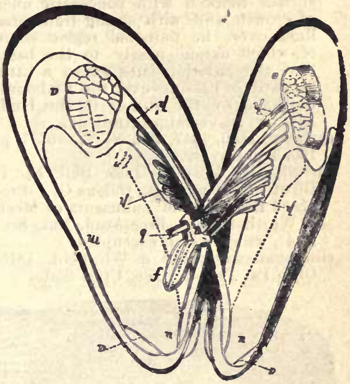


FIG. 850.—Modiola modiolus. *aa*, Anterior adductors; *a'a'*, posterior adductors; *uu*, *p'p'*, pedal muscles; *pp*, byssal muscles; *f*, foot; *b*, byssus; *m*, pallial line.

nevadensis, Walcott, 1885, Monogr. U. S. Geo. Sur., vol. 8, p. 239, Subcarboniferous.
obtusa, see Modiolopsis 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 Anthracomya.

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.
aviculoides, 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.

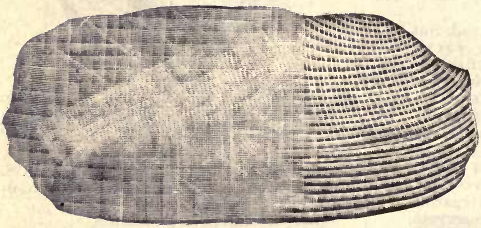


FIG. 851.—Modiolopsis capax.

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.

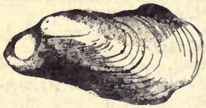


FIG. 852.—Modiolopsis faberi. Left valve.

faberi, n. sp. Shell elongate, nearly twice as long as high; below the average size of species in this genus; broadest behind 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.—Modiolopsis 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.

modioliformis, 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.

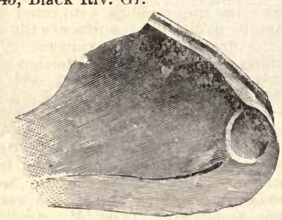


FIG. 854.—Modiolopsis modiolaris. Hinge and pallial line and muscular impression.

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.

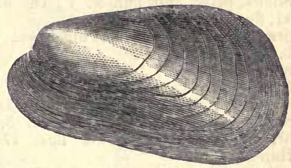


FIG. 855.—Modiolopsis versaillesensis. Left valve.

versaillesensis, S. A. Miller, 1874, Cin. Quar. Jour. Sci., p. 150, Hud. Riv. Gr.

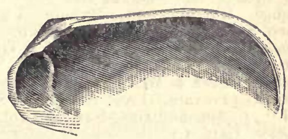


FIG. 856.—Modiolopsis versaillesensis. Hinge-line and muscular impression.

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.

FIG. 857.—Modiomorpha concentrica.

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.

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.] Aviculoid, obliquely produced, angular posteriorly, 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.

FIG. 858.—Monopteria gibbosa.

marian, White, 1874, Rep. Invert. Foss., p. 22, and Geo. Sur. W. 100th Mer., vol. 4, p. 151, Carboniferous.

MONOTIS, Bronn, 1824, System Urweltlicher Konchylien. [Ety. *monos*, one; *ous*, *otos*, ear.] Obliquely oval, compressed, radiated; anterior side short, rounded; posterior slighty eared. Type M. salinaria.

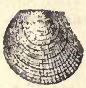


FIG. 859.—Monotis gregaria.

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.
halli, 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 *Pteria;* shell structure prismatic. Type M. lamellosa.

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.

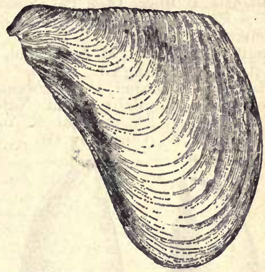


FIG. 860.—Myalina recurvirostris.

stludovici, Worthen, 1873, Geo. Sur. Ill., vol. 5, p. 540, St. Louis Gr.
swallovi, McChesney, 1860, New Pal. Foss., p. 57, and Geo. Sur. Ill., vol. 2, p. 341, Coal Meas.

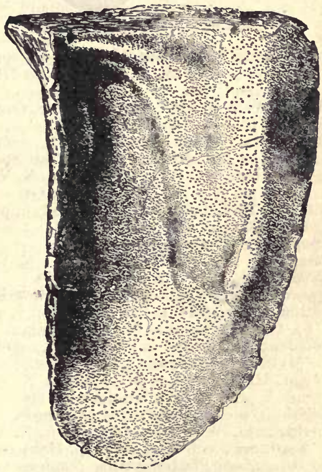


FIG. 861.—Myalina subquadrata.

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 striæ. 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, Gaspe 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.

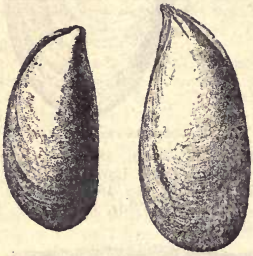


FIG. 862.—Mytilarca chemungensis.

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, Gaspe 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.

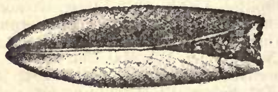


FIG. 864.—Mytilops præcedens.

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.
concavus, see Myalina concava.
fibristriatus, see Mytilarca fibristriata.
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 cobboldiæ.

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. 128, 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.
kazanensis, 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.
machæriformis, see Tellinomya machæriformis.
mactriformis, see Tellinomya mactriformis.
mercerensis, 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.
niotica, 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. 28, Ham. Gr.
umbonata, Hall, 1883, Pal. N. Y., vol. 5, pl. 47, figs. 51 and 52, Chemung Gr.

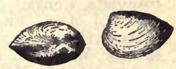


FIG. 866.—Nucula ventricosa.

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,) Stansb. 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.

ohioensis, 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; postumbonal 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.

faba, see Modiolopsis faba.

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 Palæoneilo maxima.

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.

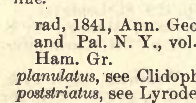


FIG. 870.—Nuculites oblongatus. Cast of interior of right valve, showing muscular scars and pallial line.

oblongus, 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 Lyrodesma poststriatum.

radiatus, see Pholadella radiata.

rostellatus, see Nuculana rostellata.

scitula, syn. for Clidophorus planulatus.

subemarginatus, see Tellinopsis, subemarginata.

sulcatinus, 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 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.

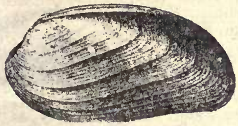


FIG. 871.—Nyassa arguta. Left valve.

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.

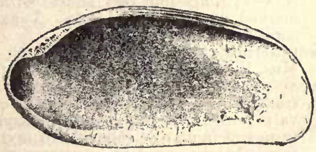


FIG. 872.—Nyassa arguta. Interior of right valve.

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. [Ety. *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.

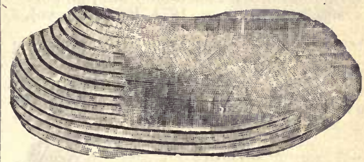


FIG. 873.—Orthodesma faberi.

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.

parallelum, 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. [Ety. *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 parallelum.

parvula, Hall, 1870, Prelim. Notice Lam. Shells, p. 88, and Pal. N. Y., vol. 5, pl. 78, figs. 29–32, Ham. Gr.

phaselia, 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 Palæosolen 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.

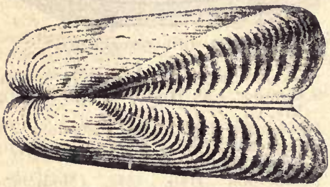


FIG. 875.—Orthonota undulata.

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, Linnæus, 1758, Syst. Nat. 10th ed., p. 696. [Ety. *ostrea*, an oyster.] Inequivalve, irregular in shape, with a single adductor muscle. Not a Palæozoic 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.

PALÆANATINA, Hall, 1870, Prelim. Notice Lam. Shells, p. 84. [Ety. *palaios*, 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, Prelim. Notice Lam. Shells, p. 85, and Pal. N. Y., vol. 5, pl. 79, figs. 26–39, Chemung Gr.

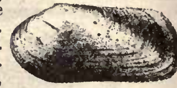


FIG. 877.—Palæanatina typus.

Palæarca, syn. for Cypricardites.

saffordi, see Cypricardites saffordi.

ventricosa, see Cypricardites ventricosus.

PALÆOCARDIA, Hall, 1867, 20th Rep. N. Y. Mus. Nat. Hist., p. 389. [Ety. *palaios*, ancient; *kardia*, a heart.] Cordiform, obliquely subovate, ventricose; umbones gibbous; beaks prominent incurved; hinge-line very short; surface marked with radiating striæ. Type P. cordiformis.

cordiformis, Hall, 1867, 20th Rep. N. Y. Mus. Nat. Hist., p. 389, Niagara Gr.

PALÆOCONCHA, n. gen. [Ety. *palaios*, 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 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.

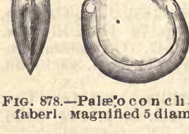


FIG. 878.—Palæoconcha faberi. Magnified 5 diam.

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. *palaios*, 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.

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.

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.

FIG. 880. — Palæoneilo bedfordensis. Magnified.

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,) Jour. Acad. Nat. Sci., vol. 8, p. 249, and Pal. N. Y., vol. 5, pl. 48, figs. 1–15, Chemung Gr.

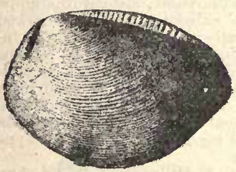


FIG. 881.—Palæoneilo constricta. Left valve enlarged, showing crenulations of hinge-line.

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.

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.

FIG. 882.—Palæoneilo maxima. Right valve.

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. 883.—Palæopinna flabellum.

[Ety. *palaios*, 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.

FIG. 884.—Panenka speciosa.

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.
præcedens, 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.

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.

FIG. 886.–Paracyclas ohioensis.

ohioensis, Meek, 1871, Proc. Acad. Nat. Sci. Phil., p. 62, and Ohio Pal., vol. 1, p. 248, Cornif. Gr.
peroccidens, Hall & 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, 1885, 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.

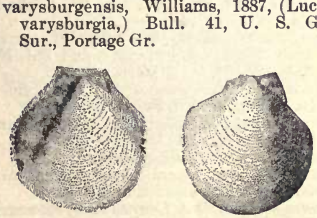


FIG. 887.—Pernopecten aviculatus.

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.
dolabriformis, see Aviculopecten dolabriformis.
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.

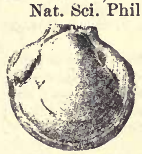


FIG. 889.—Pernopecten limiformis.

aviculatus, Swallow 1858, (Pecten aviculus,) Trans. St. Louis Acad. Sci., p. 213, and Geo. Sur. Ill., vol. 5, p. 588, Coal Meas
cooperensis, Shumard, 1885, (Avicula cooperensis,) Geo. Rep. Mo., p. 206, Waverly or Choteau Gr.
fasciculatus, see Lyriopecten fasciatus.
limiformis, White & Whitfield, 1862, (Aviculopecten limaformis,) Proc. Bost. Soc. Nat. Hist., vol. 8, p. 295, Marshall Gr.

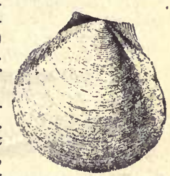


FIG. 890.—Pernopecten shumardanus.

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.

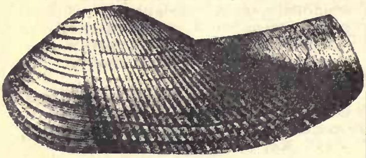


FIG. 891.—Pholadella newberryi.

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 equivalve; 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. 236, Subcarbonirerous.

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.

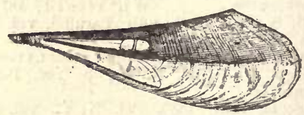


FIG. 893.—Pinna squamosa.

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.—Placunopsis 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.

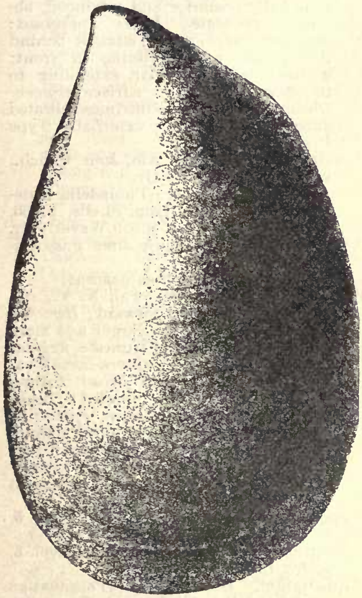


FIG. 895.—Plethomytilus ponderosus.

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.

FIG. 896.—Pleurophorus costatiformis.

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.

Pleurorhynchus, 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 Paracyclas lirata.
moorei, see Posidonomya moorii.
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.


FIG. 897.—Posidonomya becheri.

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.


FIG. 898. Posidonomya fracta.

moorii, 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 small area carries a series of vertical nearly parallel teeth.


FIG. 899. Præcardium vetustum.

vetustum, Hall, 1843, (Cardium vetustum,) Geo. Rep. 4th Dist. N. Y., p. 245, and Pal. N. Y., vol. 5, p. 427, Portage Gr.

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.
cuneatus, 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; *rhynchos*, 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.

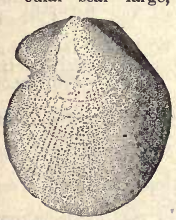


FIG. 901.—Pseudomonotis hawni.

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.

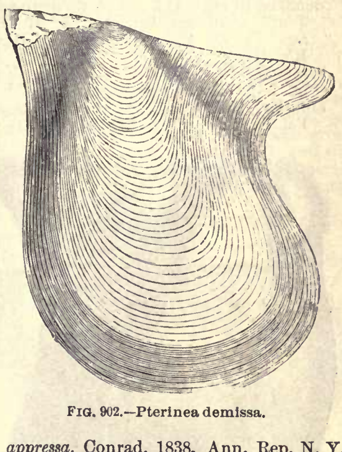


FIG. 902.—Pterinea demissa.

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.

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.

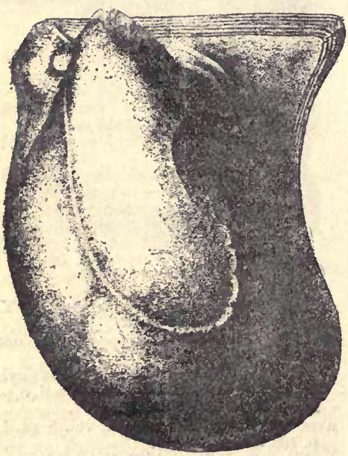


FIG. 903.—Pterinea flabellum.

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.
interstrialis, Hall, 1884, Pal. N. Y., vol. 5, pt. 1, p. 96, Chemung Gr.
modiolaris, see Modiolopsis modiolaris.
morganensis, see Avicula morganensis.
mucronata, Ulrich, 1879, Jour. Cin. Soc. Nat. Hist., vol. 2, p. 24, Hud. Riv. Gr.
neglecta, McChesney, 1861, New Palæozoic 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 Cypricardinia planulata.
prolifica, 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.
pygmæa, see Modiella pygmæa.
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.
striæcosta, McChesney, 1861, (Ambonychia striæcosta,) 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 Gosselettia 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.

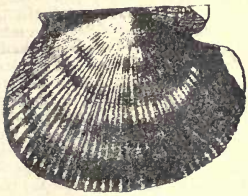


FIG. 904.—Pterinopecten undosus.

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.
dispandus, 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.

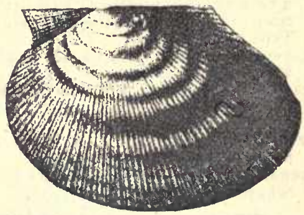


FIG. 905.—Pterinopecten undosus.

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, obtusely 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.

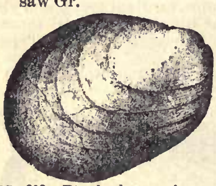


FIG. 908.—Ptychodesma knappanum. Right side.

PTYCHODESMA, Hall & Whitfield, 1872, 24th Rep. N. Y. Mus. Nat. Hist., p. 192. [Ety. *ptychos*, a folding; *desma*, a ligament, or band.] Form modioloid; hinge having a wide ligamental area, grooved by the successive growth of the ligament, as in pectunculus. Type P. knappanum.

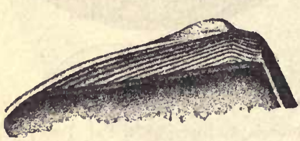


FIG. 909.—Ptychodesma knappanum. Enlargement of one side of ligamental area.

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.

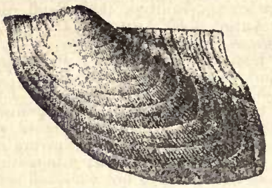


FIG. 910.—Ptychopteria beecheri.

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.

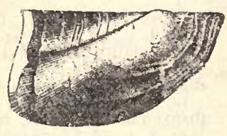


FIG. 911.—Ptychopteria beecheri.

elongata, Hall, 1884, Pal. N. Y., vol. 5, pt. 1, p. 141, Chemung Gr.

eucrate, Hall, 1884, Pal. N. Y., vol. 5, pt. 1, 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. Geo. Sur., 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.

FIG. 912.—Pyanomya faberi. Right valve and dorsal view.

gibbosa, S. A. Miller, 1881, Jour. Cin. Soc. Nat. Hist., vol. 4, p. 318, Hud. Riv. Gr.

FIG. 913.—Pyanomya gibbosa. Left valve and dorsal view.

PYRENOMŒUS, 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 $\frac{2}{2}$ small; siphonal inflection deep, connected with the pallial line; ligament external, on very prominent fulcra. Type S. sanguinolentus. Typical species S. diphos. Not American Palæozoic. Species left under this name for want of material to determine generic relations.

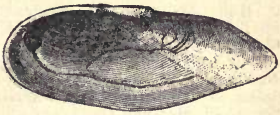


FIG. 914.—Sanguinolaria diphos.

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.

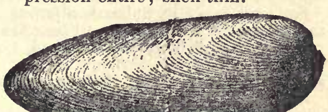


FIG. 915.—Sanguinolites obliquus.

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 Choteau 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.
naiadiformis, 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, (Cypricardia 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 Cypricardinia sulcifera.
tethys, Billings, 1874, Pal. Foss., vol. 2, p. 50, Gaspe 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; *odous*, a tooth.] Shell oval or subtrigonal; 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.

FIG. 916.—Schizodus medinensis.

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.

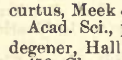


FIG. 917.—Hinge of Schizodus truncatus.

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.

mooresi, n. sp. Shell very large, subrhomboidal, height and length subequal; 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.

nauvooensis, 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.

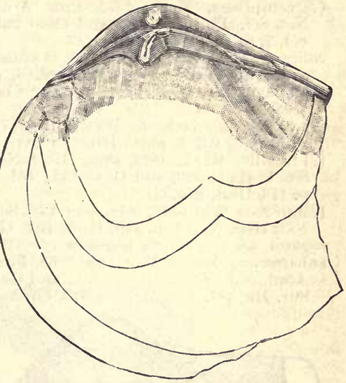


FIG. 919.—Schizodus mooresi. Interior of right valve, showing pallial line and place of subcordate muscular impression and hinge-teeth.

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, (Allorisma (?) 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 Cuneamya neglecta.

subarcuata, Meek & Worthen, 1865, Proc. Acad. Nat. Sci. Phil., p. 251, and Geo. Sur. Ill., vol. 3, p. 537, Keokuk Gr.

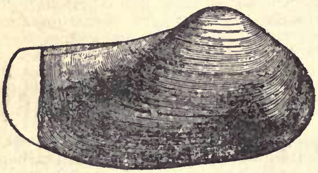


FIG. 920.—Sedgwickia topekensis.

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, 1828, 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, oblong, 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.

FIG. 922.—Solenomya vetusta.

vetusta, Meek, 1871, Proc. Acad. Nat. Sci. Phil., p. 66, and Ohio Pal., vol. 1, d. 206, Up. Held. Gr.

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.

FIG. 923.—Solenopsis solenoides.

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.

SPATHELLA, Hall, 1885, Pal. N. Y., vol. 5, p. 33. [Ety. *spathe*, a spathe; *ellus*, diminutive.] Equivalve, very inequilateral, wider behind, transversely subcylindrical; anterior end short, narrowly rounded; beaks subanterior, small; umbonal slope rounded or subangular; surface concentrically lined. Type S. typica.

typica, Hall, 1885, Pal. N. Y., vol. 5, p. 407, Chemung Gr.

ventricosa, 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.—Sphenolium faberi. Left valve.

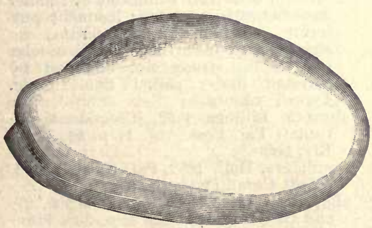


FIG. 925.—Sphenolium richmondense.

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 from one form 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.

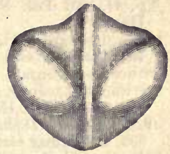


FIG. 926.—Sphenolium richmondense. Anterior view.

SPHENOTUS, Hall, 1885, Pal. N. Y., vol. 5, p. 33. [Ety. *sphen*, wedge; *ous*, ear.] 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.


FIG. 927.—Sphenotus æolus.

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 arcæformis,) 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.

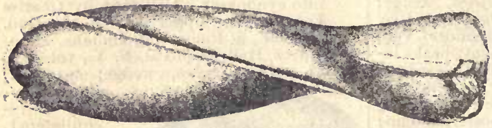


FIG. 928—Spirodomus insignis.

SPIRODOMUS, Beecher, 1886, 39th Rep. N. Y. Mus. Nat. Hist. [Ety. *speira*, 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. *techne*, art; *phoros*, bearing.] Shell small, equivalve, 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, equivalve, 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 astartæformis,) 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.

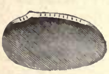


FIG. 931.—Tellinomya hilli.

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.
machæriformis, Hall, 1843, (Nucula machæriformis,) Geo. Rep. 4th Dist. N.Y., p.76, and Pal. N. Y., vol. 2, p. 85, Clinton Gr.
mactriformis, Hall, 1843, (Nucula mactræformis,) 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.

FIG. 932.—Tellinomyra nasuta.

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.

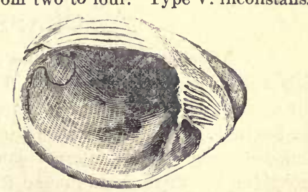


FIG. 934.—Vanuxemia bayfieldi. Interior of left valve, showing the striated teeth.

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.

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.

YOLDIA, 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 laminæ 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. rushensis.

knoxensis, McChesney, 1865, (Leda knoxensis,) Expl. Pal. Foss., pl. 2, Coal Meas.

FIG. 935.—Yoldia myalis.

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.

rushensis, McChesney, 1865, (Leda rushensis,) 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.

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, Oenonites, 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 appearance 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, Schlotheim, 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.

FIG. 938. Cornulites distans.

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; *odous* 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. *drepane*, sickle; *odous* 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.

chiromorphus, 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 Oenonites major.

nanus, 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. Lon., 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.

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.

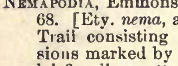


FIG. 939 — Nereidavus varians. Magnified 8 diam.

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.

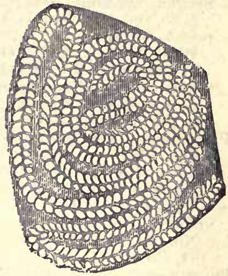


FIG. 940.—Nereites deweyi.

lanceolatus, 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. Geo. 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 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. *prionion*, 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.

FIG. 941.—Protoscolex ornatus.

SALTERELLA, Billings, 1861, Pal. Foss., vol. 1, p. 17. [Ety. proper name.] Small, slender, elongate, conical tubes, consisting of several hollow cones placed one within another, the last one forming the chamber of habitation; surface concentrically or longitudinally striated. Type S. rugosa.

FIG. 942.—Salterella rugosa.

billingsi, Safford, 1869, Geo. of Tenn., p. 289, Trenton Gr.

obtusa, 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. Mongraph of Limniades. [Ety. *skolex*, worm;

lithos, stone.] Merely worm furrows, without organic characters.

canadensis, Billings, 1862, Pal. Foss. vol. 1, p. 96, Potsdam Gr.

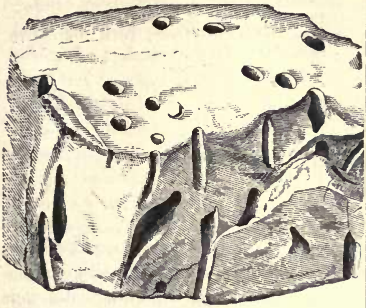


FIG. 943.—Scolithus canadensis.

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 valvatus.

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. 48, 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, Lamarck, 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.

FIG. 945.—Spirorbis carbonarius.

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. Prov. Ont., p. 83, Ham. Gr.

valvatus, Goldfuss, 1826, (Serpula valvata). Not American.

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, Edriopthalmata, and Podopthalmata.

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 exserted 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 subcrescentiform 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 Edriopthalmata 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, Tetradecapoda.

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 Tetradecapoda have their relations with the Decapoda.

SUBCLASS AND ORDER CIRRIPEDIA.

FAMILY BALANIDÆ.—Palæocrusia, Protobalanus.

FAMILY LEPADIDÆ.—Lepidocoleus, Strobilepis, Turrilepas.

SUBCLASS ENTOMOSTRACA.

ORDER OSTRACODA.

FAMILY BEYRICHIIDÆ.—Beyrichia, Beyrichona, Hipponicharion, Primitia.

FAMILY CYPRIDÆ.—Candona.

FAMILY CYTHERIDÆ.—Cytherella, Cytheropsis.

FAMILY FABERIIDÆ.—Faberia.

FAMILY LEPERDITIIDÆ.—Aparchites, Isochilina, Leperditia.

ORDER PHYLLOPODA.

FAMILY ESTHERIIDÆ.—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.—Anopolenus, 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, Elymocaris, Ribeiria (?), Solenocaris, Tropidocaris.

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.

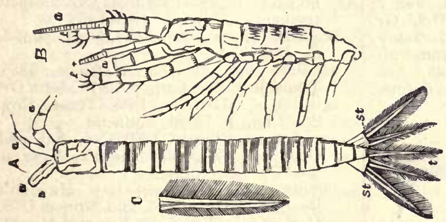


FIG. 947.—Acanthotelson eveni. *A*, dorsal view; *st*, stylet; *t*, telson; *B*, side view; *a* and *x*, antennæ; *f*, anterior leg; *C*, enlarged stylet.

ACANTHOTELSON, 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. 46, p. 28, and Geo. Sur. Ill., vol. 3, p. 551, Coal Meas.

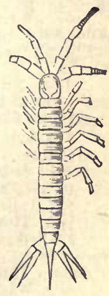


FIG. 949.—Acanthotelson stimpsoni. Dorsal view.

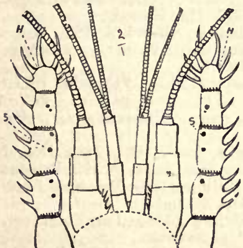


FIG. 948.—Acanthotelson eveni. Enlarged; *H*, anterior legs and antennæ; *S*, punctures left by spines on the lower side.

FIG. 950.—Acanthotelson stimpsoni. Enlarged 3 diam.; *i*, a protuberance that may be an eye.

Acantholoma, syn. for Acidaspis.

spinosa, syn. for Acidaspis tuberculata.

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. brighti.

FIG. 951.—Acidaspis anchoralis. Cephalic shield.

anchoralis, S. A. Miller, 1875, Cin. Quar. Jour. Sci., vol. 2, p. 349, Hud. Riv. Gr.

callicera, Hall, 1888, Pal. N. Y., vol. 7, p. 69, Up. Held. Gr.

ceralepta, Anthony, 1838, (Ceratocephala ceralepta,) Am. 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.

crosotus, 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 *crossota*.

FIG. 952.—Acidaspis anchoralis. Pygidium.

danai, Hall, 1862, Geo. Sur. Wis., p. 423, Niagara Gr.

eriopis, see Terataspis eriopis.

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, (Dicranurus 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.

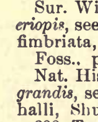


FIG. 953. Acidaspis onealli.

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.

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.

acadicus, Hartt, 1868, Acad. Geol., p. 655, St. John Gr.

acadicus 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.

bidens, 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, Prodrom. 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, axal lobe convex; pygidium small, rounded, three segments; hypostoma oval, truncated anteriorly. Type A. ceticephalus.
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.

FIG. 955. Agraulus cylindricus.

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.
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.
whitfieldanus, 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 without grooves; pygidium with short axis and pleuræ with free terminations; labrum pointed, convex, margined. Type A. frontiloba.

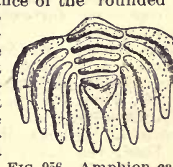


FIG. 956—Amphion canadensis. Pygidium.

barrandii, Billings, 1865, Pal. Foss., vol. 1, p. 288, Quebec Gr.

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, Uber die palæaden 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.

FIG. 958.—Ampyx normalis. Head without movable cheeks and the pygidium.

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.

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 outward, and is marginal in front; the long eyelobe, 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.

FIG. 959.—Anopolenus venustus.

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.

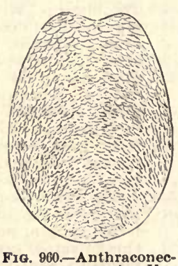


FIG. 960.—Anthraconectes mazonensis. Hypostoma enlarged to show the scale-like sculpturing.

mazonensis, Meek & Worthen, 1868, Am. Jour. Sci and Arts, vol. 46, p. 21, and Geo. Sur. Ill., vol. 3, p. 544, Coal Meas.

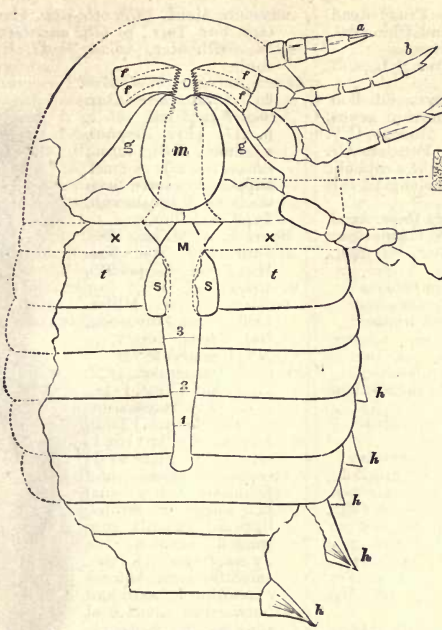


FIG. 961.—Anthraconectes mazonensis. *a*, *b*, *c*, Legs, crushed and broken; *h*, ends of dorsal half of body segments; *m*, hypostoma; *P*, swimming paddle broken; *t*, natural articulation; *g*, basal joints of same; *x*, enlarged surface markings; *M*, mesial appendage of operculum; 1, 2, 3, articulations; *x*, *t*, lateral alæ of operculum; *s*, *s*, accessory pieces; *O*, position of mouth.

ANTHRACOPALÆMON, Salter, 1861, Quar. Jour. Geo. Soc. Lond., vol. 17, p. 529. [Ety. *anthrax*, coal; *palæmon*, 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; abdomen of six joints, as broad as long, pleuræ except the second pointed; telson broad, appendages to the penultimate joint double on each side, subtrigonal, broad, lateral fins divided. Type A. grossarti.

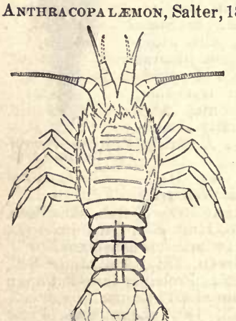


FIG. 962. — Anthracopalæmon gracilis. Dorsal view somewhat enlarged.

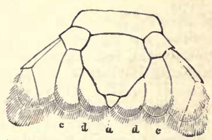


FIG. 963.—Anthracopalæmon gracilis. Caudal parts and one abdominal segment in advance of the telson—all enlarged. *a*, Small, terminal palette; *d*, *d*, two accessory lamellæ; *c*, *c*, lateral lamellæ or fins.

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 $3\frac{1}{2}$ segments, subtrigonal, pointed in front, truncated and sinuous posteriorly; abdomen with six imbricating segments; telson as long as $3\frac{1}{2}$ abdominal segments with a stylet on each side. Type A. vermiformis.

FIG. 964.—Archæocaris vermiformis.

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.

Arethusina, 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 Crepicephalus 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 Bathyurellus 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.

FIG. 965. — Asaphiscus wheeleri.

bradleyi, Meek, 1873, 6th Rep. Hayden's Geo. Sur. Terr., p. 484, Up. Taconic.

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 semielliptical; 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.
corycœus, see Proetus corycœus.
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.
ditmarsiæ, 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 Bathyurus extans.
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.

FIG. 967.—Asaphus gigas.

(?) 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.
graftonensis, 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.
megalopthalmus, 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.

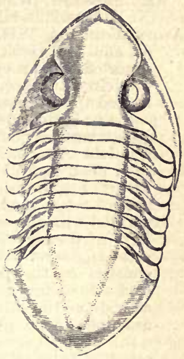


FIG. 968.—Asaphus megistus.

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.
susæ, 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.
triangulatus, 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.

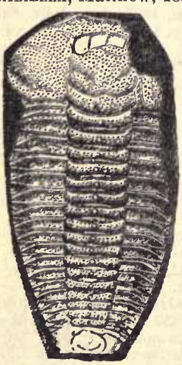


FIG. 969—Atops trilineatus.

BARRANDIA, McCoy, 1849, Ann. Nat. Hist. 2d ser. vol. 4, p. 409. [Ety. proper name.] Ovate, 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

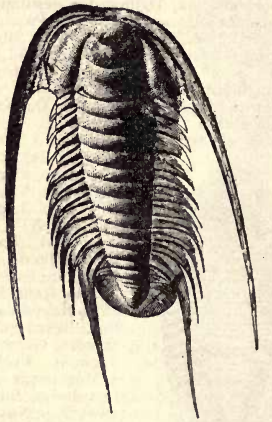


FIG. 970—Bathynotus holopyga. Long eye-lobes crushed down.

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 *Bathyurus.*] 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.

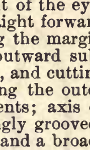


FIG. 971.—Bathyurellus nitidus.

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.

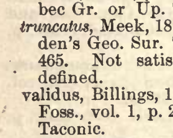


FIG. 972.—Bathyuriscus productus.

BATHYURISCUS, Meek, 1873, 6th Rep. Hayden's U. S. Geo. Sur. Terr., p. 484. [Ety. from *Bathyurus.*] 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, (Bathyurus 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; pleuræ 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. Bathyurus 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 spininger,) 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 subcrescentiform, 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.

danæ, see Euproops danæ.
lacœi, Packard, 1885, Am. Naturalist, vol. 19, p. 291, Coal Meas.

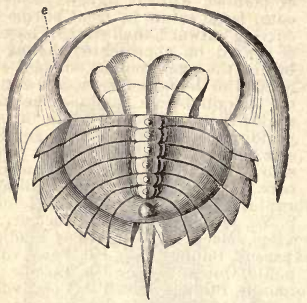


FIG. 974.—Belinurus bellulus. *e*, Position of eye, at the lateral extremity of a transversely elliptical area.

BEYRICHIA, 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. klœdeni.
æquilatera, 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, 1886, 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.
dagon, Clarke, 1855, Bull. U. S. Geo. Sur., No. 16, p. 29, Genesee Shale.

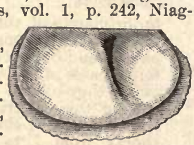


FIG. 976.—Beyrichia duryi. Magnified 25 diam.

duryi, S. A. Miller, 1874, Cin. Quar. Jour. Sci., vol. 1, p. 232, Hud. Riv. Gr.

fœtoidea, 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.

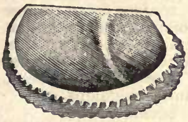


FIG. 977.—Beyrichia duryi. Interior of left valve, magnified 25 diam.

granulata, Hall, 1859, Pal. N. Y., vol. 3, p. 377, Low. Held. Gr.
jonesi, Dawson, 1868, Acad. Geol., p. 312, Carboniferous.
klœdeni 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.

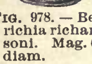


FIG. 978. — Beyrichia richardsoni. Mag. 6½ diam.

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.
rugulifera, see Primitia rugulifera.
sigillata, see Primitia sigillata.
spinosa, Hall, 1852, (Cytherina spinosa,) Pal. N. Y., vol. 2, p. 317, Niagara 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.

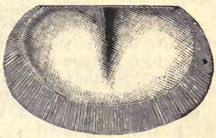


FIG. 979.—Beyrichia striatomarginata. Mag. 20 diam.

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 semiorbicular with a flattened entire margin, axial lobe short, sulci prolonged toward the margin, lateral folds broad, not reaching the margin. Type B. altaceus.

FIG. 980.—Bronteus lunatus.

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.

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.

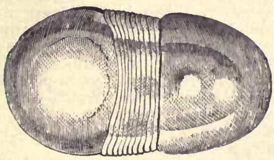


FIG. 981.—Bumastus barriensis.

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.
multicosta, 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.

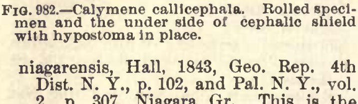


FIG. 982.—Calymene callicephala. Rolled specimen and the under side of cephalic shield with hypostoma in place.

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. callicephala.
spinifera, not defined.
trisulcata, Hall, 1843, Geo. 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, Lond. 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 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.

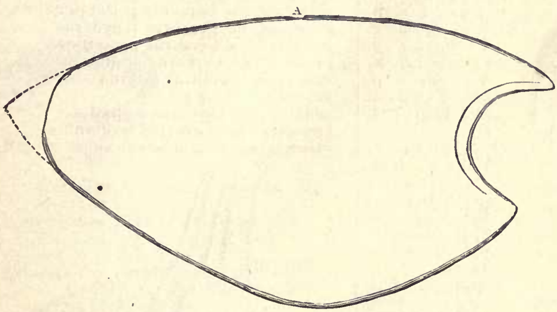


FIG. 983.—Ceratiocaris sinuata. Outline.

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 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.
crosotus, see Acidaspis crosotus.
(?) eryx, Billings, 1860, (Cheirurus eryx,) Can. Nat. and Geol., vol. 5, p. 67, Quebec Gr. or Up. Taconic.
(?) glaucus, 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, (Cheirurus 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, (Cheirurus numitor,) Catal. Sil. Foss. Antic., p. 27, Hud. Riv. Gr.

nuperus, Billings, 1866, (Cheirurus nuperus,) Catal. Sil. Foss. Antic., p. 60, Anticosti Gr.

(?) perforator, Billings, 1865, (Cheirurus perforator,) Pal. Foss., vol. 1, p. 287, Quebec Gr. or Up. Taconic.

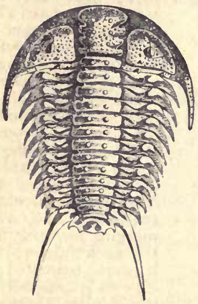


Fig. 984.—Ceraurus pleurexanthemus.

pleurexanthemus, Green, 1832, Monog. Trilobites, p. 84, and Pal. N. Y., vol. 1, p. 242, Trenton and Hud. Riv. Gr.

(?) polydorus, Billings, 1865, (Cheirurus polydorus,) Pal. Foss., vol. 1, p. 286, Quebec Gr. or Up. Taconic.

pompilius, Billings, 1865, (Cheirurus pompilius,) Pal. Foss., vol. 1. p. 181, Chazy or Black Riv. Gr.

(?) prolificus, Billings, 1865, (Cheirurus prolificus,) Pal. Foss., vol. 1, p. 285 and 325, Quebec Gr. or Up. Taconic.

pustulosus, syn. for Ceraurus pleurexanthemus.

rarus, Walcott, 1877, 31st Rep. N. Y. St. Mus. Nat. Hist., p. 68, Trenton Gr.

satyrus, Billings, 1865, (Cheirurus satyrus,) Pal. Foss., vol. 1, p. 324, Chazy Gr.

(?) sol, Billings, 1865, (Cheirurus sol,) Pal. Foss., vol. 1, p. 288, Quebec Gr. or Up. Taconic.

(?) solitarius, Billings, 1865, (Cheirurus solitarius,) Pal. Foss., vol. 1, p. 206, Quebec Gr. or Up. Taconic.

tarquinius, Billings, 1863, (Cheirurus tarquinius,) Proc. Port. Soc. Nat. Hist., vol. 1, p. 121, Upper Silurian.

vigilans, see Encrinurus vigilans.

(?) vulcanus, Billings, 1865, (Cheirurus 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.

Cheirurus, 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.

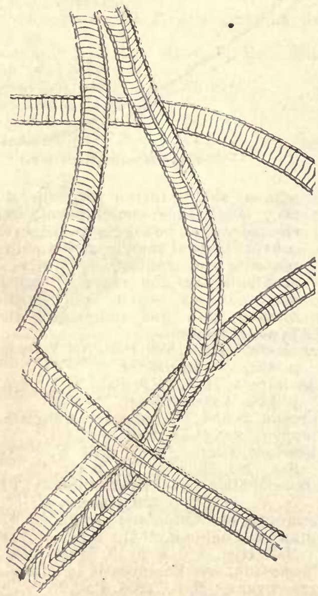


Fig. 985.—Climachtichnites wilsoni.

CLIMACHTICHNITES, 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.

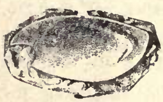


FIG. 986.—Colpocaris bradleyi.

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 Liostracus aurora.
baileyi, see Conocoryphe baileyi.
billingsi, see Ptychoparia billingsi.
binodosus, see Ptychoparia binodosa.
calciferus, see Ptychoparia calcifera.
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.
gemini-spinosus, see Conocoryphe gemini-spinosa.
halli, see Solenopleura halli.
hartti, see Ptychoparia hartti.
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 Liostracus neglectus.
optatus, see Ptychoparia optata.
orestes, see Solenopleura orestes.
ouangondianus, see Liostracus ouangondianus.
oweni, see Ptychoparia oweni.
pattersoni, see Ptychoparia pattersoni.
perseus, see Ptychoparia perseus.
quadratus, Hartt, see Liostracus quadratus.
quadratus, Whitfield, see Ptychoparia quadrata.
robbi, see Solenopleura robbi.
shumardi, see Ptychoparia shumardi.
subcoronatus, see Ptychoparia subcoronata.
tener, see Liostracus 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.

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. 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 acuminated 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.

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 lilianus. Cephalic shield without the movable cheeks.

FIG. 989.—Crepicephalus lilianus. Pygidium.

lilianus, 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.

Cryphæus, 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.

boothi, see Dalmanites boothi.

calliteles, see Dalmanites calliteles.

greeni, syn. for Dalmanites calliteles.

Cryptolithus, syn. for Trinucleus.

tesselatus, see Trinucleus concentricus.

Cybele, Loven, 1845, p. 110, Ofversigt Vetensk. Acad. Handl., p. 110.

punctata, Hall, 1852. This species belongs to the genus Encrinurus, 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. ceratopthalmus.

brevimarginatus, Walcott, 1885, Monogr. U. S. Geo. Sur., vol. 8, p. 93, Trenton Gr.

FIG. 990.—Cyphaspis christyi.

christyi, Hall, Trans. Alb. Inst., vol. 4, p. 188, Niagara Gr.

cœlebs, 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.

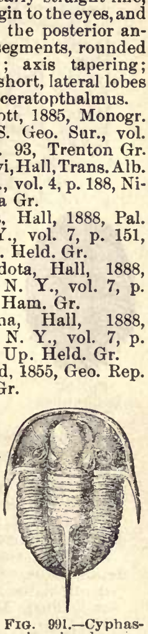


FIG. 991.—Cyphaspis girardeauensis.

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.

CYTHERELLA, 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.

CYTHEROPSIS, McCoy, 1849, Ann. and Mag. Nat. Hist., 2d. ser., vol. 4, p. 249. [Ety. *Cytheropsis*, resembling Cythere.] Distinguished from Cythere, which now swarm 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.

FIG. 993.—Cytheropsis cincinnatiensis.

concinna, see Primitia concinna.

crassimarginata, Winchell, 1862, (Cythere crassimarginata,) Proc. Acad. Nat. Sci., p. 429, Marshall Gr.

crenulata, Emmons, 1856, (Cytherina crenulata,) Am. Geol., p. 220, Trenton Gr.

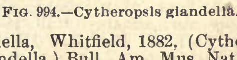


FIG. 994.—Cytheropsis glandella.

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.

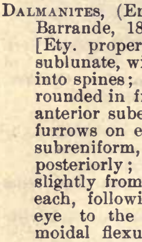


FIG. 995.—Dalmanites achates.

achates, Billings, 1860, Can. Nat. and Geo., vol. 5, p. 63, Trenton Gr.

ægeria, 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, (Cryphæus 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.

FIG. 996.—Dalmanites callicephalus.

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.

FIG. 997. Dalmanites calliteles.

comis, Hall, 1888, Pal. N. Y., vol. 7, p. 41, Up. Held. Gr.

concinnus, Hall, 1876, Illust. Devon. Foss., pl. 10, Schoharie grit.

concinnus 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.

limulurus, Green, 1832, (Asaphus limulurus,) 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.

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.
micrurus, Green, 1832, (Asaphus micrurus,) Monograph Trilobites, p. 56, and Pal. N. Y., vol. 3, p. 359, Low. Held. Gr.

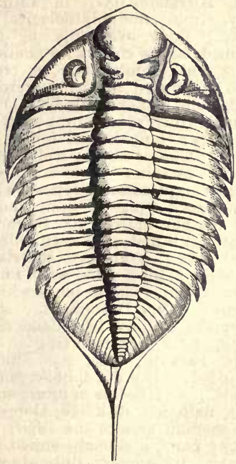


FIG. 998.—Dalmanites limulurus.

myrmecophorus, Green, 1835, (Asaphus myrmecophorus,) Supp. to Monograph of Tribolites, 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 Tribolites, 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.
iole, 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.
marcoui. 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.—Dicellocephalus minnesotensis.

minnesotensis, Owen, 1852, Rep. Wis., Iowa, and Min., 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.

DIPELTIS, 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.

DIPLICHNITES, 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.

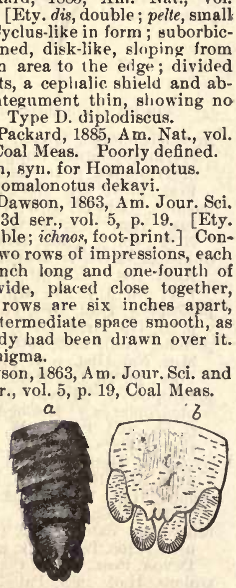


FIG. 1000.—Diplostylus dawsoni. *a*, Tail, nat. size; *b*, terminal joint, enlarged.

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, 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; anchylosed, 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.

DITHYROCARIS, 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 lateral angles produced into spines; surface with faint imbricating striæ, 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; postoral 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 spine, with a lateral movable spine on each side; posterior margin of the abdominal segments bearing spines. Type E. sublævis.

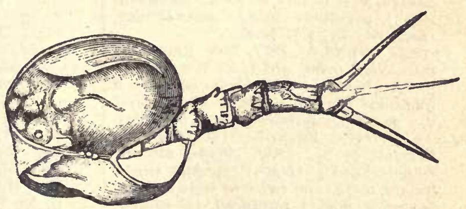


FIG. 1002.—Echinocaris punctata.

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. 38, 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.

ECHINOGNATHUS, 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 Lamellibranch; 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.

FIG. 1003.—Elliptocephala thompsoni.

undulostriata, Hall, 1847, (Olenus undulostriatus,) 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

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.
Embolamus rotundatus, Rominger, syn. for Bathyuriscus 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.
deltoideus, 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.
excedrensis, 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.
nereus, 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.


FIG. 1005.—Encrinurus egani. Cephalic shield.

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 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.


FIG. 1006.—Endymionia 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 crescentric, 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 antero-lateral 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-

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.

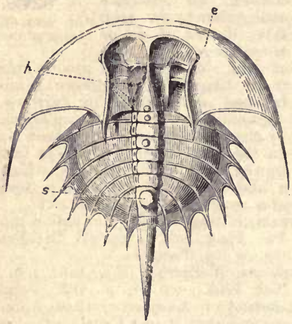


FIG. 1007.—Euproops danæ. *e*, Eyes; *p*, pits; *s*, node.

longispina, Packard, 1885, Am. Naturalist, vol. 19, p. 291, Coal Meas.

EURYPTEKELLA, 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.

beecheri, 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.

eriensis, 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.

micropthalmus, 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. 157, 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.

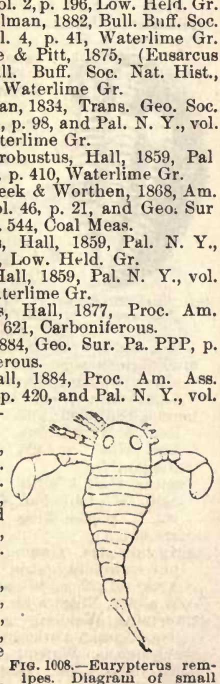


FIG. 1008.—Eurypterus remipes. Diagram of small specimen.

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.
tetragonopthalmus, 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 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.

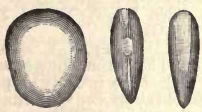


FIG. 1009.—Faberia anomala. Three views, mag. 5 diam.

HARPES, Goldfuss, 1839, Nova Acta Physico medica Academiæ Cæsareæ Leopoldino Carolinæ 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 eyes and then to the antero-lateral margins, thoracic segments numerous. Type H. ungula.

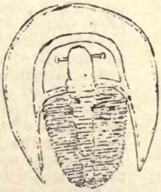


FIG. 1010.—Harpes ungula.

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, p. 182, Trenton Gr.

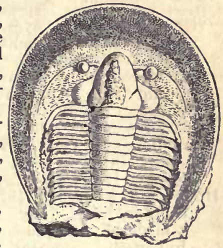


FIG. 1011.—Harpes ottawensis.

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,

HARTTIA, Walcott, 1884, Bull. U. S. Geo. Sur. vol. 2, p. 283. [Ety. proper name.] Distingnished 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, (Conocephalites matthewi,) Acad. Geol., p. 646, St. John Gr.


FIG. 1012. — Harttia matthewi. Cephalic shield.

Hausmannia, Hall, 1888, 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 toward 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.

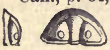


FIG. 1013.—Holometopus angelini. Head and side view.

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

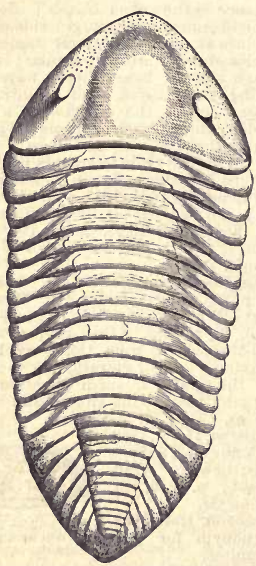


FIG. 1014.—Homalonotus delphinocephalus.

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.

herculaneus, 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 Geo., 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 Geo., vol. 4, p. 369, Chazy Gr.
clavifrons, Billings, 1859, Can. Nat. and Geo., vol. 4, p. 379, Chazy and Black Riv. Grs.
conifrons, Billings, 1859, Can. Nat. and Geo., vol. 4, p. 378, Black Riv. Gr.
conradi, Billings, 1859, Can. Nat. and Geo., 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.

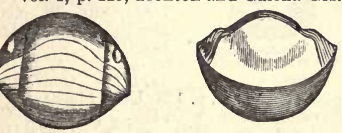


FIG. 1015.—Illænus globosus. Two views.

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 globosns. Side view.

globosus, Billings, 1859, Can. Nat. and Geo., 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 Geo., 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 Geo., 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 Geo., 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.
pterocephalus, 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.

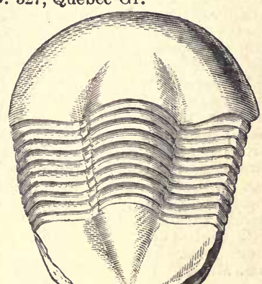


FIG. 1017.—Illænus taurus.

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.

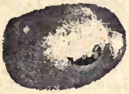


FIG. 1018.—Isochilina jonesi.

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. leidyi.

leidyi, Lea, 1856, (Cypricardia leidyi,) Proc. Acad. Nat. Sci., vol. 7, p. 341, Coal Meas.

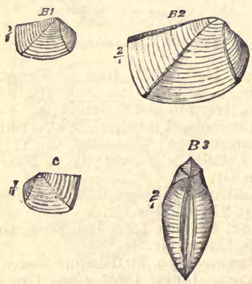


FIG.—1019.—Leaia tricarinata. *B* 1, right valve; *B* 2, enlarged; *B* 3, dorsal view; *c*, left valve.

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; *dittos*, 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. brittanica.

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.

FIG. 1020.—Leperditia byrnesi. Mag.

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.

FIG. 1021.—Leperditia cæcigena. Natural size and magnified.

cayuga, Hall, 1862, 15th Rep. N. Y. St. Mus. Nat. Hist., p. 83, Cornif. Gr.

concinnula, 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.

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; *dittos*, 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.

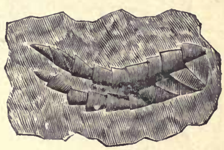


FIG. 1022.—Lepidocoleus jamesi. Mag. 2 diam. Lebanon specimen.

LEPIDOCOLEUS, Faber, 1886, Jour. Cin. Soc. Nat. Hist., vol. 9, p. 15. [Ety. *lepis*, scale; *koleos*, 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.
jamesi, Hall & Whitfield, 1875, (Plumulites jamesi,) Ohio Pal., vol. 2, p. 106, Hud. Riv. Gr.

FIG. 1023.—Lepidocoleus jamesi. Faber's. Cincinnati specimen.

LICHAS, Dalman, 1826, Uber 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.

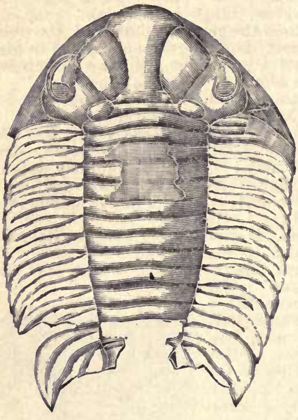


FIG. 1024.—Lichas faberi. Mag. 2 diam.

armatus, Hall, 1862. Preoccupied; changed to L. eriopis.
bigsbyi, 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.
decipiens, 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.
eriopis, see Terataspis eriopis.

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 laciniate, 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.
hylæus, 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.
nereus, 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.

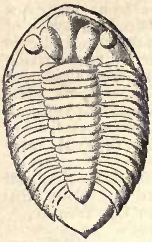


FIG. 1026.—Lichas trentonensis.

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, Palæontologica Scandinavica, p. 23. [Ety. *leiostrakos*, smooth-shelled.] 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.

FIG. 1027.—Liostracus aculeatus.

aurora, Hartt, 1868, (Conocephalites aurora,) Acad. Geol., p. 653, St. John Gr.

linnarsoni, Brogger, 1878, Paradoxides skifrene vid Krekling, 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.

LONCHOCEPHALUS, Owen, 1852, Geo. Wis., Iowa, and Minn., p. 575. [Ety. *longus*, long; *kephale*, head.] Cephalic shield, having a wide frontal limb; posterior 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.

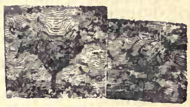


FIG. 1028.—Lonchocephalus chippewensis.

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, 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.

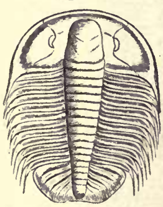


FIG. 1029.—Longanellus quebecensis.

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; 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.

FIG. 1030.—Megalaspis belemnura. Pygidium.

belemnura, White, 1874, Rep. Invert. Foss., p. 11, and Geo. Sur. W. 100th Mer., vol. 4, p. 59, Quebec Gr. or Up. Taconic.

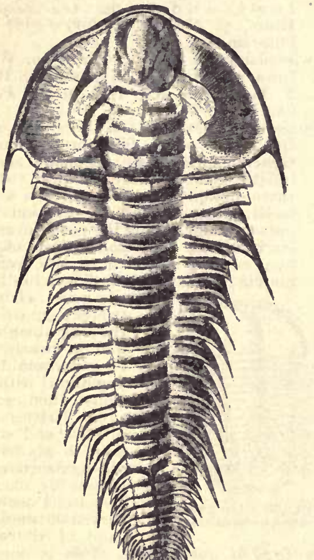


FIG. 1031.—Mesonacis vermontana.

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.

FIG. 1032. Menocephalus salteri.

(?) salteri, Devine, 1863, Can. Nat. and Geo., vol. 8, p. 210, and Pal. Foss., vol. 1, p. 203, Up. Taconic.

?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; *thuris*, 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.

FIG. 1033.—Microdiscus quadricostatus. Magnified 5 diam.

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. Geo., p. 116, Up. Taconic.

speciosus, Ford, 1873, Am. Jour. Sci. and Arts, 3d ser., vol. 6, p. 137, Up. Taconic.

NILEUS, Dalman, 1826, Uber 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.

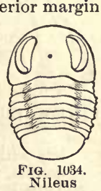


FIG. 1034. Nileus macrops.

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 dekayi.

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 pleuræ, 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 Bathyuriscus 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 Bathyuriscus 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.

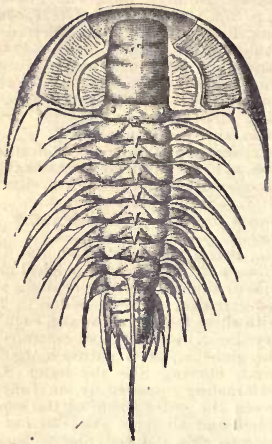


FIG. 1035.—Olenoides typicalis.

fordi, Walcott, 1887, Am. Jour. Sci. and Arts, 3d ser., vol. 34, p. 195, Up. Taconic.

lævis, 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.

quadriceps, Hall & Whitfield, 1877, (Dicellocephalus quadriceps,) Geol. Expl. 40th Par., vol. 4, p. 240, Up. Taconic.

spinosus, 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, (Dicellocephalus wahsatchensis,) Geol. Expl. 40th Par., vol. 4, p. 241, Up. Taconic.

Olenus, Dalman, 1826, Uber die Palæaden 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 oblong, 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

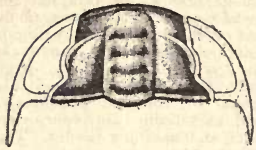


FIG. 1036.—Oryctocephalus primus. Cephalic shield.

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.

FIG. 1037. — Oryctocephalus primus. Pygidium.

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'

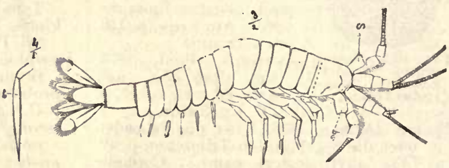


FIG. 1038.—Palæocaris typus. 3 diam.

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; stylets with first joint very small, second double, and also flattened horizontally. Type P. typus.

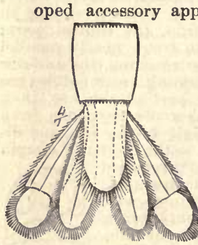


FIG. 1039.—Palæocaris typus. Caudal part 4 diam.

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. *palaios*, ancient; *Creusia*, 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. *palaios*, 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 anchylosed 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. tessini.

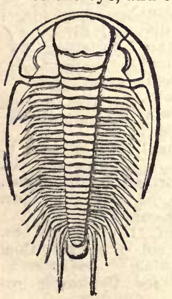


FIG. 1040.—Paradoxides bohemicus.

abenacus, 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.

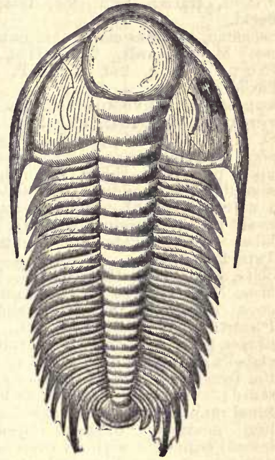


FIG. 1041.—Paradoxides harlani.

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.
quadrispinosus, Emmons, syn. for Bathynotus holopyga.
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. scarabæoides.
holopyga, see Bathynotus, holopyga.
PEMPHIGASPIS, Hall, 1863, 16th Rep. N. Y. St. Mus. Nat. Hist., p. 221. [Ety. *pemphix*, 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; pleuræ rounded, pygidium moderate, of few (often coalesced) segments with an even border, never produced. Type P. latifrons.

FIG. 1042.—Phacops bufo.

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.
callicephala, 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 Geo., vol. 4, p. 65, Mid. Sil.
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.
trisulcata, Hall, 1843, (Calymene (?) trisulcata,) 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. *phæthon*, 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 Cyphaspis lævis.

FIG. 1044.—Phillipsia lodiensis.

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 Cyphaspis minuscula.
missouriensis, Shumard, 1858, Trans. St. St. Louis Acad. Sci., vol. 1, p. 225, Coal Meas.
ornata, Hall, see Cyphaspis 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.
swallovi, Shumard, 1855, (Proetus swallovi,) 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.

Platynotus, 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. strangulata.

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.

FIG. 1045. Primitia cincinnatiensis.

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 uber 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 trilobed, segmented, semicircular; axis very convex, short. Type P. cuvieri.

alaricus, Billings, 1860, Can. Nat. and Geo., vol. 5, p. 68, Hud. Riv. Gr.

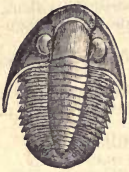


FIG. 1046.—Proetus alaricus.

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.

corycœus, Conrad, 1842, (Asaphus corycœus,) 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.

curvimarginatus, 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.

folliceps, 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 Choteau 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.

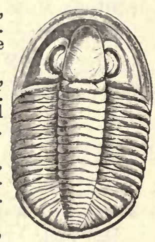


FIG. 1047. — Proetus phocion.

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 swallovi.

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.

PROTICHNITES, 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 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

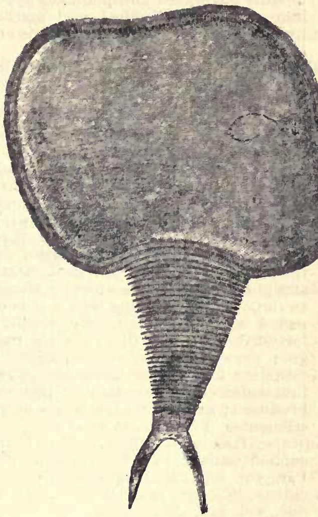


FIG. 1049.—Protocaris marshi.

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

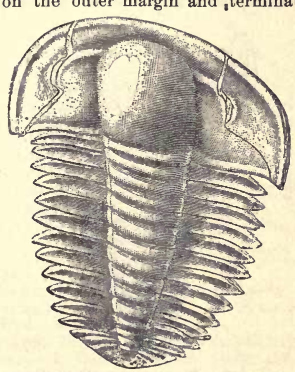


FIG. 1050.—Prototypus hitchcocki.

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 naturwissench. 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 naturwissench. 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

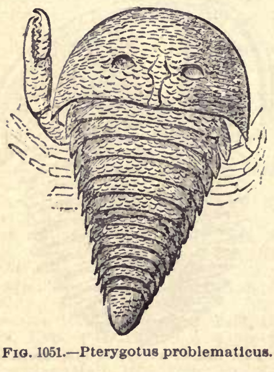


FIG. 1051.—Pterygotus problematicus.

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 granulosus,) 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.

FIG. 1052.—Ptychaspis sesostris.

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, Prodrom. 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.

cordilleræ, Rominger, 1887, (Conocephalites cordilleræ,) 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.

housensis, Walcott, 1886, Bull. U. S. Geo. Sur., No. 30, p. 201, Up. Taconic.

læviceps, 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.

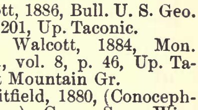


FIG. 1053.—Ptychoparia zenkeri.

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.

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, pleuræ short, falcate, directed backward; pygidium small and terminating in two short spines. Type R. colbi.

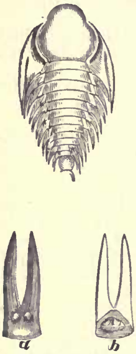


FIG. 1054. — Remopleurides striatulus. *a*, *b*, Hypostoma.

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.

schlotheimi, Billings, 1865, Pal. Foss., vol. 1, p. 294, Quebec Gr.

striatulus, Walcott, 1875, Cin. Quar. Jour. Sci., vol. 2, p. 347, Trenton Gr.

Rhabdichinites, 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 Ceratiocaris; 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 subcylindrical 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 corrugated boss for the attachment of a muscle. Type R. pholadiformis.

calcifera, Billings, 1865, Pal. Foss., vol. 1, p. 340, Calciferous Gr.

FIG. 1055. — Ribeiria calcifera.

compressa, Whitfield, 1886, Bull. Am. Mus. Nat. Hist. vol. 1, Birdseye Gr.

longiuscula, Billings, Pal. Foss., vol. 1, p. 341, Calciferous Gr.

ventricosa, Whitfield, 1886, Bull. Am. Mus. Nat. Hist., vol. 1, p. 344, Birdseye Gr.

FIG. 1056.—Rusichnites carbonarius.

RUSICHNITES, Dawson, 1861, Can. Nat. and Geo., vol. 1, p. 363. Ety. *rusos*, wrinkled; *ichnos*, track.] Supposed by the author to be the track of a Crustacean, like the Limulus, and consisting 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, Birdseye 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.

FIG. 1057. Shumardia granulosa.

SHUMARDIA, Billings, 1862, Pal. Foss., vol. 1, p. 92. [Ety. proper name.] Cephalic shield semicircular; glabella convex, subcylindrical, no eyes, pygidium semielliptical, axis cylindro-conical, ribbed, side lobes ribbed, distinguished from Agnostus by the ribs on the pygidium. Type S. 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.

stludovici, 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, semicircular; 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.

FIG. 1059.—Solenopleura nana. Magnified.

orestes, Hartt, 1868, (Conocephalites orestes,) Acad. Geol., p. 649, St. John Gr.

robbi, Hartt, 1868, (Conocephalites robbi,) Acad. Geol., p. 648, St. John Gr.

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.

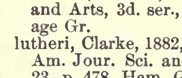


FIG. 1060.—Sphærexochus parvus. Upper and side view of glabella.

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.

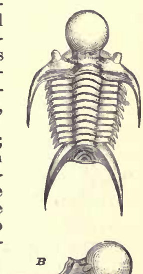


FIG. 1061.—Sphærocoryphe robusta.

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. powriei.

excelsior, Hall, 1884, 36th Rep. N. Y. St. Mus. Nat. Hist., p. 77, Catskill Gr.

SYMPHYSURUS, 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. læviceps.

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 subrcescentiform, 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 Illaenus.

ovata, see Illaenus ovatus.

TRIARTHRELLA, 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.

TRIARTHRUS, 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.

fischeri, see Atops fischeri.

glaber, Billings, 1859, Can. Nat. and Geol., vol. 4, p. 382, and Can. Geol., p. 202, Utica Slate Gr.

spinosus, Billings, 1857, Rep. of Progr. Geo. Sur. Can., p. 340, and Can. Geol., p. 202, Utica Slate Gr.

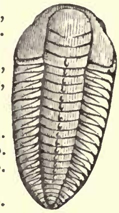


FIG. 1062.—Triarthrus becki.

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, semiovate 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 ARCHITARBIDÆ.—Anthracomartus, Architarbus, Geraphrynus.
FAMILY ARTHROLYCOSIDÆ.—Arthrolycosa.
FAMILY POLIOCHERIDÆ.—Poliochera.

ORDER PEDIPALPI.

FAMILY GERALINURIDÆ.—Geralinura.

ORDER SCORPIONES.

FAMILY EOSCORPIONIDÆ.—Eoscorpius, 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, 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.

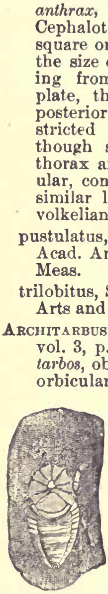


FIG. 1064.—Architarbus rotundatus.

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.

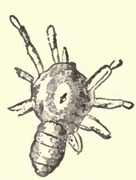


FIG. 1065.—Arthrolycosa antiqua.

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.

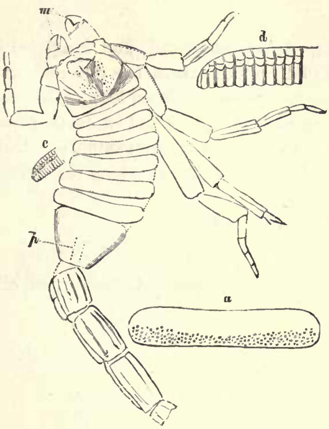


FIG. 1066.—Eoscorpius carbonarius. Natural size; *a*, body segment enlarged; *c*, comb; *d*, same enlarged; *m*, mandibles; *p*, pits.

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; *Phrynus*, 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 ARCHIULIDÆ.—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.

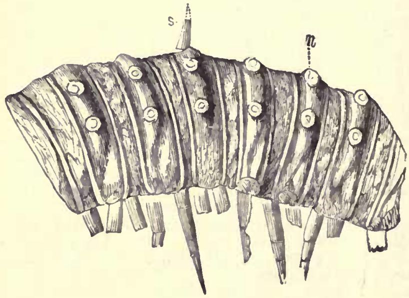


FIG. 1067.—Acantherpestes major. Fragment. *s*, spine; *n*, base of spine.

AMYNILESPES, Scudder, 1885, in Zittel's Handbuch der Pal., p. 729. [Ety. *amuno*, to keep off; *iluspaomai*, to crawl.] Spines simple, arranged in dorsolateral 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.

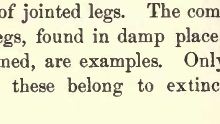


FIG. 1068.—Amynilespes wortheni.

ANTHRACERPES, Meek & 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 backward, 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.

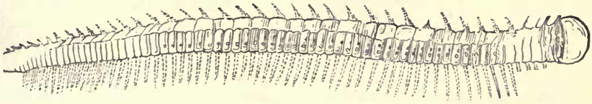


FIG. 1071.—Euphoberia armigera. Entire specimen.

corneus, Matthew, 1888, Trans. Roy. Soc. Can., p. 59, Devonian.

FIG. 1069. — Archiulus xylobioides. Anterior part enlarged.

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 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

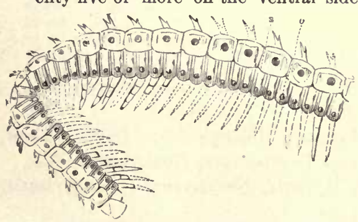


FIG. 1070.—Euphoberia armigera. Part of a large specimen.

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.

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.

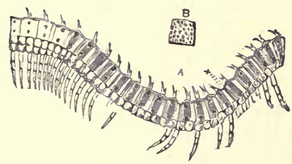


FIG. 1072.—Euphoberia armigera. A, part of an individual; B, enlarged surface pitting.

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. *palaios*, 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.

TRICHIULUS, 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. sigillariæ.

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.

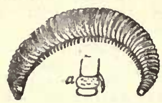


FIG. 1073.—Xylobius sigillariæ. *a*, Organ with palpus, pertaining to the mouth, enlarged.

sigillariæ, 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.

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 PHTHANOCORIDÆ.—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. lacoana.

lacoana. Scudder, 1884, Mem. Bost. Soc. Nat. Hist., vol. 3, p. 345, Coal Meas.

AETHOPHLEBIA, Scudder, 1884, Mem. Bost. Soc. Nat. Hist., vol. 3, p. 338. [Ety. *aethes*, strange; *phleps*, a vein.] Interno-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

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. priscus.

priscus, 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.

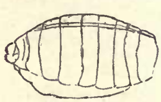


FIG. 1074.—Archimylacris acadicum.

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 Mylacris bretonense.

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. *chele*, forked; *phlebion*, vein.] Body rather slender, but wings large and coarse

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-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. sigillariæ.

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.

sigillariæ, Dawson, 1860, Quar. Jour. Geo. Soc., vol. 16, p. 271, Coal Meas.

Fig. 1073. — Xylobius sigillariæ. *a*, Organ with palpus, pertaining to the mouth, enlarged.

similis, Scudder, 1868, Mem. Bost. Soc. Nat. Hist., vol. 2, p. 234, and Acad. Geol., p. 496, Coal Meas.

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

ERRATA.

Fig. 1072 is Euphoberia granosa.

Figs. 1074 and 1075 are transposed.

fined 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 PHTHANOCORIDÆ.—Phthanocoris.

FAMILY PROTOPHASMIDÆ.—Haplophlebium, Paolia, Titanophasma.

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lacoana. Scudder, 1884, Mem. Bost. Soc. Nat. Hist., vol. 3, p. 345, Coal Meas.

AETHOPHLEBIA, Scudder, 1884, Mem. Bost. Soc. Nat. Hist., vol. 3, p. 338. [Ety. *aethes*, strange; *phleps*, a vein.] Interno-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.

ANTHRACOTHREMMA, 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. priscus.

priscus, 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.

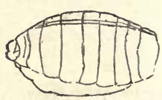

FIG. 1074.—Archimylacris acadicum.

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 Mylacris bretonense.

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. *chele*, 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.

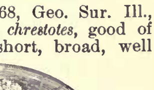

FIG. 1075.—Cheliphlebia carbonaria.

carbonaria, Scudder, 1884, Mem. Bost. Soc. Nat. Hist., vol. 3, p. 328, Coal Meas.

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 twofifths 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.

DIDYMOPHLEPS, Scudder, 1878, Proc. Bost. Soc. Nat. Hist., vol. 19, p. 300. [Ety. *didymos*, double; *phleps*, vein.] All the veins and branches above the internomedian longitudinal and nearly parallel; nearly all the lower half of the wing being occupied by the oblique branches of the internomedian 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; internomedian 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.

DYSCRITUS, 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. *Ephemera*, 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.

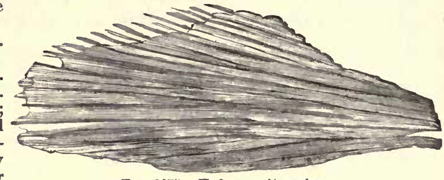

FIG. 1078.—Ephemerites gigas.

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.

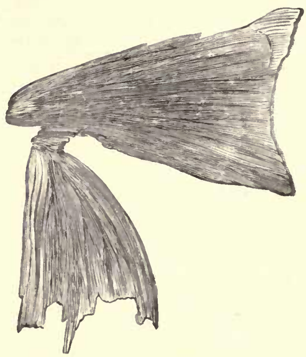

FIG. 1079.—Ephemerites simplex.

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.

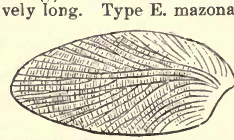

FIG. 1080.—Etoblattina primaeva. From Saarbruck in Europe for comparison.

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.

venusta, Lesquereux, 1860, (Blattina venusta,) Geo. Sur. Ark., vol. 2, p. 314, Coal Meas.

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.

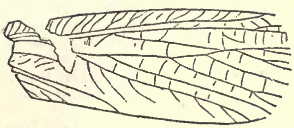

FIG. 1082.—Genentomum validum.

GENOPTERYX, Scudder, 1884, Mem. Bost. Soc. Nat. Hist., vol. 3, p. 327. [Ety. *genos*, kind, race; *pterux*, a wing.] Interno-median vein with branches very similiar 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.

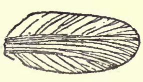

FIG. 1083.—Gerablattina balteata.

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; *pompos*, 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.

blatinoides, 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.

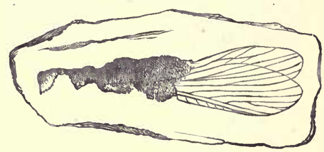

FIG. 1084.—Gerarus danæ.

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; *phlebion*, a vein.] Wing with simple neuration 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.

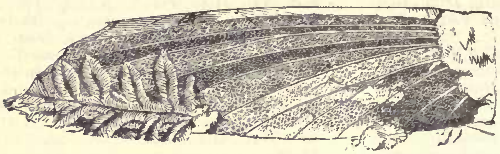

FIG. 1085.—Haplophlebium barnesi. A fern covers part of the wing.

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.

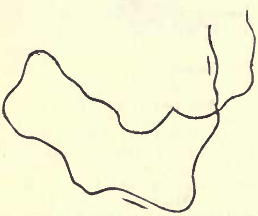

FIG. 1086.—Haplotichnus indianensis.

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 then 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.

FIG. 1087.—Homothetus 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

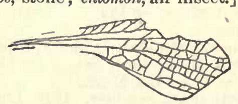

FIG. 1088.—Lithentomum hartti.

scapular branch with a single, or at most two branches, which are almost wholly longitudinal. Type L. hartti.

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. *lithos*, 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. — Lithomylacris angustum.

angustum, Scudder, 1879, Mem. Bost. Soc. Nat. Hist., vol. 3, p. 48, Coal Meas.

pittstonianum, Scudder, 1879, 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.

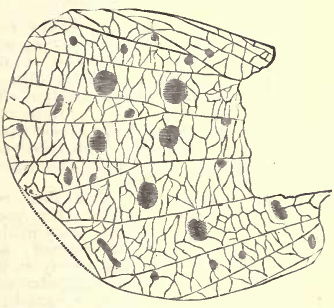

FIG. 1090.—Megathentomum pustulatum.

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.

danæ, 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.

FIG. 1091.—Mylacris 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.

FIG. 1092.—Mylacris anthracophilum Pronotal shield.

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.

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. lacoanum.

heros, Scudder, 1880, Mem. Bost. Soc. Nat. Hist., vol. 3, p. 54, Coal Meas.

lacoanum, 1880, Mem. Bost. Soc. Nat. Hist., vol. 3, p. 53, Coal Meas.

ORYCTOBLATTINA, Scudder, 1885, Proc. Acad. Nat. Sci. Phil., p. 37. [Ety. *oruktos*, 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 occupy 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; *Mylakris*, 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,

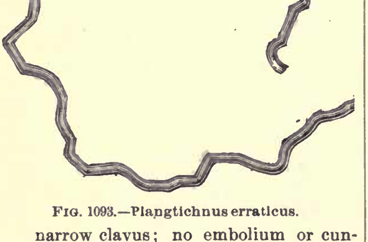

FIG. 1093.—Plangtichnus erraticus.

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.] Founded upon the fragment of an upper wing,

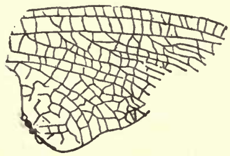

FIG. 1094.—Platyphemera anticua.

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; *mylakris*, 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.

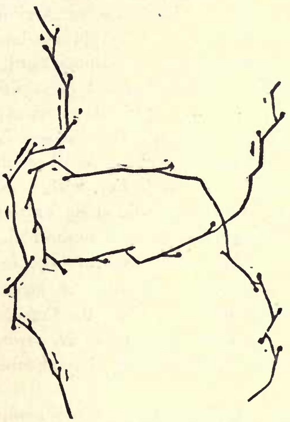

FIG. 1095.—Treptichnus bifurcus. The trails are larger than shown by the figure.

TITANOPHASMA, 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 Holostea; but is distinguished by having large, round scales, no shingle-like fulcra 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 fulcra 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 diphycercal; dorsal fin is divided in two or more divisions; pectorals and ventrals have a scaly axis; no fulcra.

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 Cœlacanthidæ.—Cœlacanthus.

Family Crossopterygidæ.—Ceratodus, Conchodus, Ctenodus, Heliodus, Onychodus, Peplorhina.

Family Dipteridæ.—Dipterus, Gnathorhiza, Ptyonodus.

Family Holoptychidæ.—Glyptolepis, Holoptychius.

Family Phaneropleuronidæ.—Phaneropleuron.

Family Rhizodontidæ.—Eusthenopteron, 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, Periplectrodus, Phœbodus, Pristicladodus, Stemmatodus, Thrinacodus, Polyrhizodus.

Family Petalodontidæ.—Antliodus, Calapodus, Cholodus, Chomatodus, Ctenopetalus, Ctenoptychius, Dactylodus, Desmiodus, Fissodus, Harpacodus, Lisgodus, Peltodus, Peripristis, Petalodus, Petalorhynchus, Polyrhizodus, Pristodus, Tanaodus, Venustodus.

FAMILY ICHTHYODORULITES.—Acondylacanthus, Amacanthus, Anaclitacanthus, Asteroptychius, Batacanthus, Bythiacanthus, Compsacanthus, Ctenacanthus, Cyrtacanthus, Drepanacanthus, Edestus, Erismacanthus, Eunemacanthus, Gampsacanthus, Gisacanthus, Glymmatacanthus, Gyracanthus, Homacanthus, Lecracanthus, Listracanthus, Machæracanthus, Marracanthus, Oracanthus, Orthacanthus, Physonemus, Pnigeacanthus, Stenacanthus, Xystracanthus.

ORDER RAIINA.

FAMILY PSAMMODONTIDÆ.—Copodus, Psammodus.

ACANTHASPIS, Newberry, 1875, Ohio Pal., vol. 2, p. 36. [Ety. *akantha*, spine; *aspis*, shield.] Cranium plates somewhat 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.

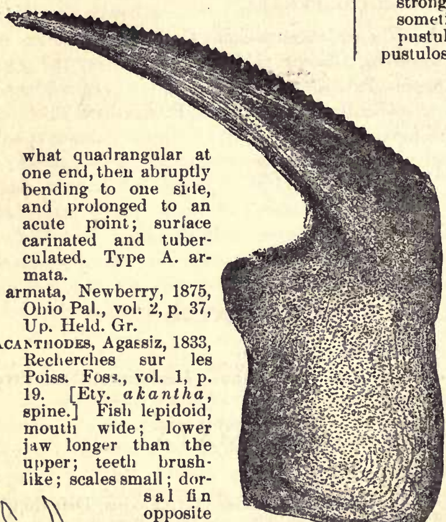

FIG. 1097.—Acanthaspis armata. Plate bearing spine from left side of cranium.

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 brushlike; scales small; dorsal fin opposite anal; pectoral large; first ray of each fin strong, large, stiff; rays of caudal fin close. Type A. bronni.

affinis, Whiteaves, 1889, Trans. Roy. Soc. Can., vol. 6, p. 77, Low. Devonian.

concinnus, Whiteaves, 1889, Trans. Roy. Soc. Can., vol. 6, p. 77, Low. Devonian.

FIG. 1098.—Acantholepis pustulosus. Reduced outlines of four plates, probably in their relative positions.

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, enameled, 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, Keokuk 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.

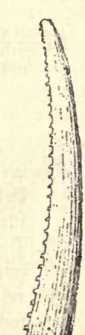

FIG. 1099.—Acondylacanthus gracilis. Side view of spine mag. ½ diameter.

occidentalis, Newberry & Worthen, 1866, (Leptacanthus occidentalis,)

Geo. Sur. Ill. vol. 2, p. 116, St. Louis Gr.
rectus, St. John & Worthen, 1883, Geo. Sur. Ill., vol. 7, p. 241, Up. Coal Meas.
xiphias, St. John & Worthen, 1883, Geo. Sur. Ill., vol. 7, p. 244, Keokuk Gr.
ACROLEPIS, Agassiz, 1836, Recherches sur les Poiss. Foss., vol. 2, p. 79. [Ety. *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.

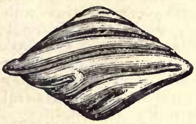

FIG. 1100.—Acrolepis sedgwicki. Magnified scale.

hortonensis, Dawson, 1868, Acad. Geol., p. 254, Subcarboniferous.
Agassichthys, Newberry, syn. for Macropetalichthys.
manni, see Macropetalichthys manni.
sullivanti, see Macropetalichthys sullivanti.
AGASSIZODUS, St. John & Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 311. [Ety. proper name; *odous*, 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.

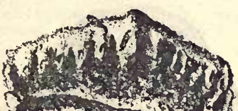

FIG. 1101.—Agassizodus variabilis.

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. 464. [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 tuberculose costæ. Type A. gibbosus.
gibbosus, Newberry & Worthen, 1866, (Homacanthus gibbosus,) Geo. Sur. Ill., vol. 2, p. 113, St. Louis Gr.
AMBLYPTERUS, Agassiz, 1833, Recherches sur les Poissons Fossiles, 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, Recherch. Poiss. Foss., vol. 2, p. 28, Coal Meas.
ANACLITACANTHUS, St. John & Worthen, 1875, Geo Sur. Ill, vol. 6, p. 442. [Ety. *anaklitos*, 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.
ANTLIODUS, Newberry & Worthen, 1866, Geo. Sur. Ill., vol. 2, p. 33. [Ety. *antlia*, a depression; *odous*, 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.
sarculus, 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; *odous*, tooth.] Flattened 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.] Dorso-median 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.

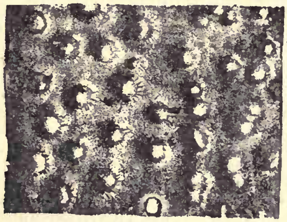

FIG. 1102.—Aspidichthys clavatus.

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.

ASTEROPTYCHIUS, 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.

stludovici, 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 subcircular 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.

necis, 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.

BATHYCHEILODUS, St. John & Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 252. [Ety. *bathys*, deep; *cheilos*, lip; *odous*, tooth.] Teeth minute, laterally elongated, subelliptical, 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.

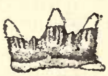

FIG. 1103.—Bathycheilodus macisaacsi.

macisaacsi, St. John & Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 252, Middle Devonian.

BOTHRIOLEPIS, Eichwald, 1840, Bull. Soc. St. Petersburg. [Ety. *bothrion*, a furrow; *lepis*, a scale.] Cephalic shield somewhat semielliptical in outline and covered with plates, as in Pterichthys and

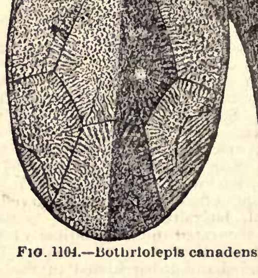

FIG. 1104.—Bothriolepis canadensis.

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 spines 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.

CALOPODUS, 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.

FIG. 1105.—Calopodus apicalis. Mag. 2 diam.

apicalis, St. John & Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 403, Middle Coal Meas.

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.

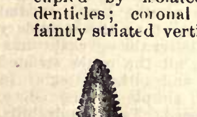

FIG. 1106.—Carcharopsis wortheni.

wortheni, Newberry, 1866, Geo. Sur. Ill., vol. 2, p. 69, Subcarboniferous.

CEPHALASPIS, Agassiz, 1836, Recherch. Pois. Foss., t. 2, p. 135. [Ety. *kephale*, head; *aspis*, shield.] Entire skeleton external; head shield very large, subcrescentiform 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; body rapidly tapering, angular on top, and presenting a jointed appearance somewhat like a trilobite; dorsal, anal, and caudal fin, the latter like a paddle or oar. Type C. lyelli.

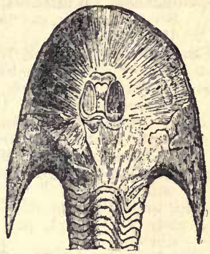

FIG. 1107.—Cephalaspis lyelli. Head shield depressed, and showing the jointed angular outline of part of the body.

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.

paucicristatus, 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 tritors 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, sculptured, and ranged diagonally in wavy lines. Type C. trailli.

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 smock or coat; *odous*, tooth.] Mandibular posterior teeth trapezoidal, arched in the direction of inrollment; median teeth narow, 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, (Pœcilodus 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.

CHOLODUS, St. John & Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 415. [Ety. *cholos*, defective; *odous*, 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 face. Type C. inæqualis.

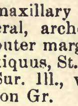

FIG. 1108.—Cholodus inæqualis. Convex face.

inæqualis, 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; *odous*, 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.

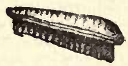

FIG. 1109.—Chomatodus incrassatus.

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; *odous*, 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 exernal 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.
concinnus, 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.
hertzeri, Newberry, 1875, Ohio Pal., vol. 2, p. 46, Portage Gr.
intercostatus, St. John & Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 267, Burlington Gr.
ischypus, Newberry & Worthen, 1870, Geo. Sur. Ill., vol. 4, p. 354, St. Louis Gr.
lamnoides, 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.
newmani, 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.
prænuntius, St. John & Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 270, Burlington Gr.
raricostatus, 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.

Climaxodus, McCoy, 1848, Ann. and Mag. Nat. Hist., 2d ser., vol. 2. [Ety. *klimax*, ladder; *odous*, 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, 1857, Proc. Acad. Nat. Sci., vol. 8, p. 100, Coal Meas. Too poorly defined to warrant recognition.

COCCOSTEUS, Agassiz, 1836, Recherch. Pois. Foss., vol. 2, p. 302. [Ety. *kokkos*, berry; *osteon*, bone.] Head rounded; body triangular, with long vertebrated 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.
acadicus, Whiteaves, 1881, Can. Nat., vol. 10, Upper Devonian.
occidentalis, Newberry, 1875, Ohio Pal., vol. 2, p. 32, Up. Held. Gr.

COCHLIODUS, Agassiz, 1843, Recherches sur les Poissons Fossiles, t. 3, p. 113. [Ety. *kochlias*, anything spiral; *odous*, tooth.] Lower jaw thick, short, bony, V-shaped, bearing on each ramus two obliquely twisted and obtusely ridged semicylindrical 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.

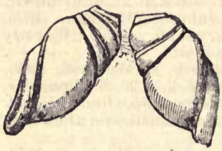

FIG. 1111.—Cochliodus contortus.

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.

CŒLACANTHUS, Agassiz, 1836, Recherches sur les Poissons Fossiles, t. 2, p. 170. [Ety. *koilos*, 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 supplemental caudal; vertebral column cartilaginous, but neural arches and fin-rays bony; teeth small, numerous, conical. Type C. granulosus.

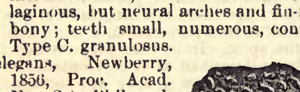

FIG. 1112.—Cœlacanthus elegans.

elegans, Newberry, 1856, Proc. Acad. Nat. Sci. Phil., vol. 8, p. 98, and Ohio Pal., vol. 1, p. 339, Coal Meas.

FIG. 1113.—Cœlacanthus granulosus. Magnified scale.

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.

COMPSACANTHUS, Newberry, 1857, Proc. Acad. Nat. Sci., vol. 8, p. 99, and Ohio Pal., vol. 1, p. 331. [Ety. *compsos*, 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. 1114.—Compsacanthus lævis.

Conchiopsis, syn for Cœlacanthus.

anguliferus, syn. for Cœlacanthus elegans.

exanthematicus, syn. for Peplorhina anthracina.

filiferus, syn. for Cœlacanthus elegans.

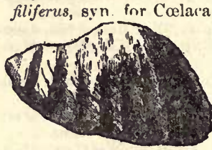

FIG. 1115.—Conchodus plicatus.

CONCHODUS, McCoy, 1848, Ann. and Mag. Nat. Hist., 2d. ser., vol. 2. [Ety. *conchos*, 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 enameled coronal surface. Type C. cornutus.

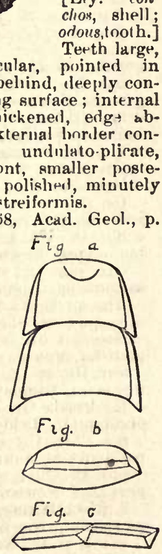

FIG. 1116.—Copodus cornutus. Maxillary form. *a*, Triturating surface; *b*, transverse profile; *c*, longitudinal profile.

pusillus, St. John & Worthen, 1883, Geo. Sur. Ill., vol. 7, p. 231, Kaskaskia Gr.

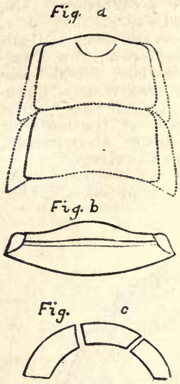

FIG. 1117.—Copodus cornutus. Mandibular form. *a*, Triturating surface; *b*, transverse profile; *c*, longitudinal profile.

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 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.

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.

variaus, St. John & Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 422, Waverly or Kinderhook Gr.

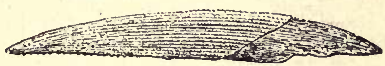

FIG. 1118.—Ctenacanthus triangularis.

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; *odous*, tooth.] Tooth somewhat fan like, with closely serrated edges, very porous and sulcated; position in the jaw unknown. Type C. cristatus.

FIG. 1119.—Ctenodus serratus.

dialophus, 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.

porrectus, Cope, 1878, Pal. Bull. No. 29, in Proc. Am. Phil. Soc., vol. 17, p. 527, Permian.

pusillus, 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 Enniskillen, in Geo. Mag., vol. 6. [Ety. *ktenos*, comb; *petalos*, 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 Antliodus. Type C. serratus.

bellulus, St. John & Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 398, St. Louis Gr.

limatulus, 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.

CTENOPTYCHIUS, 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.—Ctenoptychius cristatus. Natural size and magnified.

digitatus, Leidy, 1856, Trans. Am. Phil. Soc., vol. 11, St. Louis Gr.

pertenuis, 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.

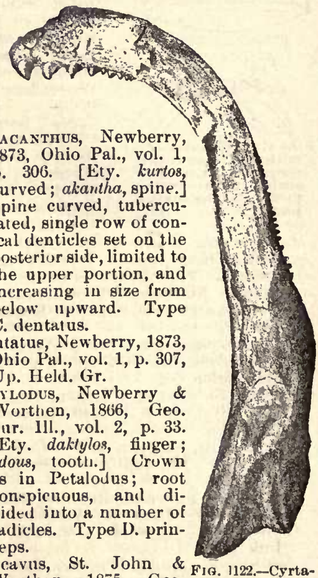

FIG. 1122.—Cyrtacanthus dentatus.

CYRTACANTHUS, Newberry, 1873, Ohio Pal., vol. 1, p. 306. [Ety. *kurtos*, 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.

concavus, St. John & Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 390, St. Louis Gr.

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.

FIG. 1123. — Dactylodus concavus. Convex face.

minimus, 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.

DELTODOPSIS, 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.

stludovici, 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; *odous*, 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. sublævis.

alatus, Newberry & Worthen, syn. for Chitonodus latus.

angularis, Newberry & Worthen, syn. for Orthopleurodus carbonarius.

angustus, see Deltodopsis angusta.

cinctu us, 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 Tæniodus fasciatus.

grandis, Newberry & Worthen, 1866, Geo. Sur. Ill., vol. 2, p. 101, Keokuk Gr. Probably syn. for Sandalodus lævissimus.

intermedius, St. John & Worthen, 1883, Geo. Sur. Ill., vol. 7, p. 153, St. Louis Gr.

latior, St. John & Worthen, 1883, Geo. Sur. Ill., vol. 7, p. 145, Keokuk Gr.

littoni, 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.

rhomboideus, 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.

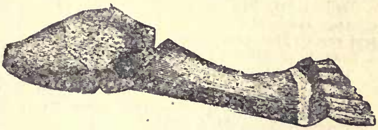

FIG. 1124.—Deltoptychius wachsmuthi.

DESMIODUS, St. John & Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 337. [Ety. *desmos*, a ligament; *odous*, a tooth.] This name was applied to a genus of bats, in 1826, by Prinz, 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.

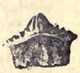

FIG. 1125.—Desmiodus costelliferus. Convex aspect.

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, (Orodus minusculus,) Geo. Rep. Ill., vol. 2, p. 67, Keokuk Gr.

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 anchylosed together, occipital bone in the type species three inches in thickness; relatively small maxillaries bearing a number of acute, conical, anchylosed 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 Sparidæ in 1810, Indice d'Littologia 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.

acinaces, 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.

FIG. 1127.—Diplodus latus.

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.

DIPTERUS, Sedgwick & Murchison, 1835, Geo. Trans., 2d ser., vol. 3. [Ety. *dipteros*, two-winged.] Diptera is an order of insects established by Linnæus. 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. brachypygopterus.

FIG. 1128.—Dipterus sherwoodi.

sherwoodi, Newberry, 1875, Ohio Pal. vol. 2, p. 61, Catskill Gr.

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.

gemmatus, 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.

ECTOSTEORHACHIS, 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; trabeculæ 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 bone segmented; 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.

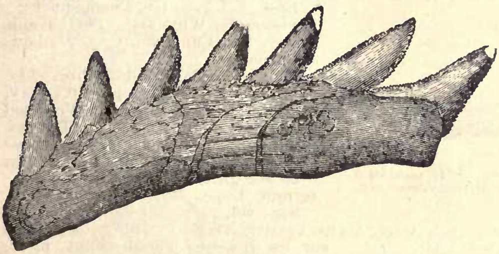

FIG. 1129.—Edestus vorax.

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.

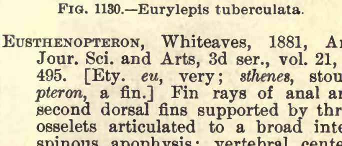

FIG. 1130.—Eurylepis tuberculata.

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.—Fissodus 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.

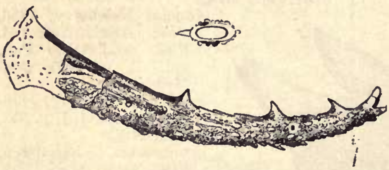

FIG. 1132.—Gampsacanthus typus. Side view of a spine magnified 2 diam., and transverse section.

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.

GNATHORHIZA, 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.

FIG. 1134.—Gyracanthus alleni. Anterior face.

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, Subcarboniferous.

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 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 inbeveled; base strong, obliquely produced; lateral angles well defined. Type H. dentatus, or, more properly, H. occidentalis.

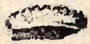

FIG. 1135.—Harpacodus occidentalis.

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, triturating plate, bearing radiating tuberculated ridges. Type H. lesleyi. Dr. Traquair, of England, regards Heliodus as a synonym for Palædaphus, Van Beneden & De-Koninck, 1864, Bull. Acad. Belg., vol. 17, p. 143.

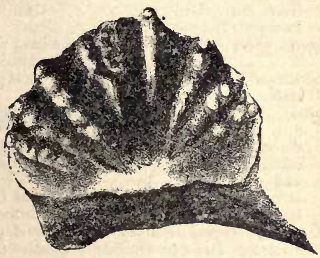

FIG. 1136.—Heliodus lesleyi.

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.

FIG. 1137.—Helodus gibbosus.

gibbus, Leidy, 1856, Trans. Am. Phil. Soc., vol. 11, p. 87, Keokuk Gr.

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, Pois. 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.

HYBOCLADODUS, 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.—Hybocladodus 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.
gurleiana, Cope, 1877, (Strigillina gurleiana,) Proc. Am. Phil. Soc., p. 191, Permian.
linguiformis, Cope, 1877, (Strigillina linguiformis,) Proc. Am. Phil. Soc., p. 53, Permian.

LAMBDODUS, 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.—Lambdodus 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.

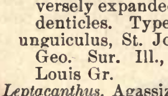
FIG. 1141.—Liodus calcaratus.

calcaratus, St. John & Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 336, Burlington Gr.
calcaratus var. grossipunctatus, 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.—Liognathus spatulatus.

abbreviated strong; crown thick, sharp-crested, and sometimes obscurely serrated; basal margins well defined; base

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.

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.

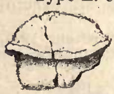

FIG. 1143. — Lisgodus curtus.

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.

hildrethi, Newberry, 1875, Ohio Pal., vol. 2, p. 56, Coal Meas.

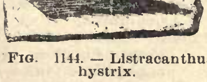

FIG. 1144. — Listracanthus hystrix.

hystrix, Newberry & Worthen, 1870, Geo. Sur. Ill., vol. 4, p. 372, Coal Meas.

Lophodus, Newberry & Worthen, 1870, Geo. Sur. Ill., vol. 4. This name was preoccupied by Romanowsky in 1864.

variabilis, see Agassizodus variabilis.

MACHÆRACANTHUS, Newberry, 1857, Bull. Nat. Inst., p. 6, and Ohio Pal., vol. 1,

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; surface 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.

FIG. 1146.—Macropetalichthys sullivanti. One-fifth natural size.

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.

MECOLEPIS, Newberry, 1857, Proc. Acad. Nat. Sci., vol. 8, p. 96. [Ety. *mekos*, large; *lepis*, a scale.] Heterocercal 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, Waverly or Kinderhook Gr.

FIG. 1148.—Mesodmodus exculptus.

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 triangle; dentary bones posteriorly acute, where they are overlapped by the articular portions of the mandibles, long and narrow, curving upward to the

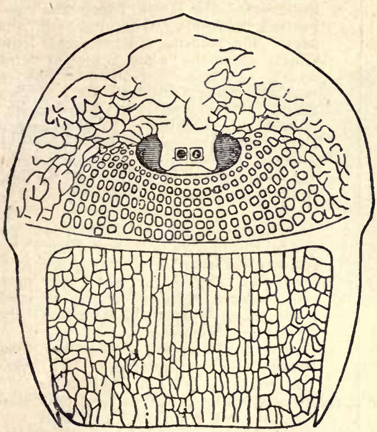

FIG. 1149.—Mycterops ordinata.

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.

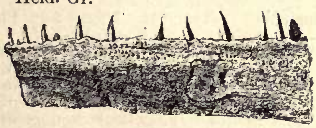

FIG. 1151.—Onychodus sigmoides. Fragment of the right mandible.

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.

dædaleus, 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.

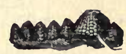

FIG. 1152.—Orodus mammillaris.

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.

turgidus, St. John & Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 310, Kaskaskia Gr.

FIG. 1153.—Orodus variabilis.

variabilis, Newberry, 1875, Ohio Pal., vol. 2, p. 50, Waverly Gr.

variocostatus, St. John & Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 304, Burlington Gr.

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.

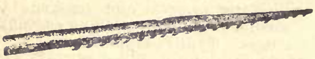

FIG. 1154.—Orthacanthus gracilis.

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.

ORTHOPLEURODUS, 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 presenting 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, Subcarboniferous.

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. *paláios*, 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.

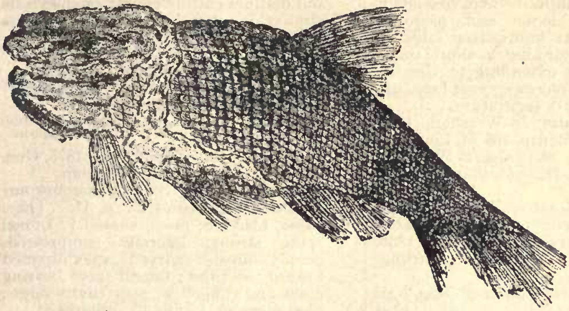

FIG. 1155.—Palæoniscus peltigerus.

scutigerus, Newberry, 1857, Proc. Acad. Nat. Sci. Phil., Coal Meas.

PELTODUS, Newberry & Worthen, 1870, Geo. Sur. Ill., vol. 4, p. 362. [Ety. *pelte*, 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.

FIG. 1156.—Peripristis semicircularis.

semicircularis, Newberry & Worthen, 1866, (Ctenoptychius semicircularis,) Geo. Sur. Ill., vol, 2, p. 72, Coal Meas.

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; *odous*, 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; *odous*, 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 buried; 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. sophiæ.

FIG. 1158.—Phœbodus sophiæ.

sophiæ, 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 imbeded, 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.

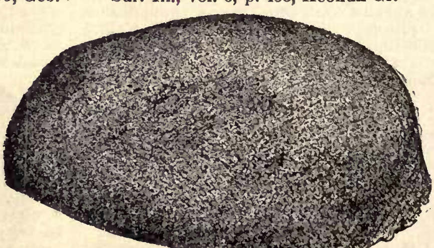

FIG. 1159.—Platyodus lineatus. Crown surface.

proclivis, St. John & Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 451, Waverly or Kinderhook Gr.

PLATYODUS, Newberry, 1875, Ohio Pal., vol. 2, p. 58. [Ety. *platys*, broad; *odous*, tooth.] Teeth elliptical in outline; crown arched in both directions; surface 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; *soma*, 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 ganoine; 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.

PNIGEACANTHUS, 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 Pnigeacanthus deltoides.

deltoides, St. John & Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 480, Keokuk Gr. But why should this species not be Pnigeacanthus 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 narrow, 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.

FIG. 1160.—Polyrhizodus littoni. Concave face,

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.

FIG. 1161.—Polyrhizodus modestus.

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.

PRISTICLADODUS, McCoy, 1855, British Pal. Rocks, p. 642. [Ety. from the two genera Pristis and Cladodus.] Teeth resemble Cladodus; median and lateral cusps strong; lateral edges sharp and more or less undulated. Type P. dentatus.

FIG. 1162.—Pristicladodus springeri.

springeri, St. John & Worthen, 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 inbeveled, 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 channeled 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,

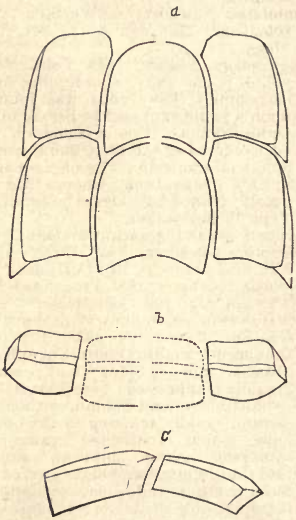

FIG. 1163.—Psammodus crassidens. *a*, Median dental plates; *b*, transverse profile; *c*, longitudinal profile.

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.

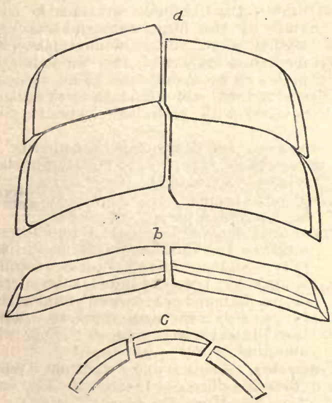

FIG. 1165.—Diagram of Psammodus springeri. *a*, Mandibular series; *b*, transverse profile; *c*, longitudinal profile.

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.

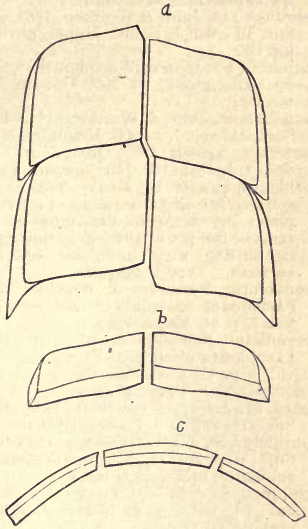

FIG. 1166.—Diagram of Psammodus springeri. *a*, Maxiliary series; *b*, transverse profile; *c*, longitudinal profile.

porosus, Agassiz, 1843, Recherch. Poiss. Foss., t. 3, p. 112, Kaskaskia Gr.

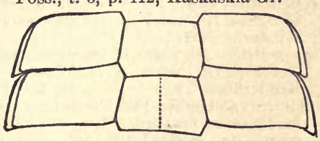

FIG. 1167.—Hypothetical diagram, showing median dental plates of Psammodus springeri.

reticulatus, Newberry & Worthen, 1866, Geo. Sur. Ill., vol. 2, p. 109, Kaskaskia Gr.

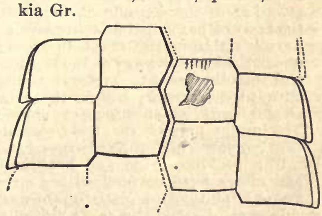

FIG. 1168.—Hypothetical diagram of Psammodus turgidus.

rhomboideus, 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 lævissimus.

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.

cunulatus, 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 cunulatus,) Kaskaskia Gr.

obliquus, St. John & Worthen, 1883, Geo. Sur. Ill., vol. 7, p. 66, Waverly or Kinderkook Gr.

placenta, Newberry & Worthen, 1866, (Helodus placenta,) Geo. Sur. Ill., vol. 2, p. 80, Waverly or Kinderkook 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, Claypole, 1883, Proc. Am. Phil. Soc., p. 664, Upper Chemung Gr.

PTYCTODUS, Pander Uber die Ctenodipterinen 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, with fulcral 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.

Fig. 1170.—Ptyctodus calceolus. Side view.

scutellatus, Newberry, 1857, Proc. Acad. Nat. Sci., vol. 8, p. 98, Coal Meas. Too poorly defined to warrant recognition.

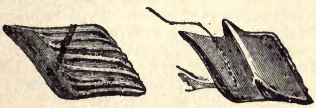

Fig. 1171.—Pygopteris mandibularis. Outside and under surface of scale magnified.

Rhadinichthys, Traquair, 1877, Quar. Jour. Geo. Soc. Lond., vol. 33, p. 548. [Ety. *rhadinos*, slender; *ichthys*, fish.] Body slender; jaws with a row of incurved laniaries, 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.

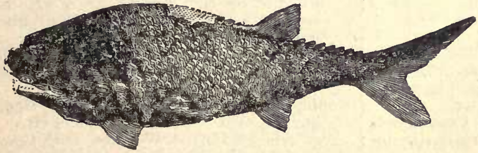

Fig. 1172.—Rhadinichthys alberti.

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. hibberti.

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.

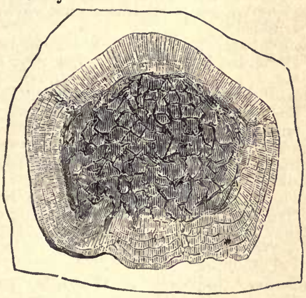

Fig. 1173.—Rhizodus occidentalis. Scale.

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 triturating or cutting edge. Type R. secans.

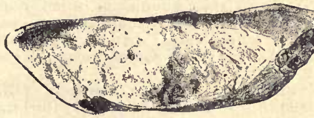

Fig. 1174.—Rhynchodus frangens.

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. lævissimus.
lævissimus, 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.

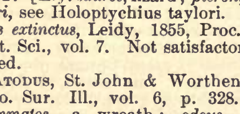

FIG. 1175.—Sandalodus spatulatus.

Sauripteris, Hall, 1843, Geo. Rep. 4th Dist. N. Y. [Ety. *sauros*, lizard; *pteron*, wing.]
taylori, see Holoptychius taylori.
Sicarius 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. *stemmatos*, 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.
prænuntius, 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; *odous*, 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; *odous*, 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; *odous*, 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; *odous*, 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*, prophetical; *odous*, tooth.] Posterior teeth distinguished from Deltoptychius by the absence of the secondary lobe, the anterior part of the tooth forward of the posterior prominence being plain, as in Stenopterodus. 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; *odous*, 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.

FIG. 1177.—Venustodus robustus.

tenuicristatus, St. John & Worthen, 1875, Geo. Sur. Ill., vol. 6, p. 348, Keokuk Gr.

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 occasionlly 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 laminæ; 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, Thyrsidium.
FAMILY TUDITANIDÆ.—Dendrerpeton, Leptophractus, Tuditanus.

ORDER PELYCOSAURIA.

FAMILY BOLOSAURIDÆ.—Bolosaurus, Chilonyx, Lysorophus.
FAMILY DIADECTIDÆ.—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 narrow; 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.

AMPHIBAMUS, Cope, 1865, Proc. Acad. Nat. Sci. Phil., p. 134. [Ety. *amphi*, both; *bama*, a step; from its two modes of progressing, swimming, and walking.] Teeth small, simple. equal on margins of jaws; sclerotic plates on eye; table of vertex produced; no horns; propodial bones distinct; tarsus cartilaginous; neural spines of caudal vertebræ well developed; (?) centra. Type A. grandiceps.

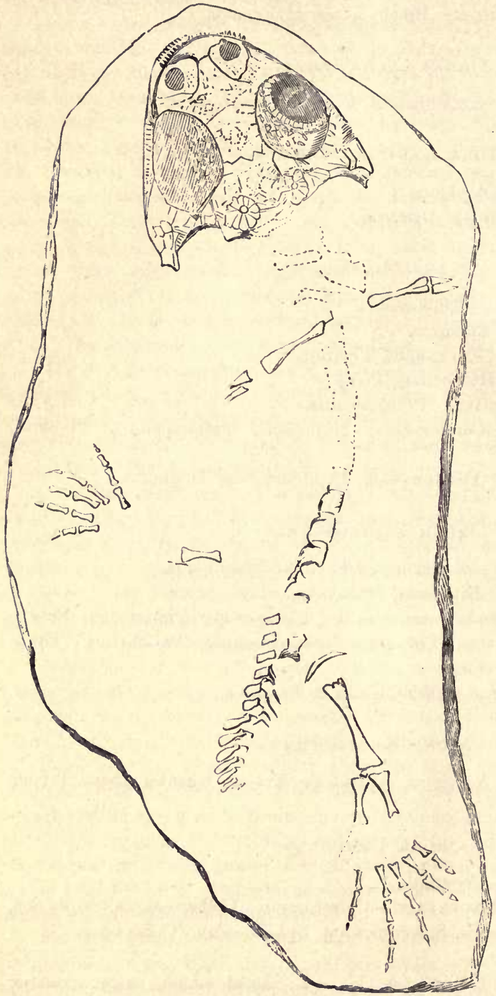

FIG. 1178.—Amphibamus grandiceps. Two diam.

grandiceps, Cope, 1865, Proc. Acad. Nat. Sci. Phil., p. 134, and Geo. Sur. Ill., vol. 2, p. 135, Coal Meas.

ANISODEXIS, Cope, 1882, Pal. Bull. No. 35, and Proc. Am. Phil. Soc., p. 459. [Ety. *anisos*, unequal; *dexis*, a bite.] Teeth on premaxillary; maxillary, and dentary bones of unequal lengths, some very large, others very small; dentinal inflections straight, nearly reaching the pulp-cavity; cranial bones sculptured; vertebræ rhachitomous. Type A. imbricarius.

imbricarius, Cope, 1882, Pal. Bull. No. 35, and Proc. Am. Phil. Soc., p. 459, Permian.

ARCHÆOBELUS, Cope, 1877, Proc. Am. Phil. Soc., vol. 17, p. 192. [Ety. *archaios*, ancient; *belos*, a weapon.] Maxillary bone with a large, hollow tooth, with two opposite shallow grooves at the base; crown hollow; skeleton unknown. Type A. vellicatus.

vellicatus, Cope, 1877, Proc. Am. Phil. Soc., vol. 17, p. 192, Permian.

BAPHETES, Owen, 1853, Jour. Geo. Soc. London, vol. 10, p. 207. [Ety. *bapto*, I dip or dive, a diving animal.] Teeth conical, curved; outer series one or two lines in diameter, inner series three lines or more; implanted and anchylosed in shallow sockets; lower third of teeth longitudinally striated; cranial bones corrugated; head broad. Type B. planiceps.

minor, Dawson, 1870, Can. Nat. and Geol., Coal Meas.

planiceps, Owen, 1853, Jour. Geo. Soc. London, vol. 10, p. 207, and Acad. Geol., p. 359, Coal Meas.

BOLOSAURUS, Cope, 1878, Pal. Bull. No. 29, and Proc. Am. Phil. Soc., vol. 17, p. 506. [Ety. *bolos*, a lump; *sauros*, a lizard.] 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 planiceps.

rapidens, see Chilonyx rapidens.
striatus, Cope, 1878, Pal. Bull. No. 29, and Proc. Am. Phil. Soc., vol. 17, p. 507, Permian.

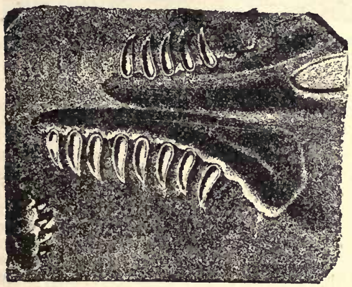

FIG. 1180.—Brachydectes newberryi.

BRACHYDECTES, Cope, 1868, Proc. Acad. Nat. Sci. Phil., p. 214. [Ety. *brachys*, short; *dektes*, a biter.] Rami short, stout; teeth subequal, elongate, cylindric 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.

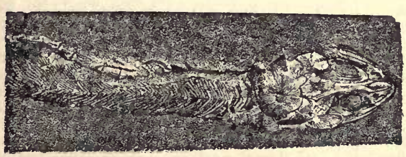

FIG. 1181.—Ceraterpeton tenuicorne.

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 fur 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.
macrospondylus, 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 branchihyals three, the anterior two each supporting one pleural branchihyal and the third supporting one; hæmal branchihyal on the inner side of the ceratohyal, approaching the median line, and with elongate pleural element. Type C. gyrinoides.

FIG. 1182.—Cocytinus 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.

hypantricus, 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 Tuditanus obtusus.

oweni, Dawson, 1863, Quar. Jour. Geo. Soc., vol. 19, p. 469, and Acad. Geol., p. 368, Coal Meas.

DIADECTES Cope, 1878, Pal. Bull. No. 29, and Proc, Am. Phil. Soc., vol. 17, p. 505. [Ety. *dia*, crosswise; *decktos*, 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. sideropelicus.

latibuccatus, see Empedias latibuccatus.

molaris, see Empedias molaris.

phaseolinus, see Empedias phaseolinus.

sideropelicus, 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, (Clepsydrops 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.

ECTOCYNODON, 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 ochordal; 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; vertebræ with hyposphen on the posterior and hypantrum 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 Acadian Geol., p. 382. [Ety. *eos*, the dawn; *sauros*, a sea-fish.] Founded upon vertebræ, with biconcave centra and free neural arch, and closed not ochordal foramen. Type E. acadianus.

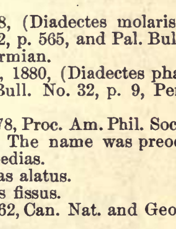

FIG. 1184.—Eosaurus acadianus. ½ Diam. *a*, Transverse section.

acadianus, Marsh, 1862, Can. Nat. and Geol., 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.

erythroliticus, see Eryops erythroliticus.

ERYOPS, Cope, 1877, Proc. Am. Phil. Soc., vol. 17, p. 188. [Ety. *eruo*, I protect; *ope*, view.] Vertebræ rhachitomous 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, (Ichthycanthus 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. *eurys*, 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.

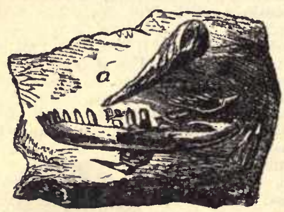

FIG. 1185.—Hylerpeton dawsoni. Mandible and portion of cranial bone.

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 ½ 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.

aciedentatus, Dawson, 1860, Quar. Jour. Geo. Soc., vol. 16, p. 268, and Acad. Geol., p. 376, Coal Meas.

FIG. 1186. — Hylonomus aciedentatus. Maxillary bone magnified; *a*, natural size.

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 amphicœlian. 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.

LYSOROPHUS, 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 amphicœlian, 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; branchihyal 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, (Sauropleura 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 fontanel; surface sculptured; mandible with an angular process; teeth conic, obtuse, larger anteriorly; mandible supporting 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 continuous with the postorbital region; zygomatic 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.

PELION, 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 project backward; mandibular rami slender, curved; vertebræ have centra as broad as long, and medially contracted; fore limbs stout; humeri long, thickened proximally, flattened and dilated distally; ulna and radius united proximally, narrowing the arm proximally while expanded distally; left hand exhibits four digits, of which the third from the inner is the longer; number of phalanges is 2, 3, 4?; carpus not osseous. Type P. lyelli.

FIG. 1190.—Pelion 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 linearis.

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.

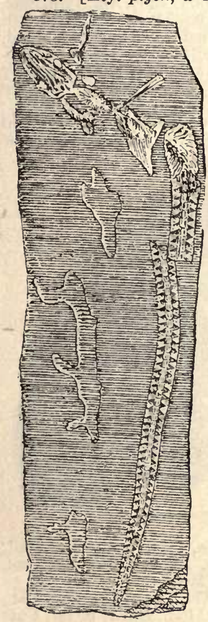

FIG. 1192.—Ptyonius serrula.

marshi, Cope, 1875, (Colosteus marshi,) Trans. Am. Phil. Soc., vol. 14, p. 24, and Ohio Pal., vol 2, p. 375, Coal Meas.

nummifer, Cope, 1875, Ohio Pal., vol. 2, p. 374, Coal Meas.

pectinatus, Cope, 1868, (Sauropleura 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.

Rhachitomus, 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 Tuditanus longipes.

newberryi, Cope, 1875, Ohio Pal., vol. 2, p. 404, Coal Meas.

pectinata, see Ptyonius pectinatus.

remex, see Oestocephalus remex.

SAUROPUS, 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.

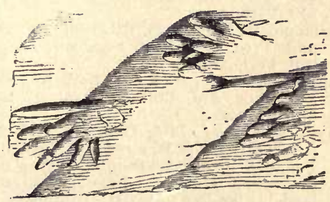

FIG. 1193.—Sauropus primævus.

primævus, Lea, 1849, Trans. Am. Phil. Soc., vol. 10, Coal Meas.

sydnensis, Dawson, 1868, Acad. Geol., p. 358, Coal Meas.

unguifer, 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.

SPHÆROPEZIUM, 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 rhachitomous, 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.

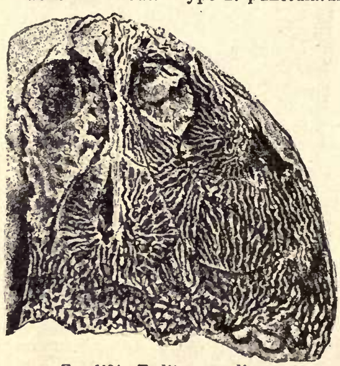

FIG. 1194.—Tuditanus radiatus.

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.
Aciedentatus, 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.
Acutulus, 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.
Alcicornis, 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 pertaing to an anchor.
Ancilla—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.
Annulariifolius, 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.
Anteceptus, 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.
Arbuscula—A shrub.
Arcanus, a, um—Closed, shut up.
Archimediformis, e—Archimediform.
Arcticus, a, um—Arctic.
Arctifossa—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.
Argenturbicus, 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.
Aspratilis, 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.

Baculum—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.
Biimbricatus, a, um—Double-imbricated.
Bijugus, a, um—Yoked two together.
Bilabiatus, 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.
Bimucronatus, a, um—Two-pointed.
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.
Bisulcus, 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.
Cæspitosus, 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.
Calycinus—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, canaliculated.
Canalis—A channel or groove.
Cancellatus, 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.
Chiromorphus, a, um—Hand-formed.
Chromaticus, a, um—Chromatic, colored.
Chrysalis—Chrysalis.
Cicatricosus, a, um—Full of scars.
Ciceronius—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.
Circumliratus, 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.
Complanatus, a, um—Leveled, 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.
Crassicardinalis, 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.
Crebriseptus, 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—Chalk-like.
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.
Cruciatus, 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-formed.
Cuneiformis, e—Wedge-shaped.
Cuneolus—A little wedge.
Cuneus—A wedge.
Cuniculosus, a, um—Full of caves.
Cuniculus—A cradle, cavity.
Cunulæ—A little cradle.
Curiosus, a, um—Curious.
Curticardinalis, e—Short-hinged.
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 Cyclopteris.
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.
Cymosus, 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.
Dactylodus, 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.
Decrescens—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.
Delicatulus, 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.
Densmammillatus, a, um—Having mammillated teeth.
Densus, a, um—Dense, thick.
Dentalium—A plow-share.
Dentatus, a, um—Toothed.
Denticulatus, a, um—Denticulated, having small teeth.
Dentilineatus, a, um—Tooth-lined.
Denudatus, a, um—Denuded.
Deparcus, 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 Dictyopteris.
Dictyota—Net-worked.
Dictyum—A net.
Difficilis, e—Difficult, rough.
Diffidens—Diffident, distrusting.
Diffluens—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.
Diplostegioides—Like Diplostegium.
Diplotesta—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.
Dissimilaris, 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.
Expatiatus, 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 fasces.
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.
Festinatus, 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 striæ.
Fiscellus—A small basket woven of slender twigs.
Fissicosta—Having divided costæ.
Fissilis, e—Split.
Fissiplica—Having divided plications.
Fissuratus, a, um—Fissured.
Fissurellus, a, um—Having a little cleft.
Fisus, 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.
Fœcundus, a, um—Fruitful, abundant.
Fœtoideus, a, um—Like a tumor.
Foliaceus, a, um—Foliaceous, like leaves, leafy.
Foliatus, a, um—Leaved, having leaves.
Foliosus, a, um—Leafy, full of leaves.
Folium—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.
Fraternus, 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.
Furcicarinatus, 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.
Gemmifer, 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.
Gratiosus, 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.
Grossiplicatus, a, um—Thick-plaited.
Grumus—A little heap.
Gypseus, a, um—Covered or plastered with gypsum.
Gyracanthus—Round spine.
Gyrinoides—Like a tadpole.
Gyroceras—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.
Herculaneus, 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.
Hiulcus, 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.
Hyperbolæus, a um—Extreme.
Hyperboreus, a, um—Very far north.
Hypniformis, e—Like Hypnum.
Hystricosus, a, um—Thorny.
Hystriculus, 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.
Ilicifolius, 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 resembler.
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.
Inclinatus, a, um—Inclined, bent.
Inclinis, e—Bending.
Incluspora—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.
Incrustans—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.
Infertus, 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.
Infundibulum, 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.
Interstrialis, 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.
Lagena—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.
Lepidorachus, e—Having a scaly ridge.
Lepidus, a, um—Pretty.
Lepis—A scale.
Leptænoides—Like Leptæna.
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.
Lichenoideus, a, um—Like a lichen.
Ligoniformis, e—Like a mattock.
Liliiformis, 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.
Limbatus, a, um—Bordered.
Limiformis, e—Lima-shaped.
Limitaris, e—Bounded, limited.
Limulurus—Limulus, tail.
Lineanodus, a, um—Having lined knots.
Linearifolius, a, um—Having linear leaves.
Linearis, e—Pertaining to a line, linear.
Linearius, 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, lingulate.
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 "Adderstongue."
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.
Machæriformis, e—Sword-shaped.
Macilentus, a, um—Meager, thin, lean.
Macrocephalus, a, um—Long-headed.
Macrochirus, a, um—Long handed.
Macrodactylus, 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.
Macropleura—Having long sides.
Macropora—Having long pores.
Macrops—Having large eyes.
Macropterus, a, um—Long-winged, or large-finned.
Macropthalmus, a, um—Long-eyed.
Macrospira—Having a long spire.
Macrospondylus, a, um—Having long vertebræ.
Macrostomus, a, um—Having a long mouth.
Macrostriatus, a, um—Having long striæ.
Macrostylus, a, um—Having long spines or columns.
Macrothyris—Having a long foramen.
Macrurus, a, um—Long-tailed.
Mactriformis, 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.
Mamillanus, a, um—Swelling, protuberant.
Mammatus, a, um—Covered with protuberances.
Mammiferus, 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.
Micropthalmus, a, um—Small-eyed.
Micropus—Small foot.
Microscopicus, a, um—Microscopic.
Microstigma—Small dot.
Microstylus—Small spile or pale.
Micrurus, 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.
Minutulus, 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.
Multattenuatus, 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.
Multivolvis, 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, si ent.
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.
Natator—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.
Nervatus, a, m—Full of nerves or fibers.
Nervosus, a, um—Full of fibers, sinewy.
Neuropteroideus, 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.
Nodobrachiatus, 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.
Nodostrius, 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.
Octonarius, a, um—Of the number eight.
Octonotatus, a, um—Having eight marks or tracks.
Oculatus, a, um—Having eyes.

Oculiferus, a, um—Eye-bearing.
Oculinus, a, am—Like an eye.
Odontopteroides—Like Odontopteris.
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 Oreopteris.
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.
Ornithicnoides—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.
Ovalis, e—Oval, egg-shaped.
Ovatifolius, a, um—Ovate-leaved.
Ovatipora—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.
Pachychirus—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 Pachypteris.
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.
Paludiniformis, 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 sea-side.
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.
Parvirostris—Having a little beak.
Parvispira—Having a small spire.
Parvituba—Having a small tube.
Parviusculus, 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.
Pauperculus, a, um—Poor.
Pecteniformis, e—Shaped like a Pecten.
Pectenoideus, 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.
Penicillus—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.
Perlatus, a, um—Very wide.
Permarginatus, 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 channeled.
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.
Petechialis, 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.
Plagosus, 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.
Planogyratus, 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.
Platypus—Broad-footed.
Platyrachis—Having a flat rachis.
Platys—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 kind of comet.
Politus, a, um—Polished, smoothed.
Polydactylus, a, um—Many-fingered.
Polygonius, 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.
Præcedens—Going before, surpassing.
Præciptus, a, um—Anticipated, going before.
Præcursor—A forerunner.
Prælongus, 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.
Prateriformis, e—Prateriform.
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.
Proboscidialis, 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.
Pulicaris—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.
Quadratifolius, a, um—Quadrate-leaved.
Quadratus, a, um—Four-cornered, squared, quadrate.
Quadribrachiatus, a, um—Having four arms.
Quadriceps—Square-headed.
Quadricinctus, a, um—Four banded or girdled.
Quadricostatus, a, um—Four-ribbed.
Quadrilateralis, e — Quadrilateral, four-sided.
Quadrimucronatus, a, um—Having four sharp points or spines.
Quadripartitus, a, um—Four-parted.
Quadriseriatus, a, um—Having four series.
Quadrispinus, a, um—Four-spined.
Quadrisulcatus, 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, e—Straight-formed.
Rectilatera—Having straight sides.
Rectilateralis, e—Straight-sided.
Rectilaterarius, a, um—Straight-sided.
Rectilinea—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.
Rhabdocarpus, 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.
Rhomboideus, 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.
Robusteus, 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.
Salisburioides—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—Waiter-shaped.
Scutigerus, a, um—Shield-bearing.
Scutulatus, 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, secreted.
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.
Semiplicatus, a, um—Half-plaited.
Semipunctatus, 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.
Sphæricus, a, um—Of or belonging to a ball, spherical.
Sphærion—A little ball or pill.
Sphærodactylus—Spherical toed or fingered.
Sphæroidalis, e—Spheroidal.
Sphærulatus, 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.
Spiniferus, 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 spine-feelers.
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.
Spironema—Having spiral threads or lines.
Spirorbis—Spire-whorl.
Spississeptus, 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.
Stellatimsulcatus, 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.
Stigmosus, a, um—Full of brand-marks, branded.
Stillativus, a, um—Dropping.
Stipatus, a, um—Crowded together, surrounded, 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 abbreviated.
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.
Subconcavus, a, um—Subconcave.
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 corpulent.
Subcrassus, a, um—Somewhat thick.
Subcrenulatus, a, um—Somewhat crenulated.
Subcuneatus, a, um—Somewhat wedge-shaped.
Subcuspidatus, a, um—Somewhat pointed.
Subcylindricus, a, um—Somewhat cylindrical.
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 emarginated.
Subfalcatus, a, um — Somewhat scythe-shaped, subfalcate.
Subfurcatus, a, um—Somewhat forked.
Subfusiformis, e — Somewhat spindle-shaped.
Subglobosus, a, um—Somewhat globose.
Subgracilis, e—Somewhat slender.
Subhorridus, a, um—Somewhat rough.
Subimbricatus, a, um—Somewhat imbricated.
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 margined.
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.
Subpapillosus, 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.

Subrhomboideus, 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.
Subscitulus, a, um — Somewhat handsome.
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.
Subtæniatus, 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.
Subtilitus, 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 or tube formed.
Subtumidus, a, um—Somewhat tumid.
Subturbinatus, 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.
Subvadus, 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—Extravagent, excessive, exaggerated.
Supracingulatus, a, um—Encircled or girdled 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 cast.
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, griping, 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—Slenger-fingered.
Tenuidens—Having slender teeth.
Tenuidiscus—Having a thin-disk.
Tenuifilum—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—Checkered, tessellated.

Testudinarius, a, um—Arched like a tortoise shell.
Tetragonocephalus—Having a quadrangular head.
Tetragonopthalmus—Having square eyes.
Tetragonum—A quadrangle.
Tetraptyx—Having four folds.
Tetricus, a, um—Forbidding, stern.
Textiligerus, a, um—Web-bearing.
Textilis, e—Woven, plaited, textile.
Textus, a, um—Woven, fabricated.
Thærodactylus, 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.
Tortalinea—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, um—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.
Tricingulatus, 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.
Tridentiferus, 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.
Triserratus, a, um—Three-notched.
Trisinuatus, a, um—Three-furrowed.
Trisulcatus, a, um—Three-furrowed.
Trisutura—Having three sutures.
Trituberculatus, a, um—Having three tubercles.
Trivolvis, 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.
Tuberculosus, 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.
Turritella—A little tower.
Turritiformis, 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.
Umbonatus, a, um—Having a shield, embossed.
Umbraculum—A shade, umbrella.
Umbrosus, 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.
Undulostriatus, 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.
Varicus, 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.
Varus, 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—Prophetical.
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.
Vermicularis, 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.
Vinctus, 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.