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CONDUCTED BY

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Page 99, bottom line, for *C* read *b*.
177, line 2, for *require* read *requires*.
182, 23, for *were* read *was*.
185, 3 from bottom, for *ncreased* read *increased*.
bottom line, for *b* read *by*.
187, 16 from top, for *Ice and* read *Iceland*.
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189, 8 from bottom, for *entirey* read *entirely*.
208, 11 from bottom, for *variolus* read *variolous*.
375, 20 from top, for *Mineraloy* read *Mineralogy*.
376, 27 from top, for *S. E. D.* read *J. E. D.*

Tertiary Formations at Hyde Park near Poughkeepsie N.Y.

THE

AMERICAN

JOURNAL OF SCIENCE, &c.

GEOLOGY, MINERALOGY, TOPOGRAPHY, &c.

REMARK.

The letter at the bottom of the page will explain the origin of this article. Although the communications of Dr. Hildreth to Mr. Atwater are dated in 1819, the information appears to be valuable and interesting. As it was drawn up in answer to certain queries relating to subjects of a miscellaneous nature, we shall not hesitate to separate the different topics as they happen to correspond with the general divisions of this Journal.—Ed.

Art I.—*Facts* relating to certain parts of the state of Ohio.*

"Nature of the soil, hills, valleys, plains, caverns, rocks, lakes, ponds, rivers, and streams; the quality of the water,

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* *Extract of a letter to the Editor, from Caleb Atwater, Esq. dated Circleville, Aug.* 4, 1825.

Dear Sir,

Several years since, I undertook to collect information as to the early settlement of this state, its geography, geology, natural history, &c., with the intention of publishing "Notes on Ohio." Circumstances entirely beyond my control prevented my publishing the work, and I now forward you a small portion of the information, which I have collected. It is in the form of answers to questions put by me to S. P. Hildreth, M. D., of Marietta, Ohio, whose character is too high to need commendation. The information itself is becoming every day more and more valuable, which must be my apology for offering it to the readers of your very valuable Journal of Science. I have other highly interesting communications, on the same subjects, from gentlemen of science and learning, which I could also forward to you, if what I now furnish prove satisfactory to your readers.

the nature and composition of rocks, and their position, whether in strata or otherwise, inclined or horizontal; the strata observed in digging wells, whether for salt or common water; petrifactions and shells?"

The soil in Washington county, except the river and creek bottoms, is composed principally of clay, intermixed with loam. It is in most places, except upon the south sides of hills that have been frequently burnt over by the spring and autumnal fires, covered with a coat of black, loose, vegetable mould, of from two to six inches in thickness—where fires in the woods have been least frequent, there this vegetable mould most abounds. The soil is no where very stony: the hill-tops are in some places covered with secondary limestone, in a stratum one or two feet in thickness, full of crevices, cracks, and broken pieces, as if the composition had been exposed to the sun, while it was yet moist and soft, and it had cracked, and shrunk in drying. The soil in some parts of the county is sandy; but those tracts are usually in the neighbourhood of large streams of water, and appear to me to be alluvial. The river and creek bottoms are entirely alluvial; being composed of earth brought from the higher grounds, by rains, and by periodical freshets, in the long lapse of ages that have succeeded the receding of the ocean from this part of our globe. The surface is composed of decayed vegetables; and as you proceed in depth the composition is more clayey, but still mixed with vegetable mould, until you reach the gravel and loose stones, on a level with the present bed of the stream, on which the bottom land is situated.

The face of the country is generally broken; being much diversified with hills, ridges, and long slopes of uneven land; but will generally admit of cultivation, either for corn, wheat, meadow, or pasture; and if for neither of these, it will do for wood-land and timber, of which in a few years there will be a great scarcity in many parts of our country, unless our farmers pursue a more systematic course in clearing up their lands, and cease to burn and destroy the most valuable timber their farms with as little remorse as they would a field of wheat stubble. Indeed, at this day, there are many farms in this county, particularly near the rivers, where they have often lost their fences by high water, which have not timber enough on them to keep their fences in repair. Extensive plains are not common in this part of the state. Those of the greatest extent are alluvial, are in the neighbourhood of rivers, and appear to have been at some remote period their beds. There is a large one at Belpre; one at Union on the Muskingum river; and one at Marietta, on which a considerable part of the town is located, and those ancient works are built. The surface of that at Marietta, is 65 feet above the present bed of the river. In sinking wells on this plain, you first pass through a stratum of gravel of considerable thickness; after which it is loose sand, until you come on a level with the bed of the river, when you again find gravel, and other appearances, much resembling its present state.

The water in many of our wells, is supplied by the rivers; more particularly in those on the bottom lands, and it rises or falls in accordance with the rivers; others are supplied by springs, and not influenced by the fluctuations of the streams. In that part of the town of Marietta, subject to be flooded, the water is sometimes for two or three days together from six to eight feet deep over the tops of the wells. All this time there is a continual whirlpool over the well's mouth; and while it is rising, and only a foot or two deep on the adjacent surface, the water rushes with great violence and noise down the well. A bystander would think the well must soon be full; but so far from this, there is a continual draft of the water, so long as it remains above the surface of the earth at the well, and it passes off through the gravel, and sand at the bottom, and finds its way to the river again; some wells are much injured by the floods; their walls giving way, or settling; and all require cleansing after the water subsides. The water in most wells is hard, and not good for washing; while the springs and rivulets have generally soft water. The water of the Muskingum is impregnated with lime, while the water of the Ohio is softer, and mixes readily with soap. A great part of the inhabitants, living on its banks, make use of it for drinking and culinary purposes, both summer and winter.

No caverns, of any great extent, have as yet been discovered in this county. There are some of considerable magnitude, near the heads of the west branch of the little Hockhocking. It was formerly a noted place for bears, and was much frequented by hunters. The most extensive that I have heard of in the Ohio Company's purchase, are on the head waters of Raccoon creek. The rocks are sandstone, and form cliffs and precipices of vast height and magnitude, for this country. Saltpetre-earth is found in most of them, and as many as 1000 lbs. of saltpetre have been obtained from one cavern. The rocks in the county of Washington, are generally coarse and fine sandstone. The finer sort are used for finishing and ornamenting our fire-places; for window-sills and caps; and for monuments in our grave-yards. They are susceptible of a finish nearly or quite equal to marble. The coarser kind are used for the walls of houses, for underpinnings to brick buildings, for cellars, and for wells; some quarries split so freely that stones may be obtained of any length and thickness that is desired; and with almost as little trouble as would be required to split a log of wood. Some of the quarries are in strata of various thickness, from four to twenty-four inches; I believe always in horizontal layers. Others are in vast cliffs of perpendicular rock, from 50 to 100 feet in height; in strata of 10 or 20 feet; these are usually in the narrows, near the river Ohio.

Limestone is common all over the county. It is found on the tops of many of the hills, but in far greater quantities in the earth at their bases; beds of it being brought to light by the washing away of the superincumbent earth in the courses of rivers and creeks. It is generally impregnated with iron, which gives it a brown, or ochreous cast, when burnt and slaked for use; this does not prevent its making excellent mortar, when duly proportioned with sand; and to give it that clear white so much admired in the plaister for inside work, we make use of a coat prepared from lime made of burnt shells, than which nothing can give a purer white.

Below these beds of limestone, you pass through a stratum of clay, and sometimes fossil coal; this is of various depths, in different parts of the county; after which you come to that vast and extensive bed of rock, which underlies the country, from the Alleghany mountains to the Mississippi river, for aught I have heard. The thickness of this rock has never yet been ascertained, but, at the depth of from 150 to 400 feet, this rock is strongly impregnated with salt, and if on boring to that depth you are so fortunate as to find water, I believe that water invariably holds in solution a greater or less quantity of the muriate of soda. Two attempts at boring for salt water have been made in this county. The first was made two or three years since, about 40 miles from Marietta, near the Muskingum river; they proceeded to the depth of about 200 feet, and, their prospects of obtaining water rather diminishing than increasing, they gave up the work.

The other trial is now making, on the waters of Little Muskingum creek, about 12 miles from Marietta It is two years since they began to bore, working at it only in the summer and autumnal months. They have penetrated the rock to the depth of 300 feet, and have as yet found no salt water; but the cattle are very fond of licking the fine dust of the rock, which comes up on the drills in the form of mud, which is an evidence that it contains salt. There is a continual discharge of carbonated hydrogen gas from the well; and also from the bed of the creek on which the well is situated, at various places, for the distance of half a mile. This gas is highly inflammable, and where there is a free discharge of it, will take fire on the surface of the water, on the application of a lighted stick, or the flash of a gun, and continue burning for days, unless put out by a heavy shower or high wind. It was this discharge of gas that induced the present proprietors to search for salt water. It being invariably found to accompany all the salt water, of any consequence, that has been discovered in this western country.

It is this discharge of gas, that brings the salt water from such vast depths in the bowels of the earth, to the surface. And where water has been discovered, and the supply of gas has failed, the water has immediately sunk in the well, and could not, by any means used, be brought again to the top of the well.

They commonly bore, at the well on Little Muskingum, to the depth of 400 or 500 feet, unless salt water is found before they reach that distance. They are encouraged thus to continue, from their knowledge of the depth at which others obtained very good water, on the west branch of Duck creek, four or five miles above the line of Washington, in Guernsey county. They have sunk two wells, which are now more than 400 feet in depth; one of them affords a very strong and pure water, but not in great quantity. The other discharges such vast quantities of petroleum, or, as it is vulgarly called "*Seneka oil*," and besides, is subject to such tremendous explosions of gas, as to force out all the water, and afford nothing but gas for several days, that they make but little or no salt. Nevertheless, the petroleum affords considerable profit, and is beginning to be in demand for lamps, in workshops and manufactories. It affords a clear brisk light, when burnt in this way, and will be a valuable article for lighting the street lamps in the future cities of Ohio.

The rock in which these wells are sunk is of various density and composition. In some places for one or two feet, the workmen can gain only an inch, or perhaps half an inch, in a day, and then they have their drills to sharpen every few minutes; the rock is so much harder than the hardest steel, that it is very difficult to get a drill to stand it at all.

At other places in the rock, they penetrate from one to three feet in a day. In this course of drilling they often pass through as many as three or four layers of fossil coal, at various depths in the rock; and it is generally the fact, that immediately before the salt water appears, they pass a stratum of stone coal of considerable thickness—perhaps six or eight inches.

Petrifactions are common, but not so frequently found as in many other parts of the state, particularly in the neighbourhood of Zanesville. The greatest collections are found intermixed with the gravel, on the elevated plains, I have before mentioned. I have seen several which were full of cells, and resembled bits of honey-comb, or wasps' nests, turned to stone—others appear to be shells of various forms and sizes, but different from any I have seen in our rivers. Vegetable productions are also found in a petrified state; some resembling bits of corn-stalks. I have in my possession a petrifaction, which appears once to have been a large Poke-root (Phytolacca Decandra). It is the best preserved of any I have seen; it retains the internal structure of the root, as perfect, and distinct, as if just pulled from the earth; and those fine lines, and circular impressions on the cortical part, are as plain and as easily distinguished as they are on the fresh root. It appears to be silicious, as it affords fire readily, with the steel. I have discovered, at two different places within a few miles of Marietta, some very curious impressions of vegetables, in a loose slaty stone, and in a red ochreous earth, that was in a middle state between ochre and slate. The impressions in the first resembled the leaves of white clover, and were very perfect; they appeared to be distributed through the whole mass of stone, which easily separated into thin layers and, between the contiguous layers, was to be seen the perfect impression of clover leaves. Those in the ochreous bed, were the perfect impressions of fern leaves; they were to be found in almost every piece that I examined, and what is a little curious, the impressions were all of the same kind of leaf, and as perfect, and fair, as if made but yesterday. The masses in which they were found, are to appearance extensive in both instances; and are soft when first taken out of the earth, but become hard as stone, on exposure to the air. At what period of time these depositions of leaves were made, and from what revolution in nature, I must leave to geologists to determine.

"Mines, minerals, fossils, quarries of stone, and particularly flint, slate, soapstone, marble, limestone, marl, gypsum, sulphur, iron, copper, lead, silver, plumbago, salt, nitre, and the ochres of various kind?"

No mines have as yet been opened in this county, but it affords plenty of iron ore, of the richest kind. It is usually of that sort denominated red, or brown ore, and is found in lumps or nodules of various sizes, from that of the smallest shot up to pieces weighing 80 or 100 pounds. The earth appears to be full of it in many places; and in others it is deposited in beds of considerable extent; but as no one has as yet erected any works, it is not known how abundant the ore may be; but I have no doubt of its being in sufficient quantity to supply any furnaces that may be built. Some of it has been melted down in a common blacksmith's furnace, and worked into excellent iron. Ores of any other metals have not been discovered, in such circumstances as to make them an object of attention. Some small lumps of native bismuth were found in the bed of a run in this neighbourhood, a few years since, but the vein from which they were washed has not been discovered, although repeatedly searched for. I sent some of it to Dr. Barton at Philadelphia, who pronounced it to be of the purest kind. I have in my possession, a small ingot of metal which was obtained from ore found in the S. E. part of this county, which appears to me to be tin and zinc combined. I have not been able as yet to learn, whether it exists in quantities sufficient to make it an object of attention. Flint stone has not been found in this county. Limestone is plenty. Sulphate of lime has been found in several places, but not in sufficient quantities to be used as an article of manure. The greatest collection that I have heard of, was found in digging a well, between Duck creek and Little Muskingum creek, within the limits of Marietta Township. The stratum was about ten inches or a foot in thickness, and about twelve feet below the surface. How extensive it may be is not known; as the workmen soon after came to water, and the well was stoned up without further examination. I have seen some specimens of this gypsum. It is of the purest kind, in a crystallized form, and almost transparent.

Red and yellow ochres are found in various places. The most extensive bed of red ochre, that has come to my knowledge, is five miles above this place, on the Muskingum river. It was discovered in digging into the bank, near low water mark, to lay the foundations of a mill. The bed is four feet in thickness; some of it was used to paint one or two doors in the house of Capt. Devoll, the owner of the mill. It has stood for several years, and looks equally well with any of the imported paint usually called "*Spanish brown.*" There is also a large bed of it on Federal creek, in Athens county. It extends entirely across the bed of the creek, and up and down it for several rods. It is of so bright a red, that when the water is low it can be seen plainly at a considerable distance. Some of this ochre, was used, in the early settlement of Marietta to paint the roofs of one or two houses; but from its not being well prepared, or from some defect in the quality of the paint, it did not stand the weather well. Clays of various qualities are abundant; some sufficiently white for pipes, or the manufacture of "queen's ware;" other kinds tinged with blue, and to all appearance the same with that used for the construction of pots in glass houses.

Pyrites are found, but more generally in the neighbourhood of coal beds. We have some very elegant ones that are found imbedded in clay, in globular crystals, of various sizes from a small shot to a musket ball, and nearly the colour of brass.

In my observations, in answer to the previous inquiry, I neglected to mention that some of those quarries of sandstone are of the proper quality for grindstones; within a few years, they have become quite an article of commerce; and hundreds of excellent grindstones are every year sent down the Ohio, into the lower part of this state, and to the states bordering on the river, where they meet with a ready sale, as the stone proper for their construction is not common at a considerable distance down the Ohio. In many of these quarries the stone is found in strata of a proper thickness for grindstones; so that the stone cutter has but little more to do, than to give the stone the circular form, and cut the hole for the crank, and his work is completed.

Fig. 1.

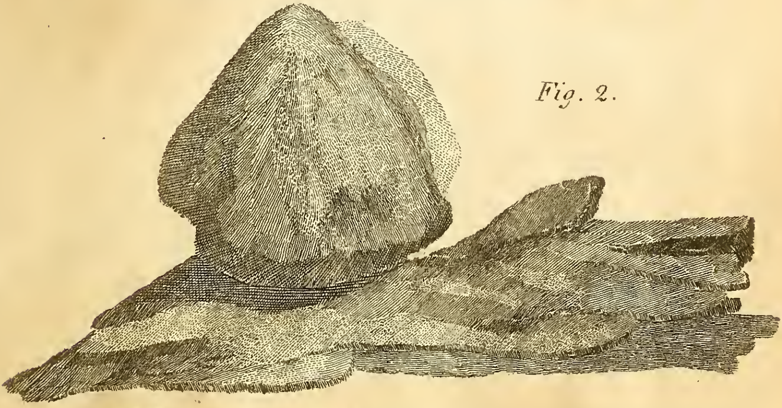

Fig. 2.

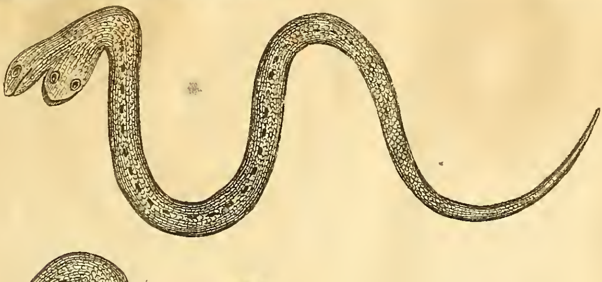

Fig. 1.

Fig. 2.

Fig. 3.

A. Doolittle sc.

Art. II.—*Notice of a Rocking Stone.*

Providence, July 28, 1825.

TO THE EDITOR.

Dear Sir,

I take the liberty to transmit you drawings, and a short description of two Rocking Stones that exist in this vicinity. No notice of these has ever been published, except a very hasty one, drawn up by myself, for one of our newspapers. If you conceive that it would subserve any useful purpose to publish this account in the next number of your Journal, it is at your service. The subject has lost much of its interest, since it has been ascertained, that these moveable rocks are of not very rare occurrence in this section of our country ; but one of these I suspect equals, if it does not surpass in *size*, any that has yet been described.

Upon S. Brown's farm, in North Providence, 3½ miles from this town, there is a broad bed of limestone, which rises 3 or 4 feet above the surface of the earth. Upon this bed lie the two bowlders, of which Fig. 1. is a south-west view. The rock A is so poised upon the imbedded rock and the top of its fellow, that it can be easily moved back and forth 4 or 5 inches with one hand, though it probably weighs 8 or 10 tons. It is even moved by the winds when they blow briskly from the south east.

Fig. 2 presents a north-east view of a rocking stone, which is found on a farm, belonging to Mr. Paine of Smithfield. It is 12 miles north of this town.

It is a bowlder of granite, and reposes upon a mass of the same kind of rock. There is considerable resemblance in its form to the rocking stone described in No. I. Vol. IX. of your Journal. It is an irregular pyramid, 15 feet in height, and 12 feet in diameter at the base. It is computed to weigh 80 or 90 tons. Notwithstanding its vast weight, it can be moved with the hand, and with a lever 8 or 10 feet long, it can be made to oscillate 4 or 5 inches. When moving, the rock appears about to tumble down the declivity upon which it is situate, and very few have the resolution to stand near its north-east side while it is moving. It is probable, however, that it will ever remain in its present situation; as many years since, a number of men, provided with levers, ropes, and even the aid of oxen, made an ineffectual effort to overturn it.

Respectfully your servant,

O. MASON.

Art III.—*Miscellaneous Localities of Minerals.*

1. *By O. Mason.*

Providence, R. I. May 12, 1825.

TO THE EDITOR.

Dear Sir,

I have recently obtained the following minerals, from localities which have probably never before been visited by a mineralogist, viz.

1. *Epidote*, from Smithfield, handsomely crystallized.

2. Fibrous and glassy *Tremolite*, from Johnston, 2½ miles west of this town. They occur in magnesian limestone, pretty abundantly. The former is fine fibrous, grouped in radiated and fascicular masses, white and yellowish white. The latter is in flattened crystals, confusedly aggregated. The glassy variety was found, and noticed in your Journal, by the late Mr. Taylor, within half a mile of the above.

3. *Fetid Quartz* in abundance, in clay state, from Cranston. When struck with a hammer it exhales an odour resembling burnt animal substances.

4. *Actynolite*, one fourth of a mile north-east of Leach's iron ore bed, in Cranston. This is by far the most interesting locality Rhode Island affords, both on account of the beauty of the mineral and its great abundance.* There appears to have been an excavation made many years since, into a talcose rock, and the actynolite is found in the masses thrown out. I noticed many pieces, however, as large as a man could well lift, consisting entirely of actynolite. The most beautiful specimens are those which occur in indurated talc, as the actynolite appears very dis-

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* It is in sufficient quantity to satisfy the rapacity of those mineralogists who have recently carried off our minerals by the cart load.

tinct, from the strong contrast between its bright bottle green colour and vitreous lustre, and the gray earthy appearance of the mineral it is imbedded in. It generally presents groups of compressed crystals, which either diverge from a centre or are promiscuously interlaced. It is fully equal to any I have ever seen.

Respectfully your servant.

2. *By E. Emmons.*

CHESTER, Mass. August 6, 1825.

DEAR SIR,

During the last Spring, the following minerals were observed by me in this vicinity in addition to those heretofore noticed.

1. *Heulandite*, (Foliated Stilbite,) in right oblique angled prisms, which is the primitive form. The greater angles were found by an attempt at measurement to be 130° and a few minutes, approaching so near the measurement given in Brookes' Introduction to Crystallography, that all doubts respecting the mineral vanish. *Modification*—Acute edges of the prisms replaced by single planes. The mineral possesses a high pearly lustre, and a foliated structure. Folia often waved or undulated. Colour white. *Geol. Sit.*—Heulandite is found associated with chabasie and stilbite in mica slate, Chester.

2. *Pimelite*, (Nickel colouring clay.) As yet I have discovered only small quantities in cavities in stalactical quartz; colour, fine grass green. The masses when first broken, present a granular structure; when dry, become compact, and full of cracks and fissures. *Geol. Sit.* Occurs in quartz connected with serpentine, Middlefield.

3. *Pinite*, generally in amorphous masses, in granitic veins traversing mica slate; one large crystal has been obtained, measuring $2\frac{1}{2}$ inches in diameter.—Not abundant.

4. *Pargasite*. In short green crystals, in carb. of lime, associated with idocrase and epidote, Chester. Not abundant.

3. *By Simeon Colton.*

Monson, Mass. July 26, 1825.

TO THE EDITOR.

Sir,—On looking over Dr. Robinson's catalogue of localities of minerals, I find there are several, which come within my knowledge, that he has not named. I take the liberty to send you a list of some of them. I do not know that you will think them worth noticing; you will, however, dispose of them as you please.

1. *Sulphate of Alumine.* There is a locality of this in Bolton, Conn. This is found in decomposed mica slate, in the eastern part of that town. The specimen I have is of a very decided character, and there is an abundance of a similar kind to be found in the same place.

2. *Quartz.* Crystals, both plain and coloured, perfectly transparent, are found in Stafford, Conn., about two miles west of the Springs, of about half an inch in diameter. One I have in possession is of a beautiful yellow, the others plain.

3. *Garnets.* These are dispersed in great abundance through the gneiss and mica slate rocks, in Monson and Stafford, and in other parts of the same range of mountains. Some crystals are found that are quite transparent. In Stafford, around the margin of what is called Square Pond, among the gravel, garnets may be collected in great numbers.

4. *Steatite.* There is a mountain in Somers, Conn. where a considerable quantity of this stone has been found. It exists in beds in different parts of the mountain, in gneiss rock, and is accompanied with several minerals that are found in veins, and in fissures. Within two years past, considerable quantities of this stone have been quarried. Blocks are transported about a mile and a half, to a mill built for the purpose, in the form of a common saw-mill; it is there sawed into slabs, and thence carried to Springfield, Hartford, and elsewhere, to be wrought. It receives a fine polish, and is an excellent stone for fire-places, as well as other purposes for which soap-stone is used.

5. *Sulphur.* Small quantities of this are found, very pure, in the crevices of the soap-stone rock, in Somers, Conn.

6. *Sulphuret of Iron.* Considerable quantities of this are found in almost every town through which the first range of mountains east of Connecticut river passes.

In Monson, it is found in regular crystals, and also scattered in an irregular manner through quartz and mica slate rocks.

In Stafford it is abundant in different parts of the town, but particularly about the region of the springs.

In Somers, considerable quantities of it are found on the soap-stone mountains, traversing the rock in veins, in different directions. When first broken, it exhibits an uncommon brilliancy ; but after being exposed to the air for a short time, a white crust of *Sulphate of Iron* is formed.

Connected with these localities of the sulphuret of Iron is a circumstance worthy of notice : it is, if I may use the expression, the existence of a sort of miniature volcanoes. The late Dr. Dwight, in his Travels, Vol. II. p. 203, in his description of Stafford, makes mention of a volcanic eruption, reported to have taken place in that town. The spot alluded to is a high rock forming the western bank of the valley of the Willimantic, and distant nearly a mile from the springs. Similar eruptions are said to have taken place on the mountain that has been named in Somers. After a long continued rain, it is said by some of the inhabitants living near the place, that reports have been heard from the mountain, in frequent succession, louder than that of musketry. On examining this rock, not long since, a small hole, of about an inch and a fourth in diameter, was found, which extended to a considerable depth into a bed of the iron ore. The mouth of this hole was extended in the form of a tunnel, and was filled with leaves, earth, and a mixture of the sulphate of iron. Eruptions of the kind mentioned, have probably taken place on this spot. In Monson, also, it is said that some years since, a similar eruption took place on a spot which abounds with this mineral, and there are not wanting indications of the truth of the story A recent account, we have had in the public prints, of a volcanic eruption, in some town, in the state of New-York, may perhaps be explained in the same manner.

7. *Magnetic Iron.*—This is found in abundance scattered through the gneiss rock, in Monson. A specimen also I have in my possession, of the size of a hen's egg, taken from among the gravel stones of an old field in Palmer.

8. *Bog Iron Ore.*—This article is found in almost every town on the range of mountains east of Connecticut river, in the south part of Massachusetts, and north part of Connecticut; in Wilbraham, Monson, Brimfield, Western, Brookfield, and Sturbridge, Massachusetts; in Stafford, Union, Willington, Tolland, and Somers, Connecticut. In Union, a person pointed out a spot to me, from which he had twice sold the ore for a considerable sum, a second bed having been deposited in place of the one removed.

9. *Schorl.*—This mineral is found, in small quantities, in quartz, and in gneiss rock in Monson.

10. *Mica.*—This is found in large plates of several inches square, in Monson; particularly in a rock denominated, by Mr. Hitchcock, pseudomorphous granite.

There are some other mineral substances I might name in this region, particularly the chalybeate springs of which there are several in the towns in this vicinity, and in which Iron is an abundant ingredient. There are also, I think, several particulars in the geology of this section of country, not embraced in Mr. Hitchcock's description, that are worthy of notice.

P. S.—I have omitted to mention *Talc*, found in the Somers mountain, of a beautiful pale green colour; also *Hornblende*, both crystallized and common.

4 *By Elijah L. Hamlin.**

REMARK.

An apology is due, both to Mr. Hamlin, and his associate, Mr. Holmes, for the long delay in noticing the very beautiful minerals, mentioned in this catalogue. This delay was owing entirely to accident; both the box, which was very small, and the explanatory letter, and catalogue,

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* *Extract of a letter to the Editor, from Elijah L. Hamlin, dated, Paris, Maine, Nov. 20, 1822.*

Dear Sir,

I herewith transmit to you, by the hands of Hon. Enoch Lincoln, a small package of minerals, and am in hopes that I may soon have an opportunity to send on a box of more numerous and larger specimens. Paris, the shire town of Oxford county, (Maine,) has been settled only about 40 years, and the country around it is comparatively yet a wilderness; and until within about a year, there has never been any examination made of its minerals; and the only search that has been made within this time, has most richly rewarded the labour. Most of these having been accidentally mislaid, and concealed in the laboratory, till a very recent period.—EDITOR.

1. *Green Tourmaline.*—Locality—Paris, one mile east from the court-house, on the road leading to Buckfield, and on the farm of Mr. Nicholas Chesley. They are there found in cylindrical prisms, striated longitudinally, and in some instances so deeply as to make their surfaces appear acicular. They vary from one eighth, to an inch and a half in diameter, and from one to *six inches* in length; no specimen, as yet, but this, has been found with a regular termination, and this is evidently triedral. Some specimens have been found uncommonly beautiful; they are perfectly transparent, and exhibit colours from the light to the deepest green.

2. *Radiated green Tourmaline.*—Found at the same place in small prismatic crystals, semi-transparent, and of a leek green colour, usually less than an inch in length, diverging from a common centre, attached to an aggregate of mica and quartz, and in some instances are found between the lamina of a large foliated mica, and spreading into that a fine green colour, where it comes in contact.

3. *Acicular green Tourmaline.*—Found at the same place, in small cylindrical prisms, from one to six inches in length, of a bright green colour, sometimes transparent, and in positions similar to the former.

4. *Acicular green Tourmaline.*—Encompassing a darkish blue crystal, probably the indicolite. Green tourmaline of this character is frequently found forming a kind of incrustation over ill defined masses of black tourmaline.

5. *Acicular Indicolite.*—Similar in all respects to the acicular green tourmaline, excepting its colour, which varies from an indigo blue to a black.

6. *Indicolite.*—Some of its small crystals, that are found in a beautiful granular kind of quartz, exhibit a fine light blue colour, while its larger ones have a deeper colour, pass-

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minerals, as you will perceive, have the same locality, are found near by, and were discovered a short time since, by Mr. Ezekiel Holmes, a student in medicine at this place, and myself, while on a mineralogical excursion.

This place seems to resemble much the Haddam and Chesterfield localities, inasmuch as it contains a similar coloured mica, and embraces nearly, if not entirely, the whole family of the tourmaline. The country around here, elsewhere, seems to be peculiarly rich in minerals.

ing off into black or brown, and are frequently in connexion with the red and green tourmaline.

7. Tabular crystals of this kind are mostly found imbedded in mica, and are from one to three inches in length, its general appearance being almost a velvet black, except the edges, which are translucent, and transmit a pale green light bordering on blue. Some specimens of this kind exhibit a fine polish, and are extremely handsome.

8. *Rubellite.*—It is mostly found enclosed in crystals of the green tourmaline, or else encrusted with that on its surface, and varies in its colour from a pink to a deep crimson red; some are found very beautiful.

9. *White Tourmaline.*—It has longitudinal striæ, and like the others becomes electric by friction; most of them are slightly tinged with red.

10. *Lilac coloured Mica.*—This is found in small globular concretions, consisting of minute folia, placed one upon another so as to form short columns, situate mostly parallel to each other, and held together by a siliceous cement, in which are discovered small crystals of quartz, and occasionally of the tourmaline. These folia are easily separated from each other, and appear to be hexædral tables.

11. *Lilac coloured Mica.*—This kind possessing a brighter colour, occurs in more massive forms, and with larger folia, and is found in connexion with a beautiful laminated feldspar.

12. *Prismatic Mica* is found in long capillary threads, on the edge of the common mica, resembling much the filaments of amianthus, and in some instances exhibiting itself in the form of long prismatic tables.

Mica is also found at the same place, crystallized in beautiful hexædral pyramids. Similar crystals of black mica are also found imbedded in white. Large plates of white laminated mica are also found here, measuring *six inches by nine*.

13. This specimen exhibits partially the *gangue* in which the tourmalines are found.

14. *Black Tourmaline.*—Specimens of this kind of the tourmaline, are found very plenty here in almost every ledge, and sometimes very beautiful. They are frequently between three and four inches in diameter, and more than one foot in length, exhibiting most of the forms mentioned by Cleaveland.

15. *Specular Oxide of Iron.*—But few specimens of this mineral have yet been found, and they were in detached pieces, at the bottom of the hill. It is not affected by the magnet, but the prussiate of potash, poured into a solution of it by nitric acid, flings down a fine blue precipitate.

16. *Arsenical Iron.*—Only one specimen of this mineral has yet been discovered, and that was in the fissure of a vein of quartz, traversing a body of coarse granite; it was in a globular form, about the size of a *six pound* shot, fine grained, exhibiting a fine silver-white lustre, and being uncommonly heavy. By friction, it exhaled the odour of garlic.

All these minerals are found at the same place, on the top and declivity of a small hill, its surface measuring perhaps one acre, and elevated not more than forty or fifty feet above the land around it. The base of the whole hill is probably a ledge; but it breaks the surface only on the top, in the space of about four rods square, exhibiting a ledge of coarse granite, thickly filled with mica and tourmalines, of which the black principally predominates. But little search has been made, and only in one place have we gone under the surface; and it was there that we found the best specimens loose in the soil.

17. *Graphite.*—This occurs in Greenwood about six miles from here, in a north-westerly direction, and is found attached, from one eighth of an inch to one inch in depth, to the surface of a coarse granite, and occasionally very much mixed up with the black tourmaline. Sulphuret of molybdena is also found in the same ledge, in connexion with sulphuret of iron.

18. *Sulphuret of Molybdena.*—This occurs very frequently in most of our ledges, sometimes apparently communicating to them a slaty form. It is found in folia, disseminated through the rock-like mica; and occasionally it is very difficult to distinguish it, by mere inspection, from the black mica, which it accompanies. This specimen seems to contain pyritous copper, and the feldspar is of a greenish colour.

19. *Staurotide* in mica slate, which contains also minute crystals of garnet. It exists in plantation letter E, about 40 miles from this, in the north eastern angle of this county, and was discovered a short time since, by the Hon. Enoch Lincoln, who informs me that it exists there in immense quantities, frequently presenting beautiful, well defined, crystallized forms.

20. This specimen contains some Iron, and we think it to be an argillaceous oxide of iron. It is found in veins from four inches to two feet in width, traversing beds of granite.

21 *Bog Iron Ore.*—Found in Greenwood, near the locality of graphite.

5. *By Jacob Porter.*

PLAINFIELD, Mass. May 1, 1824.

1. *Rhomb Spar*, well crystallized in steatite, and associated with green foliated talc, at Cummington.

2. *Stalactical Quartz*, resembling the Middlefield variety, at Cummington and Worthington.

3. *Garnets*, at Chesterfield. Some rocks, of reddish hornblende, in this township, contain an immense number of garnets, from the size of a shot to that of a small cannon ball. These rocks are situated about a mile north-east of the meeting house, near the celebrated locality of cyanite.

4. *Foliated Graphite* at Chesterfield. The graphite of Cummington, Worthington, and Chester is of this variety; that of Hinsdale is compact, and of a good quality.

5. *Scapolite and Spodumene*, from Goshen.

6. *Rose Quartz*, from Chesterfield.

7. *Carbonate of Iron*, from Cummington.

8. *Shell Limestone*, abundant at Hamilton, Sherburne, Lebanon, and the neighbouring towns, New-York.

9. *Limpid Quartz*, at Fairfield and Newport, New-York. Some of these beautiful crystals have cavities in them partly filled with a transparent liquid.

10. *Radiated Quartz*, covered with crystals, at Goshen and Williamsburgh.

11. *Quartz Sand*, at Cheshire, extensively used in the manufacture of glass.

12. *Blue Jasper*, on a branch of Westfield river, Chester.

13. *Black Tourmaline*, well crystallized, at Worthington.

14. *Radiated Tourmaline*, at Plainfield; the crystals glossy black, and of great elegance.

15. *Zoisite*, remarkably beautiful, at Worthington.

16. *Sulphuret of Iron*, in quartz, at Sudbury.

17. *Magnetic Oxide of Iron*, at Plainfield. A small bed of this ore has lately been discovered.

18. *Favosite*, and other organic remains, at Lebanon, New-York.

Soapstone of Middlefield, Mass.

Correction of a passage in Dr. Dwight's Travels.

In the first volume, second letter, of President Dwight's Travels, occurs the following paragraph:

" Magnesian stones are found in New-Haven, Milford, Stamford, and several other places. A quarry of this species of stone, at Plainfield, in the county of Hampshire, has been wrought to a considerable extent. I have seen a house faced with it in Northampton."

There is an inaccuracy in this statement, no stones of this kind having been found at Plainfield The house referred to is, doubtless, that on Round Hill, built, as the owner informed me, of steatite, brought principally from Middlefield.

Were these travels a work of ordinary merit, so slight an error would not be worth noticing. But it is desirable that the few errors contained in a work so characterized by accuracy should be pointed out, before passing into a second edition.

March 25th, 1825.

6. *Notice of Firestones used in the Manufactories of Glass.*

Extract of a letter to the editor, from Mr. John S. Foster, dated Boston, November 12, 1824.

In all processes where the agency of heat is required, it is a desideratum to obtain those substances for the construction of furnaces and melting pots which will most effectually resist its action; and we may attribute to the neglect or ignorance of these, the failure of many American manufactories, which were susceptible of profit. These remarks are peculiarly applicable to the process of glass making; and the hope of improvement has led lately to various experiments, at the Boston Glass Works, which promise permanent utility. No progress seems to have been made, very recently, in the discovery or application of American clays, but we have succeeded in procuring a supply of the celebrated Stourbridge clay, and Sunderland firestone, from England. and have given them a short but satisfactory trial. Besides these we have used the Haverstraw and Smithfield firestone, and approve of them both. The use of stone, instead of brick, in the construction of furnaces, is attended with great saving of expense, not only in the first outlay, but in subsequent repairs; and when the stone is past use for its primary object, it affords a good substitute for burnt clay, in the composition of firebrick and melting pots. The stone and sand of our own country, so far as our experience extends, are equal in quality to the imported, and lower in price.

The specimens alluded to are numbered and described as follows; and a note is now added as to their nature —*Ed.*

No. 6. Firestone from Sunderland, England, an article extensively used in that country, for furnaces and forges; it blocks freely, and is wrought with ease. It is the first importation here. This is a white silicious sandstone.

No. 7. Firestone from Haverstraw, New-York It splits and works as free as the Sunderland, and its cost is little more than half that, taking freight and duties into account. This is the old red sandstone which underlies the greenstone trap of New-Jersey, Connecticut and Massachusetts, and probably would be found of a good quality in all these regions.

No 8. Firestone from Smithfield, Rhode-Island, which stands a high temperature, perhaps better than either of the others, but is generally obtained in rugged masses, is wrought with great difficulty, and requires expensive transportation; it will cost when wrought probably double the price of English. This is a very fine granular quartz, arranged in layers, with intervening mica, also in layers. It is probably derived from a gneiss or mica slate formation. The fine-grained mica slates are frequently among the best fire-stones. The late Mr. Whitney, of New-Haven, used with much advantage the remarkable stone of this description from Bolton and East-Hartford. This stone is also much used for grindstones, and for flagging-stones, as it splits easily in large and beautiful slabs.

No. 9. Clay from Stourbridge, England, celebrated for its resistance to heat. Like the Sunderland stone, it is an article of prime importance, and extensive use, in English glass manufactories. This is the first importation, in an unwrought state; it requires little or no burnt clay with it.

No. 10. Pipe clay from Gay Head, Martha's Vineyard.

No. 11. Sand from Brick and Lanes bank, Port Elizabeth, New-Jersey. This bank was opened about two years since, in consequence of our inquiries, and now supplies most of the eastern glass works.

No. 12. Sand from Lanesborough, Mass., which is considered the best we have ever melted; but its inland situation renders the expense of transportation an obstacle to its use. It is found in the form of white rocks, and is believed to abound on the banks of the North river, from which it might be transported cheaply. But no judge of the article has visited it to ascertain the fact.

No. 13 is a sample of the North river stone. As this is merely a fine granular limestone, and of course entirely inapplicable to furnaces, it would be useless to mention it on the present occasion, were it not to correct the impression of the *discoverers*, who suppose it to be a pure quartz. It is quite unnecessary to say to a mineralogist, that the softness and effervescence with acids, render it perfectly easy to distinguish limestone from quartz; and that when the effervescence is languid, or even unobservable, as sometimes happens in the case of dolomite, the inferior hardness is always decisive.

Art. IV.—*Notice of Minerals. &c. from Palestine, Egypt, &c.* in a letter from the Rev. Isaac Bird, Missionary, to the Editor, dated Beyroot, Palestine, March 15, 1825, with remarks upon the specimens, by the Editor.

Dear Sir,

As I shall never forget the obligations I am under to you as an instructor, so I cannot but gladly embrace every opportunity which occurs to return your favours.

One of the remarks you made to me at our last parting was, to request me to send you any such interesting specimens of mineralogy as might fall in my way in this country; and you were pleased to add, that their chief quality of interest would be, the circumstance of their location. I confess it is only on the strength of this last suggestion, that I should venture to send you so meagre a box as the present. The contents have been picked up, without any pains, here and there, as I have been passing on other business. A few specimens have been kindly given me (from Egypt and elsewhere) by my brethren. I hope to be able, if my life and residence in this land should be prolonged, to send you something of the kind, more worthy of your acceptance, hereafter.

You might expect from me some geological sketch of the country, but I shall leave it for some abler hand. I can just say, however, what probably you already know, that the country is secondary, and the leading rock limestone. This rock presents itself, in the banks of rivers, and of the sea, and on the slopes of the mountains, in thin layers, running, in directions from horizontal to perpendicular, in every degree of obliquity. Flint is very common on the surface, and is seen in great knobs, studding some particular layers of the limestone. Petrifactions, as you will see from the specimens sent, are very common on Carmel and on Lebanon, but I have never visited the former, nor the highest ranges of the latter. Good marble must exist in the country, though I know not of a single quarry. The little marble that is seen in monuments and buildings, seems to have been gathered up from the ruins of ancient buildings. Some fine fragments are to be found of the Verd Antique and similar marbles, but they were probably imported. Pillars of gray granite are lying in heaps at Tyre and other places, and occasionally a few are seen of the red kind. One immense column of the latter kind lies prostrate in Tyre, near some splendid ruins, and forms a part of a wretched garden wall. The shape is quite peculiar, intended doubtless to exhibit a front like a double column. A right section of it would leave a figure like this.

It is likely that the latter kind of granite, and perhaps the former, was imported from Egypt.

P. S. The consul has sent me a few specimens of coal lately discovered near this in the mountains. From him also I have obtained the petrifactions of fish. I add a vial of Dead sea water as a curiosity, which I took from the sea myself. If any of my family friends should ask the favour of two or three of those pebbles from Cedron or Gethsemane, pray gratify them. I shall probably mention to them that I have sent them. About the Verd Antique, I may be mistaken. I have not a distinct idea of that kind of marble, how it differs from the specimens of green marble I send you.

The labels where there are any, are first given, and then such remarks as may tend to illustrate the specimens.

1. " Many fragments of this are scattered about the Mulberry gardens of Beyroot."

Verd Antique Porphyry.

Among Mr. Bird's specimens, are three taken from the ruins of Tyre, which are the verd antique porphyry. not the verd antique marble. It is well known to mineralogists, that the verd antique porphyry is characterized by a very dark green basis of uniform appearance, containing distinct imbedded crystals of feldspar of a much lighter green. This porphyry does not effervesce with acids, and is so hard as not to be easily impressed by the steel. It is believed to have come from Upper Egypt, and its locality seems to be described by Bruce in his travels, under the name of green marble, whereas it is obvious from the properties which he ascribes to it, that it could not have been marble, but the verd antique porphyry, which we see among the ruins of many ancient cities, upon and near the Mediterranean, and which appears to have been much valued by the ancient Romans. The verd antique marble, on the contrary, is soft enough to be very easily scratched by steel, it effervesces with acids, and has not a homogeneous ground and imbedded crystals, but its beauty is produced by blended clouds of green, white, black, &c. mixed without any regularity. It is often a mixture of serpentine and primitive granular limestone; frequently, however, the green colour appears to arise from a combination of the oxide of chrome, with the substance of the marble. We must presume that the verd antique porphyry found at Beyroot came, like that of Rome, from Egypt.

2. " Shore of the dead sea."

This is an ovoidal pebble of (apparently for I did not break it) compact limestone about $2\frac{1}{2}$ inches long by 1 or $\frac{1}{2}$ wide; it is worn perfectly smooth by attrition.

3. " From the high craggy cliff, bounding the dead sea on the west."

It is a calcareous animal relic of that convoluted form commonly called the screw-stone.

4. "Dead-Sea."

Apparently a variety of calcareous tufa.

5. "Water of the Dead Sea."

For a notice of this water, see Professor Hall's paper in the last number of this Journal.

6. "Plucked from one of the largest of the cedars of Lebanon, by P. Fiske, Oct. 6. 1823." Also, "Ball from the cedars of Lebanon, a few of which trees remain thirty or forty miles N. E. of Beyroot. P. F. 1823."

These cones are two or three inches long by about two in diameter in the largest part; their colour is dark brown, and they have an agreeable aromatic smell; they are rather barrel shaped than conical.

7. "Chip from the cedars of Lebanon."

This has very little vivacity of colour, and is nearly inodorous; it appears inferior in the beauty of its grain to our cedars.

8. "People say that watermelons are found petrified on Carmel; this was a specimen."

Mr. Bird professes nothing more than to give the popular impression; he was himself too well acquainted with minerals to mistake these specimens. They are nodular hornstone of a light gray colour, lined in their cavities with innumerable crystals of quartz, thickly grouped together in brilliant drusy cavities, forming irregular geodes. Doubtless if the Mussulmen regard this mass as a petrified melon, they would say that the quartz crystals are the seeds turned to stone.

9. "Bituminous stone, brought by a mussulman from what his people call the real tomb of Moses, near the dead sea—a common stone in this quarter."

This is a black bituminous limestone, giving its peculiar odour very powerfully by heat, and effervescing with acids; it is dull and not translucent even on the edges; its fracture is conchoidal, and if it would bear a polish, it would evidently form a black marble.

10. "Found in a road near the town of Hebron—probably from the glass works."

This is a very rich green glass, almost grass green—it is easily scratched by steel.

11. "Broken by Mr. Fisk from a statue in the temple of Carnac in Thebes, Upper Egypt."

A light gray semi-crystalline limestone, feebly translucent on the edges—seems to have been a very ineligible substance for a statue—geologically it appears to belong to the transition class.

12. " From the temple of Tartyra, Upper Egypt. Mr. Fisk."

This is a fine-grained loosely coherent red sand-stone, without beauty, in small pieces, but it might still have formed handsome structures.

13. " Fragment from the temple of Carnac, being the common stone of Egypt. From Mr. Fisk."

This is a handsome yellowish gray sandstone, very purely siliceous—cuts glass like quartz, and resembles very much some of the sandstone of which Edinburgh is built. The last two specimens appear to be identical with some pieces in the Gibbs cabinet, brought by the French savans of Napoleon's army from Egypt more than twenty-five years ago.

14. " Two pieces from the Holy Sepulchre—said to have made part of the Holy Sepulchre itself, given me by an Arab Christian of Jerusalem. 1824."

One of these pieces is a white, and the other a black limestone—the latter appears to be identical with No. 9.

15. " Gethsemane and Holy Sepulchre."

This, being merely a petrified shell, is probably a stranger in the place where it was found, and came there by chance.

16. " Mouth-piece of a pipe from Jerusalem."

This is composed of handsome reddish variegated compact marble in the form of tubes and ovoidal shaped pieces, the latter having only the same bore with the tubes; only one of the pieces smelled of tobacco; they are rather elegantly turned and polished. Two other pieces, labelled Tyre, appear to be exactly similar.

17. " From the ruins of Tyre."

A piece of well-characterized granite, with reddish feldspar, gray quartz, and almost black mica.

18. " Picked up at Tyre."

A piece of variegated compact marble as large as the hand—cut and moderately polished; its colours are clouds and veins of white, gray, brown, reddish, and greenish lines.

19. " Red granite from a wall in the city of Tyre, and doubtless from the ruins of a splendid temple near by, a part of which is still standing—probably originally from Egypt."

This is evidently a portion of that kind of red granite of which Pompey's pillar and many other ancient monuments are formed. It is the feldspar which gives the character to this granite—this part of it is flesh red, and predominates in quantity, while the quartz is gray and the mica black.

20. " Fragment from Mount Zion, without the walls of Jerusalem."

This is a handsome piece of pottery beautifully glazed; colour of the body grayish white—of the glazing mouse colour with white veins.

21. " Foundation of a monastery in Mount Tabor."

Snow white, highly translucent and crystallized primitive marble.

22. " Found at Acre."

A piece of oriental red porphyry, well polished.

23. " White marble from Nazareth."

The same as the last but one.

24. " Prophet Jonas."

This is a flat calcareous pebble of a very dark gray colour, rounded and smoothed by attrition; it is not mentioned to what circumstance in the prophet's life this has reference.

25. " Old foundation near Hebron."

This is a shell limestone, and exhales an odour like burnt oyster-shells whenever it is touched with an acid."

26. " Two pebbles drawn up from under water in the Jordan, April 1824."

Gray compact limestone, rounded and smoothed by attrition.

27. " From a fine sugar-loaf hill visible from Mount Olivet, called Frank mountain, a little S. E. of Bethlehem; said to have been the last fortified hill surrendered by the Crusaders."

Conchoidal hornstone, verging on chalcedony; colour gray, fires with steel abundantly.

28. " From the sides of the cave said to be that of Saul and David, a few miles S. E. of Bethlehem."

A gray compact semi-crystalline limestone.

29. " Formation from the deposit of the waves of the Dead Sea; multitudes of sticks, and stones, and other rubbish on the shore are overlayed in this manner."

This is a calcareous tufa deposited in layers so very thin that twenty are easily counted in a thickness of three fourths of an inch; as the mass is concave and convex, it looks at first like an oyster shell.

30. "Kedron and Cedron."

The fragments that are thus labelled are calcareous stones, both primitive and secondary, not bearing any strong marks of attrition.

31. "Two pebbles from the brook Cedron. 1824."

One of these is very interesting: it is a fragment probably once detached from a rock of mica slate, the mica being almost black, but the most interesting feature of the stone is, that it is composed principally of beryl, there being several distinct and beautiful crystals of a deep sea-green, besides a mass of less distinct configuration; it must evidently be a stranger in the bed where it was found.

32. "From the temple of Carnac."

Trap; the hornblende has an almost vitreous appearance.

33. "Carmel."

Flint well characterized, looking almost exactly like the English flint, being like that in the form a of grotesque nodule, and its dark colour penetrated to the depth of a line or more by a shade of gray; derived, evidently, from the calcareous mass in which it had been imbedded, and which appeared, from the adhering pieces, to be rather compact lime stone than chalk. The adhering matter effervesced with acids, and gave out the smell of burnt oyster-shells.

34 "Jerusalem Much of the marble seen in Jerusalem is of this colour and quality."

This is a compact limestone, clouded with flesh red and gray.

35. "Broken by a Mussulman boy from the mosque of Omar in Jerusalem; supposed to occupy the site of Solomon's temple."

There are three pieces which are the same as 34.

36. "Common stone of the mountains of Gornoo, where are the tombs of the kings in Egypt."

Three pieces of compact limestone. dull, and very little differing from the compact marl of Beyroot, (44.) in which the fish are contained. There is also a large and very perfect petrified shell fish from the same place; it is a bivalve.

37. "Jordan."

Two waterworn calcareous pebbles.

38. "Tyre."

A similar pebble, handsomely veined with black and white.

39. "Nabi Jonas, near Sidon."

A white granular limestone, two pieces—knocking off a corner from one of them, I observed it to be fetid, like some of the primitive marbles of New-England.

"Nabi Jonas, from the tombs."

A dove-coloured, and white-veined granular marble, fetid also on percussion.

"Nabi Jonas, from a modern monument."

This is like the first two mentioned under this head.

"Beach above Nabi Jonas."

A white calcareous pebble.

40. "Gethsemane."

A brown conchoidal hornstone.

41. "Picked up by Mr. King on the shore between Joppa and Cesàrea."

This is a calcareous breccia, consisting of entire shells, cemented by calcareous matter, and fragments of shells; every part of it effervesces with acids; it has not a fetid odour when struck.

42. "Mount Lebanon."

Arragonite of a yellowish colour and striated structure. Among the specimens from Lebanon and Carmel are many shells and other calcareous petrifactions.

43. "From the ruins of an edifice in Tyre, said to have been one of the early Christian churches."

This is a compact limestone, very nearly analogous to chalk; there is upon it a cornice carved, and below it is painted green for the ground with lines in reddish brown, and figures in blue.

44. From the Kesrooan, 20 miles north of Beyroot—found about 20 miles north of Beyroot—from near Beyroot."

There are six pieces with the above labels; they are evidently from the same bed, and are very interesting. They are very similar to the yellowish compact marl, which contains the petrified fish at Mount Bolca, near Verona. The marl of Beyroot is sometimes so compact that it resembles the compact limestones; but it is without lustre, and in some of the specimens, it is so loose in its texture as to soil the fingers by handling. Its colour is very light gray, inclining to yellow.

Like the marl of Mount Bolca, and of Maestricht, it embosoms great numbers of fish. Sometimes half a dozen are found in one piece of a few inches dimensions. Like the fish of Verona, they are preserved in the condition of mummies, the skeletons remaining more or less entire, and the muscles dried and preserved; the colour is exactly that of the fish at Verona. This interesting and important locality should be further investigated.

There are good specimens of bituminous coal, burning freely with abundant flame; and very well characterized bituminous shale, which burns almost as freely as the coal, but leaves a large residuum in the shape of the stone. It is evident from these specimens that there is good coal in that country, and probably it is abundant.

The specimens being forwarded by the way of Smyrna, many were left behind which may perhaps be received hereafter; and of a considerable number more the labels appear to have been displaced, so that their localities cannot now be determined. Most of them, however, as is evident from the very distinct organized remains which they contain, belong to the transition, or earlier secondary limestones.

It is evident from the nature of the specimens, that if they represent the country correctly, Mr. Bird has sketched in his letter the true character of those parts to which the specimens refer.

If we were to indulge in those associations of sentiment and feeling which so many revered and venerated names are adapted to awaken, we might extend these remarks much further. This has been recently done by Professor Hall, in a not dissimilar notice of minerals from Palestine, already published in this Journal.

Those missionaries who, while pursuing the benevolent objects of their perilous and noble enterprises, find time also to observe facts illustrative of science, confer an incidental favour on mankind, and give their missions an adventitious advantage in the eyes of those who may thus be led to regard the main design with more favour.

Yale College, Sept. 7, 1825.

BOTANY.

Art. V.—*Caricography*. By Prof. Dewey. Continued from Vol. IX. p. 263.

[Communicated to the Lyceum of Natural History of the Berkshire Medical Institution.]

47. Carex *miliacea*. Muh.
Muh., Pursh, Eaton, Pers. no. 171. and Ell.* no. 44. Schw.
Schk. tab. Ooo fig. 151.
C. *prasina*. Wahl. no. 118. Rees' Cyc. no. 137.

Spicis distinctis; spica staminifera solitaria elongata gracili; spicis fructiferis tristigmaticis ternis elongatis cylindraceis subtenuibus, suprema subsessili, cæteris pedunculatis omnibus bracteatis cernuis; fructibus ovatis triquetris glabris subrostratis subbifidis vel ore integris, squama oblonga *emarginata* vel obcordata scabro-aristata longioribus.

Culm 18—24 inches high, slender, triangular, scabrous above, glabrous, leafy; leaves linear-lanceolate, highest often equalling the culm, rough on the edges, striate and mostly flat; bracts leafy with short sheaths, the lowest surpassing the culm; staminate spike single, slender, long, pedunculate, larger above, with decurrent florets; staminate scale oblong rather acute, white on the edge, with a short awn; pistillate spikes 2—3, long, slender, somewhat loosely flowered, highest nearly sessile, the others pedunculate, and all nodding; stigmas three; fruit ovate, somewhat three-sided, glabrous, with a short beak and entire or somewhat bifid at the orifice; pistillate scale oblong and *emarginate*, sometimes obcordate, terminated by a scabrous awn, white on the edge and green on the keel. Whole plant is rather pale green.

Flowers in May and June—grows in wet meadows, common, but not very abundant.

* Elliott's "Sketch of the Botany of South Carolina and Georgia."

This plant has a slight resemblance to one variety of C. *crinita*, for which it is sometimes mistaken. They differ however in their spikes, and especially in their pistillate scales; and, though the scale of C. *miliacea* is sometimes so slightly emarginate as to require nice examination, they are easily distinguished.

48. C. *umbellata*. Schk.
Muh., Pursh, Eaton, Pers. no. 172. Schw.
Schk. tab. Www fig. 171.

Spicis distinctis; spica staminifera brevis, solitaria longa pedunculata; spicis fructiferis tristigmaticis subquaternis, una sæpe subsessili et staminiferæ approximata, cæteris subradicalibus exserte-pedunculatis, omnibus ovatis *subumbellatis;* fructibus ovatis utrinque acutis rostratis breve-bidentatis pubescentibus, squamam ovato-lanceolatam æquantibus.

Culm *half an inch to four inches* long, leafy; leaves subradical, linear, rough on the edge, rather stiff, 6—12 inches long, purple at the base, inclosing the peduncles of the lower spikes; staminate spike single, long-pedunculate, short, round; staminate scale oblong, rather acute, tawney; pistillate spikes 3—5, often one near the staminate, subsessile and bracteate, the others exsertly pedunculate, erect, subradical, with five to fifteen fruit standing in a subumbellate form; fruit ovate, attenuated at the base, rostrate, nerved, pubescent, and slightly bidentate; pistillate scale ovate-lanceolate, green on the keel, about equalling the fruit. Whole plant is pale green.

Flowers in May—grows in small tufts on dry hills in a light soil. I have found it only in this town. Phillipston, N. Y.—Dr. Barratt.

This is a finely characterized species. The pistillate spike near the staminate is not mentioned distinctly by any author, and though it is very common, is not universally found on the specimens growing here. Schk. has figured two forms of the fruit, but has not given the upper and sessile pistillate spike; yet as both varieties are found growing together, there can be no doubt of their identity.

49. C. *laxiflora*. Lam.
Muh., Pursh, Eaton, Pers. no. 152 and Ell. no. 40. and Rees' Cyc. no. 136. Schw.
Schk. tab. Kkk fig. 141.
C. *grisea*. Wahl. no. 35, and Rees' Cyc. no. 150.
C. *paupercula*. Mx.

Spicis distinctis; spica staminifera solitaria oblonga gracili rarò bracteata; spicis fructiferis tristigmaticis ternis laxifloris remotis erectis, suprema brevè et inclusè pedunculatis, infima exsertè pedunculatis; fructibus ovatis vel oblongo-ovalibus subobtusis glabris ventricosis nervosis ore integro subtriquetris, squama ovato-mucronata et scabra paulò longioribus.

Culm 10—18 inches high, triangular, leafy; leaves linear-lanceolate, rather soft, rough on the edge, shorter than the culm; bracts long, leafy, surpassing the culm with rather short sheaths; staminate spike single, oblong, generally from the same bract with the highest pistillate, slender; staminate scale obovate, lower ones acuminate; pistillate spikes three, erect, alternate, remote, loose-flowered, about 6—8 flowered but varying from 3—10, the lowest spike supported on a long peduncle, the others by a shorter, and the highest by a short and inclosed peduncle,—sometimes there are four or five spikes with two or three approximate and near the staminate spike, with nearly inclosed peduncles; pistillate scale ovate-mucronate with a rough point, white on the edge and green on the keel, a little shorter than the fruit. Colour of the plant varies from a pale to a bright green.

Flowers in May—grows in meadows and woods and about hedges—common over the country.

This is a beautiful species, and is finely figured by Schk. There can be no doubt that the plant described by Mr. Elliott and others under this name is the C. *laxiflora*, Lam. according to Schk., and that it is the C. *grisea* of Wahl. The last described it from a specimen in the Herbarium of of Swartz, and inquires whether it was from N. America. This species is doubtless the C. *paupercula*, Mx., though his description does not in every particular exactly agree with it. In Rees' Cyc. this species is described under the two different names given by Lam. and Wahl.

50. C. *folliculata*. L.

Muh., Pursh, Eaton, Pers. no. 153, Mx. Ell. no. 33.
Wahl. no 72. Rees' Cyc. no. 144. Schw.
Schk. tab. N fig. 52.

Spicis distinctis; spica staminifera solitaria oblonga pedunculata; spicis fructiferis subbinis approximatis paucifloris erectis sub-pedunculatis, inferiore interdum remota et subexsertè pedunculatis; fructibus ovato-conicis acuminatis rostratis bidentatis maximis glaberrimis nervosis inflatis divergentibus, squama ovato-cuspidata triplo longioribus.

Culm 12—24 inches high, acutely triangular, scabrous above, leafy; leaves linear-lanceolate, rather rough, nerved, glabrous, shorter below, upper ones surpassing the culm; bracts long, leafy, nerved, much surpassing the culm, with short sheaths; staminate spike single, pedunculate, oblong, slender; staminate scale long, lanceolate, tawney; pistillate spikes 1—3, generally two, approximate, erect, with inclosed and short peduncles, the highest nearly sessile, the lowest sometimes remote and exsertly pedunculate, three to nine flowered but generally about six; fruit ovate, conic, rostrate, two-toothed, much inflated, nerved; pistillate scale ovate, cuspidate, about one-third as long as the fruit. Colour of the whole plant dark green—very glabrous.

β. C. *intumescens?* Rudge, Pursh, Rees' Cyc. no. 145.

Flowers in May—grows in marshy situations—common.

From the description of this species by Linnæus, which has been repeated by most of the authors until the publication of Muh.'s Gram., it would seem that the specimens first sent to Europe had *only one* pistillate spike. Hence the descriptions in Willd., Pursh, Eaton, Rees' Cyc. &c. are defective, as there is generally more than one pistillate spike. The writer in Rees' Cyc. has noticed this disagreement of the description with the fig. of the plant in the Linn. Trans. The repetition of the defective description of Willd. by Pursh, shows with how little attention Pursh had examined this species. Muh. was of the opinion that C. *intumescens*, Rudge, might be the C. *folliculata*, L., in which he is followed by Pursh. But in Rees' Cyc. the two are described as different species, though there seems to be no essential difference between them. As the writer appears to have had the means of comparing the fig. of Rudge with that of C. *folliculata*, it may be inferred that the two, if varieties, are very remote. By those familiarly acquainted with C. *folliculata*, the point could be determined upon a moment's inspection of the fig. of C. *intumescens*, in the Linn. Trans. This fig. however, I have never seen. There can be no doubt that the C. *lurida*, Wahl. is not, as is supposed in Rees' Cyc., the C. *intumescens*, Rudge; but is the C. *lupulina*, Muh. Of this, if it were not evident from the description, we have the express declaration of Muh.

51. C. *tentaculata.* Muh.
Muh., Pursh, Eaton, Pers. no. 116. Ell. no. 30. Schw.
Schk. tab. Ggg. fig. 130.
C. *rostrata.* Mx., Eaton, Pers. no. 154.
Schk. tab. Hhh fig. 134.

Spicis distinctis; spica staminifera solitaria subsessili braeteata; spicis fructiferis tristigmaticis binis vel ternis oblongis cylindraceis bracteatis, suprema sessili. cæteris brevè et inclusè pedunculatis; fructibus ovatis inflatis longo-rostratis bidentatis nervosis glabris divergentibus arctè oppressis, squama ovata parva scabro-mucronata duplo longioribus.

Culm 1—2 feet high, triangular, scabrous above, leafy; leaves linear-lanceolate, nerved, longer than the culm, rough on the edge; bracts long, leafy. surpassing the culm much, and with short sheaths; staminate spike single, oblong, bracteate; staminate scale long, linear, mucronate with a scabrous point; pistillate spikes 2—3, rarely one or four, approximate, oblong-cylindric, thick and large, sessile or with short peduncles nearly or quite inclosed in the sheath, rarely ovate, varying in length from half an inch to two inches, very densely flowered, somewhat horizontal, with long, large bracts; stigmas three; fruit ovate, long-beaked, two-toothed, inflated, much crowded, nerved, diverging; pistillate scale ovate, small, but as noticed by Muh., broad at the base, linear, mucronate, scabrous, about half the length of the fruit. Colour of the plant rather yellowish green.

Flowers in May—grows in wet, marshy situations, in small clusters, sometimes forming small bogs—common over the country.

Though Schk. has given figures of C. *tentaculata* and C. *rostrata*, as if they were different species, yet they are too similar to be considered more than mere varieties of the same species. They are thus considered by Muh., Pursh, and others. In the fig. of C. *rostrata*, the fruit is rather more diverging and the spikes smaller. But it is not uncommon to find specimens of C. *tentaculata* very closely resembling the fig. of C. *rostrata* in Schk., and differing less from it at least than the varieties of C. *tentaculata* differ from each other. Mr. Schweinitz supposes that a variety of C. *hysteri-*

cina, is referred to this species, but the accurate observer cannot make the mistake.

52. C. *hystericina*. Willd.
Muh, Pursh, Eaton, Pers. no. 155.
Ell. no 41. Schw.
Schk. tab. Fff fig. 127.

Spicis distinctis; spica staminifera solitaria triquetra bracteata pedunculata; spicis fructiferis subternis tristigmaticis alternis subdistantibus oblongis cylindraceis bracteatis cernuis, suprema inclusè pedunculata, cæteris exsertè pedunculatis, et infima sublongo-pedunculata; fructibus ovatis glabris inflatis subtriquetris rostratis ore bifido nervosis, squama oblonga emarginata scabro-mucronata duplo longioribus.

Culm 15—24 inches high, triangular, scabrous above, leafy; leaves linear-lanceolate, rather rough, about the length of the culm, with short sheaths terminating in large, leafy bracts which surpass the culm; staminate spike single, rather slender, triangular, bracteate; staminate scale ovate-oblong, short-mucronate, tawney, green on the keel; pistillate spikes 2—4, generally three, rather distant, bracteate, cylindric, oblong, nodding, upper nearly sessile, lower rather long pedunculate, with quite short sheaths; stigmas three; fruit ovate, somewhat triangular, rather long beaked and bifid at the orifice, glabrous, nerved, nearly horizontal, not so crowded as in the preceding species; pistillate scale oblong, distinctly emarginate, terminated by a scabrous point, white green on the keel. Colour of the plant is yellowish green—of the spikes, brown near maturity.

Flowers in May—grows in wet places with the preceding species—common over the country.

In some of his letters, Muh. first called this plant C. *erinacea*, but afterwards adopted the name given it by Willd. The description given in Pursh corresponds to the plant, when there are only two pistillate spikes, which is not very common in this species. The fig. of Schk. is excellent.

This species flowers just after C. *tentaculata*, and is very liable to be confounded with it, especially as it grows in the same situations and as its spikes are not at first nodding. Its pistillate spikes are commonly longer and smaller in proportion to their length; and by its recurved peduncles, fruit, and pistillate scale, it is readily distinguished from all its related species. I have *very rarely* seen any fruit upon the staminate spike, though Muh. seems often to have noticed such specimens.

53. C. *miliaris*. Mx.

Spicis distinctis; spica staminifera solitaria pallida longius pedunculata; spica fructifera sessili ovoidea fusca,—bractea setacea brevi; fructibus sphæroideis lævibus.

As I have never seen this plant, I have merely changed the description of Mx. so as to be in conformity with the preceding. The culm is erect, slender, scabrous above, leafy; leaves very narrow and flat; pistillate spike single, ovate, tawney, sessile,—sometimes two, the lower being distant and sessile; bract bristly and short; fruit spheroidal and smooth.

Grows in the *northern marshes* of Canada according to Mx. There is reason to doubt whether it is found in one of the localities mentioned by Pursh. The plant *appears* to be entirely distinct from others yet described, and if the description be at all complete, will doubtless hereafter be found about the northern lakes, and not improbably about ponds among the mountains of the northern part of the United States.

54. C. *anceps*. Muh.

Pursh, Eaton, Schw., Pers. no. 134. Ell. no. 36. Schw.
Schk. tab. Fff fig. 128, and tab. Kkkk fig. 195.
C. *plantaginea*. Muh. Gram.
C. *heterosperma*. Wahl. no. 67.
C. *striatula*. Mx.

Spicis distinctis; spica staminifera solitaria oblonga brevè pedunculata; spicis fructiferis tristigmaticis subternis subfiliformibus erectis alternis sparsifloris pedunculo ancipiti, suprema subsessili, cæteris subremotis exsertè pedunculatis; fructibus ovali-ventricosis basi elongatis apice attenuatis alternis subtriquetris glabris striatis ore membranaceo vel integro excurvis, squama oblonga mucronata vel ovata acuta paulo longioribus.

Culm about one foot high, *acutely* triangular, often nearly two-edged above and scabrous, leafy; radical leaves, living through the winter, linear-lanceolate, rather long, distinctly nerved or ribbed, from one fourth to more than half an inch wide, glaucous and often remaining glaucous through the winter, sending forth the culm in the spring; those of the culm lanceolate, nerved, with white sheaths especially opposite to the leaf; staminate spike single, pedunculate, oblong, roundish, rising from the bract of the highest pistillate; staminate scale oblong, rather obtuse, white on the edge; stigmas three; pistillate spikes 2—5, generally three, erect, alternate, loose flowered and with a zig-zag rachis, rather remote,—the highest nearly sessile, the others pedunculate, supported by leafy bracts with short sheaths and on *two-edged* peduncles; stigmas three; Muh. observed fruit on the staminate spike of some specimens, but I have never found any; fruit rather oval, attenuated at both ends, and seeming to stand on small pedicels, striate, turned back at the apex, membranaceous or entire at the orifice; pistillate scale variable, oblong and mucronate, sometimes ovate and acute, sometimes obtuse with a short point, often differing on the same spike, white on the edge, green on the keel, more than half the length of the fruit. Colour of the plant rather glaucous.

Flowers in May—grows about woods and hedges, very rarely in wet situations—common.

The *name* of this species is credited to Muh. by Schk. Yet Muh. describes it under the name of C. *plantaginea*, while he refers the plant to the fig. of C. *anceps*, and asks whether it is not "C. *anceps*, Schkuhr?" It seems certain that Muh. could not have seen the true C. *plantaginea*, for his description corresponds most accurately to C. *anceps* in Schk. and disagrees entirely with that of C. *plantaginea*, tab. U. fig. 70. In the same work, as well as with the descriptions of the plant by Lam., Wahl., Schk., &c. The leafless sheaths of C. *plantaginea*, as well as other characters, clearly distinguish it from C. *anceps*. The latter flowers a little later, but is found in the same situations.

C. *latifolia* in Mr. Schweinitz' "Analytical Table," seems to be only a variety of C. *anceps*, having more broad and more distinctly nerved leaves and broader sheaths. Both varieties are common here, and the gradation from the narrower to the broader leaves is readily traced. This variety is certainly not the C. *latifolia*, Wahl., as he expressly refers his plant to the fig. of C. *plantaginea* in Schk. tab. U fig. 70. and describes the sheaths as *subaphyllous*. It is well known that the sheaths of C. *plantaginea* have sometimes an elongated termination remotely approaching to the form of a leaf. Although the plant in Schk. tab. Kkkk, fig 195, is referred by Schk. to C. *plantaginea*, it is certainly the broad-leafed variety of C. *anceps*, and the reference of this figure should unquestionably be to this species. Schkuhr was probably led to consider this variety of C *anceps* as belonging to C. *plantaginea*, from the striking resemblance of the leaves of the two plants, while in every other respect they are different. This difference is sufficiently obvious to those who are familiar with both. Mr. Elliott observes that this species has been to him " obscure ;" a fact which others have found too true. It is hoped that this attempt to remove the principal causes of obscurity in ascertaining this plant, will be an adequate reason for the length of these remarks.

55. C. *Oederi*. Ehrhart.
Mx., Pers. no. 125. Rees' Cyc. no. 117.
Schk. tab. F fig. 26
C. *flava* β *Oederi*. Pursh, and Agardh.
——— β *flavescens*. Wahlenb.
C. *irregularis*. Schw. Analyt. Tab.

Spicis distinctis vel androgynis vel utrisque; spica staminifera solitaria erecta; spicis fructiferis tristigmaticis subquaternis aggregatis subsessilibus bracteatis brevi-oblongis, suprema androgyna nunc superne stamenifera nunc inferne vel utrinque; fructibus subobovatis subinflatis nervosis rostro subulato rectiusculo bidentatis, squama ovata paulo longioribus.

Culm 4—10 inches high, obtusely triangular, leafy ; leaves linear-lanceolate, rather smooth, somewhat turned in at the edges; bracts long, leafy, surpassing the culm, with very short sheaths; staminate spike single, oblong, rather small, sometimes pedunculate, with an ovate-oblong tawny scale; pistillate spikes 3—5, often four, clustered, oblong, round, short, nearly sessile; lowest often remote; highest often androgynous with staminate flowers sometimes above and sometimes below, or both ; the other spikes sometimes having a few staminate flowers above ; stigmas three ; fruit rather obovate, nerved or costate, sub-triangular, diverging or sub-reflexed with a nearly straight two-toothed beak ; pistillate scale ovate, acutish, tawny, a little shorter than the fruit. Colour of the whole plant yellowish.

Flowers in May—grows in wet situations. Abundant in all its varieties at Niagara Falls near *Table* Rock, with C. *pyriformis*, C. *scirpoides*, C. *stipata*, &c Though I found C. *pyriformis*, with C. *alba* upon Goat Island, I did not see C. *Oederi* on the American side. Penn. Schw.

Having received specimens from Mr. Schweinitz and examined his large collection of Carices, as well as this plant at Niagara Falls, it is certain that C. *irregularis*, Schw. is the C. *Oederi* of Europe.

Botanists are not agreed in considering this plant as a distinct species from C. *flava*. But, as it is in Europe and our country a much smaller plant, grows in different situations, has its spikes and fruit considerably different, and appears so different to the eye, I have followed Ehrhart and others in considering it a distinct species. Our plant agrees exactly with specimens from the north of Europe.

56. C. *Buxbaumii.* Wahl.
Muh., Pursh, Eaton, Schw., Ell., Agardh.
Pers. no. 96, Wahl. no. 129. Rees' Cyc. no. 77.
Schk. tab. X and Gg fig. 76.
C. *polygama.* Schk.

Spicis distinctis vel androgynis subquaternis spica suprema staminifera sæpe androgyna pedunculata clavata superne *fructifera*, cæteris fructiferis oblongis subremotis sessilibus bracteatis distigmaticis et tristigmaticis; fructibus ovatò-oblongis et obovatis obtusis subtriquetris nervosis ore subintegro glabris, squamæ oblongæ mucronatæ subæqualibus.

Culm 1—2 feet high, slender, leafy towards the base, subscabrous above; leaves linear-lanceolate, long, rough, on the edge; bracts linear, rough, shorter than the culm; spikes 3—5, sometimes are wholly staminate, pedunculate, erect, sometimes the upper spike is staminate below, or above, or both, clubform, the others oblong sessile and bracteate; staminate scale linear-lanceolate, mucronate, dark brown; pistillate scale oblong, mucronate, nearly black, with a green keel; stigmas two and three; fruit oval oblong, glabrous, somewhat compressed, obtuse, nearly entire at the orifice, often a little shorter than the oblong mucronate scale.

Flowers in June and July—grows in marshy places. Penn., Muh. Carolinas, Schw.

In our country this species seems generally to want the staminate spike, and to have the upper spike staminate below like C. *hirsuta*, &c. to which it is closely related. It occurs, however, as in Europe, under both varieties of the spikes. Wahlenburg calls it *pseudo-androgynous*.

57. C. *flexuosa.* Schk.
Muh., Pursh, Eaton, Schw., Ell.
Pers. no. 166.
Schk. tab. Ddd and Aaaa, fig. 124.
C. *tenuis*. Rudge secund. Muh. and Rees' Cyc. no. 155.
——— *Debilis*. Mx.

Spicis distinctis; spica staminifera solitaria filiformi: spicis fructiferis tristigmaticis quaternis filiformibus flexuosis cernuis sparsifloris longè et exsertè pedunculatis; fructibus oblongo-lanceolatis subtriquetris alternis glabris rostratis bifidis, squama ovato-lanceolata vix duplo longioribus.

Culm 1—2 feet high, triquetrous, scabrous above, slender; leaves linear, long as the culm, shorter below, scabrous on the edges, with striate sheaths; bracts linear, leafy, surpassing the culm, the lower ones with very long sheaths; staminate spike single, very slender, long, with rarely a few fruit, staminate scale oblong, obtuse, white on the margin; pistillate spikes four, filiform, nodding, loose-flowered, from one to two inches long, rather remote, alternate, lower ones very long, exsertly pedunculate; rachis flexuous; stigmas three; fruit oblong-lanceolate, alternate, glabrous, subtriquetrous, nerved, rostrate and two-toothed; pistillate scale ovate lanceolate, whitish on the margin and green on the keel, a little more than half the length of the fruit. Colour of the plant light and dark green.

Flowers in May and June—grows in moist woods and meadows—common. Penn., Muh.

There can be little doubt that C. *debilis*, Mx. is this plant, as he notices its resemblance to C. *sylvatica*, Huds., to which this plant is certainly closely related. The specimens I have seen have many more fruit than Muh. mentions, though not many more than are given on the figure of this species in Schk. It should be observed that the C. *debilis*, Forster, the C. *Forsteri*, Wahl. no. 81, is a very different plant from C. *debilis*, Mx.

58. C. *sylvatica*. Huds.
Pers. no. 165. Rees' Cyc. no. 148.
Schk. tab. Ll fig. 101.
C. *drymeja*. Ehrh. secundum Wahl. no. 79.

Spicis distinctis; spica staminifera solitaria gracili brevi pedunculata; spicis fructiferis tristigmaticis subquaternis filiformibus sparsifloris remotis cernuis longo exserte pedunculatis; fructibus ovatis triquetris glabris subventricosis longiuscule rostratis bifidis, squama ovata mucronata membranacea vix superantibus.

Culm 9—18 inches high, leafy, scabrous above, triquetrous; leaves linear-lanceolate, shorter than the culm, rough on the edges, and like the preceding with brownish sheaths at the base; bracts leafy, about equal to the culm, lower ones long; staminate spike single, erect, subpedunculate, slender; staminate scale oblong, acute, membranaceous, white, green on the keel, pistillate spikes generally four, an inch to an inch and a half long, loose-flowered, nodding, filiform, remote, exsertly pedunculate,—lower ones with long peduncles extending from long sheaths; stigmas three; fruit ovate, triquetrous, glabrous, rostrate, bifid; pistillate scale ovate, white on the margin, green on the keel, mucronate, nearly equalling the fruit. Colour of the plant light green.

Flowers in May and June—grows in the same situations as the preceding—common, but not abundant, in this county, Newburgh, N Y. and near Little Falls on the Mohawk.

This species has not heretofore been credited to our country. Schk. has given two figs. of the plant with which ours well agrees. It differs from C. *flexuosa* in the particulars mentioned by Willd. Its fruit is shorter and more inflated than that of C. *flexuosa*, and its pistillate scale is longer in proportion, as well as different in form.

59. C. *limosa*. L.
Pers. no. 179, Agardh. Rees' Cyc. no. 130.
Schk. tab. X. fig. 78.
C. *lenticularis*. Mx. and Schw.
Am. Journ. Vol. VII. p 273.

Spicis distinctis; spica staminifera solitaria ebracteata; spicis fructiferis tristigmaticis subbinis ovatis vel oblongis sublongo-pedunculatis subsparsifloris pendulis subremotis; fructibus ellipticis compressis brevissime rostratis ore integris, squamæ ovato-cuspidatæ et ovato-lanceolatæ vel oblongæ subæqualibus.

Culm about one foot high, ascending, obtusely triquetrous, subscabrous above; leaves subradical, rather glaucous, narrow, flat, carinate, sometimes a little rolled in on the edge; scarcely as long as the culm, with brownish sheaths at the base; bracts leafy, linear, surpassing the stem with *very short* brownish sheaths; staminate spike single, rising from the sheath of the highest pistillate, and pedunculate; staminate scale lanceolate, often oblong, brownish; stigmas three; pistillate spikes *one to three*, ovate or oblong, sometimes cylindric, long pedunculate, pendulous, remotish; fruit compressed, elliptic, or lenticular, rarely obovate, scarcely rostrate, entire at the orifice; pistillate scale ovate cuspidate, ovate-lanceolate, or oblong and obtusish, sometimes a little longer or shorter than the fruit, or equal to it, becoming brown or reddish, with a green keel. Plant rather glaucous, changing to brown.

β. C. *irrigua*. Wahl Has subcylindric spikes, and long acuminate, dark red pistillate scales. Stockbridge.

γ. C. *variflora*, Wahl. Has sub-linear spikes, rather loose flowered, with subcircinate pistillate scales, and oval staminate scales, with ovate-suboblong fruit

δ C. *livida*, Wahl. Has shorter peduncles, few-flowered, oblong pistillate scale about equal to the fruit, and obtusish, with rather ovate-oblong fruit, and sub-incurved leaves. Becket.

ε. C. *oblonga*, (mihi,) spikes rather long cylindric. White Mts. N. H.

Flowers in June. Grows on marshes about ponds. Stockbridge and Becket—Dr. Emmons. Ashfield—Dr. J. Porter. Mt. Washington, N. H.—Dr. Barratt.

In Vol. VII. p. 273, the description of C. *lenticularis*, Mx. was given, as well as the popular characters of the above plant. The resemblance of our plant to C. *limo a* was also mentioned, though it was then supposed to be a different species. I have little doubt that C. *lenticularis*, Mx. is the same plant, as the beak is scarcely to be perceived on some specimens. From an examination of our plant from different places, of which at least three varieties are now before me, and one different also from those given by Wahlenbergh, and from a comparison of them with C. *limosa* from England and Sweden, there can be no doubt that our plant is the C. *limosa*, L. The Carex, Vol. IX. Tab. A. fig. 2, named C. *lenticularis*, must be considered a var. of C. *limosa*.

60 C. *leucoglochin*. Ehrh.
Wahl. no. 8, Pers no. 6.
C. *pauciflora*. Schk. tab A. fig. 4. Rees' Cyc. no. 9.
C. *pulicaris*. Lin. Flor. Suec.*

* This is not C. *pulicaris*, Schk. the C. *psyllophora*, Ehrh.

Spica unica androgyna subquadriflora; flore staminifero terminali subsolitario; fructibus tristigmaticis lanceolatis subtriquetris teretibus valde reflexis, squama oblongo-lanceolata vix duplo longioribus.

Culm 3—8 inches high, ascending, triquetrous, scabrous above; leaves subradical, two, sometimes more, linear, subconvolute, about the length of the culm, sheathed at the base; spike single, terminal, androgynous; staminate flowers above, subsolitary, with a lanceolate scale becoming brownish; fruit 2—4, long, lanceolate, roundish, reflexed, slightly triquetrous, with a *caducous* scale, which is oblong-lanceolate, and a little more than half the length of the fruit; stigmas three.

Flowers in June. Common in the marshes of Sweden; in our country found at Ashfi ld with C. *limosa*, in a marsh, and at Hawley, in a bog near the meeting-house, by Dr. J. Porter, from whom my specimens were received.

This is a singular and beautiful species, finely figured by Schk.

61. C. *lacustris*. Willd.
Pursh, Eaton, Schw. Ell. ?, Pers. no. 200.
Schk. tab. Oooo fig. 152.
C. *riparia*. Muh.

Spicis distinctis; spicis staminiferis subquaternis erectis, inferioribus sessilibus; spicis fructiferis tristigmaticis binis vel ternis oblongis cylindraceis erectis brevi-pedunculatis, suprema subsessili; fructibus oblongis nervosis glabris bifurcatis, squama oblongo-lanceolata paulo longioribus.

Culm 2—3 feet high, triquetrous, scabrous above, large; leaves linear-lanceolate, longer than the culm, rough, large, broad, carinate; bracts long, leafy, large, surpassing the culm, with scarcely any sheaths; staminate spikes 3—4. oblong, large, erect, highest pedunculate; staminate scale oblong, rather obtuse, mucronate, dark brown; pistillate spikes two or three, oblong, cylindric, short pedunculate, erect, highest nearly sessile; stigmas three; fruit oblong, nerved, glabrous, brown, bifurcate, scarcely beaked; pistillate scale oblong cuspidate, brown, nearly equalling the fruit. Colour of the plant rather light green.

Flowers in May and June. Grows in marshy situations and along ditches in low lands; common.

This species is nearly related to C. *riparia*, Curtis, C. *paludosa*, Gooden., and C. *evoluta*, Horton. Muhlenberg appears to have considered it the same as C. *riparia*, although he referred it to the fig. of C *lacustris*. Schk., and although Schk., Persoon, and others consider the two as different species. It cannot be C. *striata*, Mx. as Persoon suspects; for that species has pubescent fruit, and is doubtless the C. *pellita*, Muh.

63. C. *ovata*. Rudge.
Linn. Trans. VII. tab. IX. fig. 1.
Pursh, Rees' Cyc. no. 69.

Spicis androgynis apice staminiferis quaternis vel quinis ovatis densifloris pedunculatis pendulis bracteatis, fructibus tristigmaticis ovatis compressis acuminatis bifidis, squamæ ovatæ acutæ æqualibus.

Culm acutely triangular, scabrous; leaves erect, slender, scabrous on the edge; bracts leafy, with very short sheaths; spikes 4—5, staminate above, ovate, pedunculate, closely flowered, pendulous; fruit ovate, compressed, acuminate, bifid, stigmas three; pistillate scale ovate, acute, brown, long as the fruit.

Found in Canada and Newfoundland—Rudge and Pursh. The preceding description is derived from that in Rees' Cyc., and published in the hope that this plant may be found by some of our Botanists in the northern part of the U. States. The species seems to be very distinct and well characterized, and the writer is very desirous of obtaining a specimen.

64. C. *cristata* Schw.

Spiculis androgynis inferne staminiferis sessilibus 6—14 arctè aggregatis globosis bracteatis; fructibus distigmaticis ovato-oblongis compressis divergentibus alatis rostratis acuminatis bifidis convexo-concavis margine ciliato serratis, squama oblongo-lanceolata longioribus.

Culm 1—3 feet high, acutely triangular, scabrous above, glabrous; leaves linear-lanceolate, abbreviated below, shorter than the culm, striate, with long striate sheaths; bracts ovate, setaceous, the lowest nearly the length of the whole spike; spikes 6—14, crowded into a head, globose, sessile, with a few staminate florets at the base; fruit ovate-oblong, winged, rostrate, acuminate, bifid, striate, very rough on the margin so as to have a sub-crested appearance, convex above and rather concave below, diverging; stigmas two; pistillate scale oblong-lanceolate, membranaceous, about two-thirds the length of the fruit. Colour of the plant light or yellowish green.

Flowers in June. Grows in moist meadows and along wet hedges; common. Penn.—Schweinitz.

This species belongs in the same natural division as C. *festucacea*, with which it has probably been confounded. It appears, however, to be distinct from it, and is very appropriately named. In the number of spikes it resembles C. *lagopodioides*, but is a very different plant.

65. C. *floridana*. Schw. Analyt. Tab.

Spicis distinctis; spica staminifera solitaria sessili parva; spicis fructiferis distigmaticis sub-quaternis aggregatis ovatis sessilibus bracteatis, infima sæpe sub-remotis, fructibus ovalibus basi subattenuatis compressis convexo-planis rostratis brevè bifidis, squamæ ovato-oblongæ scabro-cuspidatæ æqualibus. Vide fig. Obs. spica terminali superne staminifera, secundum Schw.

Culm about six inches high, triquetrous, slender, scabrous above; leaves radical, linear, flat, narrow, sometimes a foot long; bracts linear-lanceolate, leafy, lower ones surpassing the culm; staminate spike single, short, small, cylindric, sessile,—pistillate at the base according to Schweinitz but entirely staminate in my specimens; staminate scale lanceolate, tawny on the edge; pistillate spikes three to five, ovate, short, sessile, aggregate, bracteate, lower one sometimes rather remote; stigmas two; fruit oval, compressed, somewhat attenuate at the base, rostrate, glabrous, shortly bifid; pistillate scale ovate-oblong, mucronate and quite scabrous, white and membranaceous, green on the keel, long as the fruit. Colour of the plant light green.

Found in Florida by Mr. Le Conte,—appears to be a very distinct species,—belongs in the same natural division as C. *novæ-anglicæ*, and C. *pyriformis*, unless the upper spike should prove to be generally androgynous. For my specimens I am indebted to the kindness of Dr. Torrey.

66. C. *blanda*. (mihi)
C. *conoidea*. Muh.
Muh. Gram. no. 39, Schw.

Spicis distinctis; spica staminifera solitaria erecta pedunculata triquetra; spicis fructiferis tristigmaticis subternis oblongis cylindraceis subsparsifloris alternis bracteatis, suprema subsessili, infima longè pedunculata. pedunculo ancipiti, fructibus ovalibus vel obovatis subtriquetris nervosis apice recurvis et integris glabris, squama ovata scabro-mucronata vix longioribus

Culm 8—12 inches high, triquetrous, scabrous above, leafy; leaves linear-lanceolate, rough on the edge, long as the culm, shorter below, with striate sheaths white opposite to the leaf; bracts linear-lanceolate, leafy, longer than the culm, with short sheaths; staminate spike single, erect, pedunculate, short, triquetrous, from the same sheath with the highest pistillate; staminate scale oblong, rather obtuse, sometimes submucronate, yellowish; pistillate spikes two to four, oblong, cylindric, alternate, rather loose-flowered, highest nearly sessile, sometimes the two highest approximate and subsessile, the others remote, exsertly pedunculate, the lowest long pedunculate; peduncles two-edged; stigmas three; fruit oval or obovate, nerved, somewhat triquetrous, entire and somewhat recurved at the apex, glabrous, becoming yellowish; pistillate scale ovate, mucronate, with a scabrous point, the lower scales often long mucronate, about equal in length to the fruit. Whole plant rather light green and glaucous.

Flowers in May and June. Grows in dry woods and meadows; common. Sheffield; Newburgh, N. Y; Penn-Muh. and Schw.

This plant is excellently described in Muh. Gram. and the reference is to C. *conoidea*, Schk. But this is an entirely different species from the C. *conoidea*, Schk., as is evident from the description of Muh. and the comparison of specimens from Muh. in the Herbarium of Mr. Schweinitz. The C. *granularioides*, Schw., described in this Journal Vol. IX. p. 262, is the true C. *conoidea*, Schk., and the fig. there referred to, Tab. A fig. 4, is only a variety of this species of Schk. The reason of the mistake may appear singular, when it is stated that both these species were correctly ascertained nearly two years before that paper was written The mistake, into which I was led, is now corrected For some reason Muh. had changed the plant after Schk. had described C. *conoidea;* to the plant described by Muh. it becomes necessary to give a new name.

There can be no doubt that the C. *conoidea* lately described by Mr. Elliot is the true C. *conoidea*, though it is not the plant intended by Muh.

To prevent confusion, it should be observed, that C. *granularioides*, Schw., a fig. of which is given in Vol. IX. of this Journal, is the C. *conoidea*, Schk. Tab. Vvv fig 168, and that this is the plant described under this name in Pursh, Eaton, and Pers. no. 150. C. *conoidea*, Schk. has oblong, obtusish, and terete or oblong-conic fruit, which is entirely different from that of C. *blanda*, which is more nearly related to C. *granularis* and C. *pyriformis*, while the true C. *conoidea* is related to the C. *pallescens*.

Remark 1. As the specific name of the species described in Vol. VII. p. 277, had been previously adopted by *R. Brown* for another species, it becomes necessary to give another name to the former. A description from more perfect specimens here follows.

C. *Torreyana*. (mihi)
Vol. IX. Tab. A. fig. 1. Am. Journ.
C. *aristata*. Vol. VII. p. 277.

Spica terminali androgyna inferne staminifera; spicis fructiferis subternis oblongis sparsifloris remotis exserte pedunculatis subpendulis; fructibus tristigmaticis oblongis basi subattenuatis subinflatis subtriquetris nervosis acutiusculis brevi-rostratis ore bilobo, squamæ oblongæ scabro-aristatæ subæqualibus.

Culm 12—20 inches high, triquetrous, scabrous above, leaves linear-lanceolate, long as the culm, shorter below, with striate sheaths, scabrous on the edge, flat; bracts linear-lanceolate, surpassing the culm; lower ones with rather long sheaths; androgynous spike terminal, oblong, clubform, staminate below; staminate scale lanceolate, acuminate, white, green on the keel; pistillate spikes 2—4, about three, oblong, rather loose flowered, more or less exsertly pedunculate, rather remote, filiform when young, somewhat pendulous with a flexuous rachis; stigmas three; fruit oblong, somewhat attenuated at the base, terete above, glabrous, nerved, subinflated with a short beak two-lobed at the orifice; pistillate scale oblong, white and hyaline, green on the keel, with a long scabrous awn, variable in length, shorter or even longer than the fruit, but generally nearly equal to its length. Colour of the plant rather light green; leaves and sheaths pubescent.

Flowers in May and June. Grows on the alluvial meadows of the Housatonic in Sheffield.

This plant is now known to be the Carex, No. 46, Muh. Gram. The resemblance of that plant to C. *castanea*. Wahl. no. 90, was remarked by Muh., and is true also of ours, yet as he considers the C. *flexilis*, Rudge, found in Newfoundland, the same as C. *castanea*, Wahl., which the descriptions of the two plants seem clearly to authorize, there can be no doubt that ours is a very different plant. Its name is in honour of one of our distinguished botanists. The C. *Torreyana*, Schw., it should be remarked, is a very different plant, being only a variety of C. *retrorsa*, Schw.

Remark 2. By comparing a specimen of C. *aurea*, Nutt. with C. *pyriformis*, Schw. described Vol IX. p. 69, it is evident that they are the same species. Mr. Nuttall has indeed placed C *aurea* among those species which have *three* stigmas; but it has always *two* only, in the numerous localities in New England, in the state of N. Y., and at Niagara Falls in Canada. It belongs to another subdivision.

ZOOLOGY.

Art. VI.—*Facts and considerations showing that the Two-Headed Snakes of North America and other parts of the world, are not individuals of a distinct race, but universally monsters.* In a letter from Dr. Samuel L. Mitchill, of New-York, to Dr. Godman of Philadelphia.

The two-headed serpent has long been an object of admiration and research. The rarity of its occurrence has added interest to the inquiry. It has, however, been found in so many, and such distant places, that several authors have been induced to make delineations, and various collectors to procure specimens.

The production to which I allude is not the *Amphisbœna* of hot climates, erroneously alleged to have a head at each extremity of the body, with the capacity of moving both ways, as its name imports, at will. The one I possess from the island of Jamaica, has no such constitution. Such a two-headed being belongs to fabulous, and not to real zoology. But it is an aphedian reptile, having two distinct heads, or a double head, at one extremity of the body.

In the usual cases, among the mammalia, the departure from the ordinary figure and structure, has been uniformly considered as indicating or constituting monstrosity. When a similar peculiarity of organization occurs in serpents, it seems to have been viewed by many, with a different regard. The creatures have attracted notice as a distinct race, and perfect in their kind.

This opinion has probably arisen from the size which the animal has attained, and the agility with which it performed all its functions. Hence a sentiment arose, that a *Serpens biceps*, belonged to a specific breed, regularly and naturally formed with two heads.

The circumstances were powerful and imposing; and for a time, I was myself inclined to that belief. But latterly I have acquired information, that has obliged me to abandon the notion.

During the year 1823, a female snake was killed about six miles west of the Genesee river, together with her whole brood of young ones, amounting to one hundred and twenty. Of these, three were monsters; one with two distinct heads; one with a double head, and only three eyes; and one with a double skull furnished with three eyes and a single lower jaw; this last had two bodies. The figures correctly drawn from the originals in my collection, represent the shape and size of the several individuals. (See the annexed plate, fig. 1, 2, and 3.) My friend, Dr. Voight, of Rochester, having heard of the occurrence, travelled to the place and inquired into the facts. He procured the three which were deformed, and very obligingly placed them at my disposal. The dam, or mother, was of the sort called the *Black Snake* or *Runner*, one of the most frequent and prolific of the New-York serpents. The species is very well known, and is apparently the *Coluber constrictor* of Linnæus, and *Le Lien* of La Cepede. It frequently attains the length of six feet, and has been known to equal twelve; is sleek and slender, with a black back and a bluish belly, with a white throat, and sometimes a white ring around the neck. The vulgar name is derived from a tale, that in the amorous season, the male is bold enough to chase human beings, and en-circle them with his folds. It is nevertheless free from poison.

This species belongs to the tribe of viviparous snakes, comprising such as are in strictness, containers of eggs, but do nevertheless hatch them within their bodies, and bring forth the young alive. This has been long known to happen in the case of the European *viper*, called *Vipera*, a derivative from *Vivipara*, from the known habit of excluding the offspring from retained or unlayed ova.

We have here an example of the monstrosity of three individuals belonging to a single litter of serpents, and that monstrosity conspicuous in the twofold formation of the head. It might hence be inferred from analogy, that all serpents of this irregular constitution are also monsters. Still, as these mis-shapen productions have somehow been regarded as exceptions to the rule, I shall add a few more observations.

Intelligence by a most credible source has reached me from the Black river, near Lake Ontario, of a snake with *three* heads. The specimen was promised to me, and I do not yet despair of receiving it.

I offer as part of this communication, a somewhat circumstantial description of a two-headed serpent, I received from one of the Fejee Islands, a few years ago. The length is four inches and three quarters. Though there is some difficulty in counting the shields, yet, as nearly as I can ascertain, the scuta of the belly are one hundred and twenty-five, and the/scutella of the tail fifty-three. There are two pairs of jaws, two pairs of eyes, and two complete and separate heads. From the anterior termination of the dorsal ridge, the body branches forwards into two equal and regular necks. These necks are short and connected by an intervening membrane, and continuous skin beneath. On this skin is a sort of ligament, reaching across the chin, from the outer angle of one mouth, to the outer angle of the other. It seems to have given strength and simultaneous motion to the jaws. The two heads are of the same size, and very symmetrically formed. The back is dark brown, approaching to black; the belly paler, and of a yellowish brown; the tail tapers away like that of most other snakes, being neither flat, abrupt, nor blunt.

Among the ancients, two-headed snakes have been mentioned by Aristotle and Ælian. Among the moderns, Joseph

Lanzoni relates that he had seen such an animal. Francis Redi has left a very particular account of one that was catched near Pisa, on the bank of the Arno; and which lived from January to February, after it was taken, affording many opportunities for experiments and remarks. When life was departing, the right head appeared to die seven hours before the left. Aldrovandus had one in his cabinet at Bologna; and there is one in the museum of the king of France, at Paris.

For further intelligence on this curious and controverted subject, I refer to the Count La Cepede's able disquisition, (Des Serpens monstreux,) on Serpentine monsters, (Vol. IV. pp. 311—326 of the copy I had the honour to receive from him,) wherein, like a sagacious reasoner, he decides the whole class of these productions to be anomalies.

A two-headed serpent is figured, in several views, by George Edwards in the fourth volume of his history of birds, plate 207, and described. The drawings are of the natural magnitude. He introduces the subject by observing that he did not propose to exhibit monsters in his work, but that the species, even if it had not two heads, might be better known to the learned world. He mentions an *English* serpent, that had been brought to him, with two distinct heads. The specimen he describes was from Barbadoes.

The other intelligence touching this inquiry, has been so fully and properly posted up by Mr. President Clinton, in the note FF, subjoined to the discourse he delivered before the New-York Literary and Philosophical Society, in 1814, and published in the transactions of that learned body, (Vol. II. pp. 160—162.) that I avoid the transcription of his luminous statement.

From the facts stated, and the references made, it appears that two-headed snakes have been found in the West-Indian and Polynesian Isles, in Great Britain, in Italy, and in the state of New-York. An inference arising naturally from the premises is, that *they are individuals of different species*, and *probably of different genera;* inasmuch as it is very unlikely that the two-headed snakes, of remote situations on the continents, and more distant localities on the islands, were the issue of the North American, or New-York Black-Snake. This conclusion is fatal to the supposition, that these singular productions constitute a race of their own, and propagate their kind in regular succession.

Of such perpetuation of the species, there is no evidence whatsoever. A procreating association, or union of male and female parents, has never been observed, because such connexions do not exist. The birth and parentage of these strange and enormous productions, have been hitherto unknown; because, until Dr. Voight's important disclosure, not a naturalist could tell whence they came.

My own judgment on the case under consideration, is, that the miscreated and extraordinary constitution of the three young black snakes is owing to *monstrosity;* and by a similar anomaly in nature to that which occasionally produces monsters in the black snake, they may be engendered in other serpents belonging to the numerous species of *Coluber.*

If it should be asked, wherefore it happens that two-headed monsters are more frequent among serpents than other animals, it may be answered that this is very far from being ascertained and established. Two-headed births are by no means uncommon in other creatures; among which may be enumerated *dogs*, *cats*, *swine*, *sheep*, *kine*, and even the *human race.* Generally they are still-born, or very short lived; and, by reason of their hideous and disgusting shapes, are soon removed from sight.

The like happens to other animals; and, among the oviparous class, to poultry, and domesticated birds. The two-headed monsters usually die soon after hatching.

I have heard of a two-headed tortoise (Testudo,) that lived to acquire a considerable size, by having taken food at both mouths.

Two-headed serpents, hitherto, seem to have been of small or diminutive size; leading to a belief that their organization, which allowed them to live and enlarge for a short term, or a season, forbade them to reach entire expansion. and old age.

Serpents are destitute of limbs, and are consequently incapable of monstrosity, in feet, legs, hands, and arms, either by defect, redundancy, or malformation, when it happens, therefore, monstrosity must be in the head or tail, and the head is most frequently the seat of it.

The prominent peculiarity in these monsters, is that they can continue alive so long, that they can receive and concoct food, and that they can thereby be nourished, and acquire bulk. It is to those qualities differing from the generality of other monsters, that the two-headed snakes owe the notoriety they hold among zoologists and travellers.

New-York, August 1, 1825.

ART. VII.—*Descriptions of several new species of Batracian Reptiles, with observations on the Larvæ of Frogs.**—By RICHARD HARLAN, of Philadelphia.

THE genus Rana of Linnæus is subdivided by modern erpetologists into three sections, which include the genera Rana, Hyla, and Bufo of Lacēpède, Brongniart, Latreille, Daudin, and others.

The unmerited neglect with which this class of animals has been treated by American naturalists, is unaccountable, when we consider the important station they maintain in the scale of beings.

The interesting phenomena attending the metamorphose of the young frog or tadpole, early attracted the attention of men of science; and the works of Swammerdam, Roësal, Malpighi, Laurenti, Galvani, and Spallanzani, furnish the most

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* The present essay was nearly completed and ready for the press, when No. IX. of the Ann. of the Lyceum of Nat. Hist. of N. York appeared, containing a paper by Capt. J. Le Conte, entitled "Remarks on the American species of the genera Hyla and Rana." In its publication, this learned and indefatigable naturalist has anticipated four of my new species, viz. *Hyla versicolor*, *H. delitescens*, *Rana palustris*, and *R. sylvatica.*

In the indications of his new species *fontinalis*, *pumila*, and *gryllus*, the author has been so exceedingly laconic, and the characters he has noticed are so indecisive, as to render it impossible for me to say, whether or not they really differ from some of my species; the characters of the "*fontinalis*," for example, will apply with equal certainty to three or four distinct species.

On the contrary, his *R. nigrita* is a beautiful, well determined new species, and forms a valuable acquisition to this department. It is thus characterized: "*Rana nigrita*, above black, speckled with small white warts; middle of the back cinereus with an interrupted stripe of black; upper lip with a white line; beneath granulate whitish; irides golden; legs barred with whitish, hind part of the thighs brown; hind legs very long."

His *R. gryllus* is probably the same as was supposed by Daudin to be the young of a species of *Hyla*. (Vid. Hist. Nat. des Grenouilles, des Rainettes, et des Crapauds, p. 17.)

curious details concerning their organization, development, and functions. The science of experimental physiology has been more indebted to this than to any other class of animals. Frogs, being easily procured, and submitting to torture without any expression of pain, either by cries or convulsions, have always been preferred by physiologists as objects of experiment, when the peculiarity of their organization offered no barriers to their views. For this purpose their remarkable tenacity of life offered further facilities. The heart and entrails may be torn out of the body, without the animal appearing to suffer to a great degree, and produces death only at the end of some hours. The heart indeed affords signs of sensibility for many days after the appearance of life has ceased in other parts. The millions of these animals which have perished beneath the recipient of the air-pump, the excitations of the electrical machine, or of the scalpel of the anatomist, have given rise to the most important facts in physiology, anatomy, and natural philosophy. In every stage of their existence, the frogs are exposed to become the prey of many enemies: some quadrupeds, birds, serpents, and fish, live habitually upon them. In order to support this immense destruction, they live to a considerable age, when they escape their enemies, and each female discharges from six to twelve hundred eggs annually.

Nothwithstanding the talent which has been employed, and the length of time which has elapsed, since these reptiles have occupied the attention of the learned of several nations, there exist at the present day some points of their organization involved in obscurity, and some errors have been perpetuated from author to author.

In order to become better acquainted with their habits, and watch the progress of their developement, I have this season confined great numbers, of both tadpoles and frogs, in convenient receptacles.

My observations on the former were interrupted by an accident, after an attention of rather more than two months. I have however collected a few facts worthy of publication. My specimens were of different species and of various ages; but observation was more particularly directed to the larvæ or tadpole of the *Rana pipiens*, Linn. as being larger than any others inhabiting this state.

Though not full grown, about the latter end of May they generally measured in total length four inches five tenths:

length of the tail two inches eight tenths; general colour dark slate-green; abdomen white or yellow, sometimes mixed; beneath the throat mottled; tail elongated, compressed, furnished with a membranous fringe on the upper and lower borders.

The extremities, or legs, which are about appearing, are not merely hid beneath the skin, as was asserted by Daudin, but exist as mere rudiments, and grow out like the stem of a tree.

It has not yet been accurately ascertained how long a time it requires for these larvæ to complete their metamorphose, or how frequently during the year the frogs produce their spawn: we know that some of the young of these animals pass the *winter* in a larvæ state. About the commencement of April, in the vicinity of Philadelphia, they were observed with the posterior extremities half formed, and, a few days later, an immense quantity of spawn with the fœtuses nearly ready to escape. In warmer situations indeed, the bottoms of the ponds were already covered with young tadpoles.

According to some authors, the young are hatched in fifteen days, and are transformed into frogs in two months* (Lacēpède): according to others, two years are required for this metamorphose. "The *Jackie* of Surinam remains sometimes for more than two years under the form of a tadpole; and even after it has become a perfect animal, it still preserves its tail for a certain time, which has given rise to the notion, that it is converted into a fish, and accounts for the name *Rana paradoxa*.

A similar phenomenon has been observed in the *Bufo scorodasma*. (Vide Dict. des Sc. Med., Art. Germ. p. 259.)

It was by inquiries directed to this stage of the animal's existence, that Spallanzani, after Swammerdam, was enabled to detect one of the most curious facts which physiology has gained from natural history. The egg of a frog plunged into water, swells, and, becoming transparent, permits us to see a blackish body, which the microscope proves to be a tadpole." And Spallanzani convinced himself of the *existence of tadpoles in the eggs laid by a female which had been entirely excluded*

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* This period varies under various circumstances, as the degree of heat, &c. to which the spawn is exposed. Shaw, in Zool. Gen., mentions one month, or five weeks.

from the male. Concerning the rapidity of the metamorphose of these reptiles, Mr. G. Cuvier has only remarked, "On sait que la Jackie (Rana paradoxa) ne perd sa queue que fort tard et long tems apres ses branchies, et que ses branchies elle-même ne tombent que quand elle a dèjà sa taille de grenouille." (Sur les Animaux douteux Voy. de M. Humboldt.)

It is very probable that the period required for the metamorphose varies with the species. In the larvæ of the *Rana pipiens*, which we detained, expressly for examination, for more than two months, no sensible alteration was observed in this respect, or scarcely any visible approach towards perfection.

Numerous opportunities occurred to corroborate the remark of Mr. Cuvier, that the organs of generation exist nearly in a perfect state in the larvæ of the frog. "Among the many changes (continues Mr. Cuvier) to which the tadpole is subjected in its passage to a state of perfection, we cannot include the appearances of the organs of generation. We already observed the ovaries and their fatty appendages: and if they be not entirely as large as they are in the frog at the epoch of its amours, they approach very near to what they are during the remainder of the year."

Agreeably to the observations of the author last quoted. "there are many species of tadpoles which have but one operculum on the left side; such are the larvæ of the R. *paradoxa*. and those of the brown toad; but those of the common frog (Rana temporaria, Linn.) appear to me to have two holes. both placed beneath."

This fact I have verified in all the tadpoles which I have subjected to examination: after dissecting great numbers of tadpoles, of different species and at different ages, both before and after the appearance of their legs, in no instance was there observed more than one opening or operculum, and that always on the left side; though dissection at all periods demonstrated the existence of gills or branchiæ on both sides, covered by integuments.—"Les seules *larves* ou *tetards* des *reptiles batraciens*, c'est à dire des *salamandres* et des *grenouilles*, *rainettes*, et *crapauds* rèunissent des branchies et des poumons, respirent à la fois, du moins pendant un certain temps, et l'air èlastique en nature, et celui que contient l'eau, participent par consèquent, d'une maniere ègale, de la nature des animaux aëriens et des animaux aquatiques, et peuvent donc, si l'on vent, porter le nom d'amphibies dans son acceptation la plus rigoureuse." (Cuvier Anim. douteux, Voy. d'Humboldt.)

In specimens which we subjected to examination, we found the lungs and nostrils to exist in a rudimentary state; the latter are small, and barely admit the passage of a very fine bristle; the former are of a deep black colour. That the larvæ do not depend altogether upon their branchia for the decarbonization of the blood, we were satisfied, by observing them to rise frequently to the surface of the water, in order to discharge the foul air and to respire: this process was repeated every three or four minutes, on some occasions, in a number of these animals confined in a tub of water.—According to Swammerdam and Roësal, the branchia of tadpoles are *exterior* and free during the first days of their existence. This statement was not verified by observations we have made on very young tadpoles of this country, in which not the slightest vestiges of branchia or of feet are visible. We subjected a number of individuals to examination, both with and without the glass: the subjects appeared to have just emerged from the eggs, were nearly transparent, the viscera being apparent through the abdominal parietes; though it is not improbable that these organs may have existed at a still earlier period. The frog, in common with other batracians, being destitute of true ribs and a diaphragm, is obliged to force the air into the lungs by means of the muscles of the throat; this is effected by closing the lips, and forming a vacuum by protruding the muscles of the throat, when the air rushes into the nostrils, which open in the anterior portion of the palate, generally between two transverse palatine ridges. I could observe no valves at these openings, which, we are informed by several authors, exist there, for the purpose of preventing the escape of the air; and have little doubt but that the fleshy and free extremity of the tongue, by being applied to the palate of the mouth, performs the function of a valve. In addition to the ordinary permanent specific distinctions, I have observed good characters in the form, number, and size of the transverse palatine plates.

Some species of frogs possess, to a remarkable degree, the faculty, more or less peculiar to all the batracian order, of changing their colours. The Rana pipiens, or common bullfrog, I have observed to change, in the course of a few hours, from a light ash, or nearly dirty white colour, to a light green and black, and the reverse; though the specific markings are more or less unchangeable.

Though the frog is subjected to change of cuticle, this does not take place throughout the body at once, as in the serpent, but falls off in detached pieces. I could not determine how frequently this process was repeated; but certainly not every "eight days." With these preliminary remarks, I proceed to the more immediate object of this paper, the description of several new species.

Sp. 1. Rana *flaviviridis.* (Nobis.) Yellow-throated green frog. Spring frog? Bartram, Manuscript Notes penes me.

Char. essent. Body rather clumsy; abdomen large; snout a little obtuse; colour above clear lively green, beneath white; under the throat yellow; buttocks mottled with black spots.

Dimensions. Length of the body three inches, of the hind legs four inches four tenths; breadth of the head one inch.

Description. (Male.) Body rather contracted; abdomen enlarged; prevailing colour green; skin smooth, with the exception of the sides, which are tuberculated; the back is separated from the sides by a longitudinal cuticular fold; the sides are obsoletely spotted; tympanum very large, suboval, plane and dark-coloured at the circumference, protuberant and green at the centre; buttocks and posterior part of the thighs mottled with black spots; thighs and legs above marked with obsolete black bands; toes of the hind feet palmated, granulated, and of a blackish colour.

Habit. Not very active; destitute of any peculiar odour: destructive to small fish, grasshoppers, and worms.

Inhabit the middle states; abound in the vicinity of Philadelphia.

Sp. 2. Rana *sylvatica.* (Le Conte, Ann. of the Lyc. of Nat. Hist. of N. York, vol. 1. no. ix. p. 282.—Wood frog.) This species I had described under the name of R. *Pennsylvanica.*

Char. essent. Olive brown or drab colour above, white beneath; a black vitta, commencing on the side of the snout, passes backwards dilating, and involves the eye and tympanum; posterior extremities obsoletely fasciated.

Dimensions. Rather smaller and more slender than the R. *clamata.*

Description. Body long and slender; snout rather elongated: a longitudinal black band on each side of the head, commencing anterior to the eye, involves two-thirds of the iris and the whole of the tympanum; lips with dark borders; lower parts of the body white, the flanks light green; upper parts of the body drab colour, with the exception of a few scattered spots posteriorly; and the hind legs with broad, obsolete, transverse, blackish bands.

Habit. A great leaper; travelling far from the water in search of insects, &c.; is difficult of access, leaping with great facility and hiding beneath the dead leaves, which the colour of the upper parts of the body closely resembles; more frequently found in the woods than in the fields; this beautiful species is not very common.

Inhabit Pennsylvania and New-Jersey.

Sp. 3. RANA *scapularis.* (Nobis.)

Char. essent. General colour above dark olive brown; snout green; beneath the throat yellow; abdomen white; a golden coloured line above the scapulæ.

Dimensions. Length of the body three inches; of the hind legs four inches.

Description. (Male.) Dark olive brown, white beneath; throat, anterior part of the thorax, and interior of the fore legs, of a bright yellow colour; the outer surfaces of the fore legs and thighs the same colour as the back; leg, tarsus, and foot dark ash colour; sides tuberculous and mottled with black; membrane of the tympanum very large, with a greenish protuberance at its centre; an elevated golden coloured line passes from its inferior border across the scapulæ. Eyes very prominent, nearly approximate; snout contracted, and with the upper lip of a dark sea-green colour; legs obsoletely and sparsely banded with black.

This species resembles the R. clamata, but differs in the colour of its throat, in the form, colour, and length of the snout, in the size and proximity of its eyes, in the colour and size of its tympanum, (which is double the size of the same part in the clamata,) in the proportion of its limbs, and lastly in the golden line across the scapulæ.

Habit. As far as observed, resembling that of the clamata, though less noisy and timid.

Inhabit Pennsylvania.

Sp. 4. RANA *palustris.* (Le Conte, Ann. of the Lyc. of Nat. Hist. N. York, vol. 1. no. ix.) This species I had described under the name R. *pardalis.* Leopard frog.

Char. essent. General colour dark cineritious above, white beneath, lighter on the snout, flanks, and extremities; interior surface of the limbs yellowish; a row of dark green spots on each side of the spine, extending the whole length of the back; two other longitudinal rows on the flanks; posterior extremities striped with broad, transverse, greenish lines or bands.

Dimensions. Length of the body three inches; of the posterior extremities, four inches three-tenths; breadth of the head eight-tenths.

Description. (Female.) Dark cineritious above, white beneath; interior of the limbs yellowish; end of the snout and upper surface of the thighs approaching to green; a longitudinal row of dark green oblong spots on each side of the spine, from eight to ten in number and symmetrically arranged; a dark green spot on the inner and upper surface of the orbits, another on the top of the snout; a dark coloured line on each side of the snout, extending from the nostrils to the eyes; a silver coloured line, or cuticular fold, extending from the orbit on each side along the back to the thighs, inclosing the dorsal spots; thigh, leg, and tarsus striped with broad, transverse, greenish bands; a row of spots on the sides of the body, extending from the scapulæ to the thighs; another irregular row of smaller spots beneath; anterior extremities spotted; hind feet completely webbed; all the toes with tubercles on the inner surfaces of the joints; body smooth, or, when viewed with a glass, embossed with fine tubercles; snout rather pointed; tympanum small, rather circular.

Habit. Very active, timid, leaping to great distances, leaving the water in search of insects, always found in or near to ponds, &c.; diffusing a rank odour; the slime which covers the skin is more excoriating than that of other frogs; appear early in April; are not very noisy.

Inhabit ponds, ditches, &c. of the middle states; common in the vicinity of Philadelphia.*

Sp. 5. Rana *utricularius.* (Nobis.)

Char. essent. Colour dark olivaceous-green above, white beneath; with suboval blackish spots scattered over the back; a vocal vesicle on each side of the neck; legs and thighs with a few blackish bands.

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* If the *Rana zebra*, partially described in Nicholson's Encyclopædia, is intended to represent this species, the name is pre-occupied. Vide Shaw, Gen. Zool. vol. 3. pt. 1st.

Dimensions. Length of the body about three inches; of the hind legs more than four inches.

Description. Dark olivaceous-green above, spotted with suboval dots; white or pale yellow beneath; snout small and angular; head rather flattened; a greenish vocal bladder, extending on each side of the inferior jaw and crossing the arms, in the male; in which respect this species resembles the R. *typhonia*, of Surinam, but is very different in its colour and markings.

Inhabit Pennsylvania and New-Jersey.*

Sp. 6. Rana *halecina*. (Daudin.)
R. *pipiens*. Schneider, Schreber, Shaw.
R. *aquatica*. Catesby, p. 70. vol. 2.
Shad frog. Bartram, Trav. N. America, p. 274.
R. *ocellata*? Kalm's Trav. in N. America, vol. 2. p. 88; who says that the Swedes call them sill-hoppetosser, or herring-hoppers, from their making their appearance early in the spring, at the commencement of the herring season.

Char. essent. Colour light cinereus above, white beneath; marked on the superior portions of the body with irregularly disposed blotches; body and limbs elongated.

Dimensions. Length of the body three and a half inches; of the hind legs, five and a half inches.

Description. Body above bright cinereus, beneath white, immaculate; back marked by several large, oblong, dark green blotches, irregularly disposed, and occasionally surrounded by a light green halo; body, limbs, and toes elongated; thighs and legs striped or spotted on the outside with dark green or purple on a black base; back and outer surface of the hind legs subverucose; sides separated from the back by a longitudinal cuticular fold; tympanum of moderate size, and in colour similar to the back; outer surface of the fore legs marked with three or four spots; toes terminated by a rose-coloured tumefaction; palate of the mouth with two middle serrated eminences; transverse eminences small; the posterior nares opening in cavities. This species in many respects resembles the R. *palustris*, but is distinguished, 1st, by its tympanum, which is much larger; 2d, by the colour; 3d, by the number and arrangement of the blotches; 4th, by the

* A specimen preserved in spirits in the cabinet of the Philadelphia Acad. of Nat. Sc. is erroneously labelled R. halecina.

elongated form of the body, snout, legs, and toes; 5th, by the posterior nares, which are much larger, and open between two transverse palatine ridges in this species, there being but a single ridge in the palustris.

Habit and locality. These are active hunters, and travel a considerable distance from the water; are common in the vicinity of Philadelphia, in ponds, canals, and marshes.

The following species have not hitherto been well described from the living animal.

Sp. 7. RANA *pipiens*. (Linn.)
Bull-frog. Bartram, Catesby, Brown, Kalm.
R. *maxima*. Catesby, Carolin. vol. 2. p. 72. pl. 72.
R. *catesbeiana*. Shaw, Gen. Zool. vol. 2. part 1. p. 106. pl. 33.

Char. essent. Brown cinereus above, whitish beneath; buttocks mottled; arms and legs striped with black; head and fore part of the body more or less green.

Dimensions. Length of the body from six to ten inches; of the hind legs from eight to twelve inches.

Description. Eyes very prominent, iris golden mottled with black; tympanum large, brownish, with a semilunar border posteriorly, extending anteriorly to the eye. Internal border of the upper jaw serrated, covered with the upper lip; within this border is a semilunar ridge; palate divided by a transverse ridge, interrupted in the middle by two serrated eminences; borders of the lower jaw not serrated, notched anteriorly; colour above cinereus-brown, or deep olive-green, beneath dirty white; throat greenish-yellow; exterior surface of the extremities, or legs, irregularly striped with black.

Habit. This unwieldy animal frequents ponds, ditches, marshes, lakes, and canals; is exceedingly gluttonous, swallowing young chickens, aquatic birds, small frogs, and tadpoles. The late Mr. Bartram states, that, on whipping one, it vomited forth three live frogs of considerable size; when confined and starved, they have been known to attempt swallowing each other; they are most destructive to fish ponds; seldom leave the water for any length of time. Their voice is harsh, somewhat resembling the suppressed voice of the bull; hence their vulgar name, "bull-frog." When taken, they frequently utter a cry like the squeaking of a rabbit: when whipped, they cry like a child. They appear early in April, but are not heard to make much noise until the weather becomes warm, or during the season of their amours, when they may be heard at the distance of a mile, more particularly during the silence of the night. This species is not known by the name of "shad frog," as was stated by Daudin; that name being applied to the *halecina* and *palustris*: though I have not observed that any one species makes its appearance much earlier than the others. When immersed in spirits, this frog changes to a lively green, with a stripe along the back; in which state it was figured by Daudin.

Inhabit the middle states; very common near Philadelphia.

Sp. 8. Rana *clamata*. (Daudin.)

Char. essent. Colour above dusky cinereus, beneath whitish; snout more or less green.

Dimensions. Length of the body three inches; hind legs four inches and two tenths.

Description. (Male.) Body above dark cinereus, approaching to green, tuberculous; snout green; beneath the throat, breast, and interior of the fore legs, bright yellow; tympanum large; longitudinal folds of the back not extending the whole length of the body, and of a light colour; the belly and interior of the legs white; thighs and legs obsoletely banded or spotted with black; sides more or less striped with black; buttocks mottled. (Female rather larger, lighter, and altogether white beneath.)

Habit. Noisy; generally crying just as it leaps into the water, and skimming over the surface previous to diving; screaming when caught in most instances; very active and tenacious of life. A dog of Mr. Bartram's having accidentally swallowed one of these animals, it was observed to struggle and to cry piteously for at least half an hour, to the great diversion of the spectators, and no small confusion of the dog, who was at a loss to comprehend this species of intestinal eloquence.

Inhabit the middle states; the most common of all our frogs.

Sp. 9. Rana *ocellata*. (Linn.)

R. *maxima virginiana*. Seba.

R. *pentadactyla*. Linn. Gmel. Argus frog. Shaw, Gen. Zool. vol. 2. pt. 1. p. 108. pl. 34.

Grunting frog. Bartram, Trav. in N. Amer. p. 272. pl. 34.

This species is badly figured by Daudin from a specimen in spirits. I have not observed this specimen in a living state; it is very doubtful whether they exist north of Charleston.

Char. essent. In form and size resembling the "pipiens." Body above brownish or greenish, with irregular deeper coloured spots; a small cuticular fold extends from the eye to above the flank; body beneath whitish, granulated under the belly and thighs; round brownish spots, surrounded with a clear teint, upon the flanks, buttocks, and thighs; fingers and toes furnished with small callosities beneath each articulation of the phalanges.

Inhabits Florida and Mexico.

Sp. 10. RANA *melanota.* (Rafinesque, Annals of Nature, first annual number, 1820.)

Char. essent. Back olivaceous-black; a yellow streak on the sides of the head; chin, throat, and inside of the legs, whitish with black spots; belly white without spots; eyes large, iris gilt-violet; anterior feet four free toes; hind feet five palmated toes.

Dimensions. Total length two and a half inches.

Inhabit Lake Champlain and Lake George: vulgar name *Black-frog.*

RANA *grunniens.* (Daudin.) "Rana fusca, aut subrubra, luteo post oculos maculata." This species, which Daudin erroneously refers to the grunting-frog of Bartram, I believe to be the R. oculata; it is most probably not a native of North America.

A New Species of Hyla.

HYLA *crucialis.—Char. essent.* Above dark green or slaty, beneath yellowish; head broad and flat; eyes prominent; a deep crucial groove on the back of the neck; hind legs very long.

Dimensions. Length of the body three and a half inches; of the hind legs, five and a half inches; breadth of the head one inch four tenths.

Description. General colour above slaty, beneath yellowish; head very broad and flat; mouth large; top of the head scabrous; a curved, scabrous, cuticular fold, extending backwards the whole breadth of the occiput from ear to ear; a similar fold extending from each eye to the nasal apertures: the latter are projecting; a scabrous eminence above each tympanum; a deep sulcus extends across the back of the neck, crossed by a smaller longitudinal groove; fore feet robust; hind feet exceedingly long, with five toes webbed to the last joint; soles yellow tuberculated; tubercles at the end of the toes large and flattened.

Inhabit Jamaica: presented by Mr. Betton of German town.

Art. VIII.—*Remarks occasioned by Art. X. Vol. IX. p.* 288.

In his account of the appearance of the insect which *eat out* of a table of fir, Mr. Foggo seems to maintain that the egg was not deposited in the tree, but "that the larva *penetrated the tree* in order to prepare for becoming a chrysalis." I am not certain that this is the meaning of Mr. F., because he implies just before that insects do from instinct deposit their eggs in the appropriate place for the animal to undergo its changes. The general solution of the phenomenon by Mr. F. is probably correct; but the other notion does not seem authorized by fact. The egg was doubtless deposited in the tree, whatever were the causes which prevented the earlier developement of the perfect animal. In the Literary and Philosophical Repository, published at Middlebury, Vt., 1816, I gave some account of the fact of bugs eating out of a table of appletree, the property of Mr. P. S. Putnam of this town. The last bug appeared in 1814; two others several years before. The place of the last was nearest to the heart of the tree, and all of them made their course along the grain between the cortical layers. The apple-tree of which the table was made, had then been cut down *twenty-eight* years, and the bug was covered by *thirty* cortical layers besides those of the sap-wood, which had been cut off. Allowing *ten* cortical layers for the sap-wood, the egg must have been deposited *forty* years before the tree was cut down, and *sixty-eight* years before the insect emerged into light. Now there can scarcely be a doubt that the egg which produced the last insect was deposited before the others, especially as there were several cortical layers between them, and its developement was consequently retarded by some cause which did not affect the others in so great a degree. It should be remarked that the insects emerged in a few weeks after their eating began to be heard, and that none of them eat more than three inches in length. I have just examined the table of Mr. Putnam again, and can discover no appearance of the insects having *eat into* the wood. An examination for the same object was made by Mr. P. at the time the insects appeared. The form of the insect, so far as I recollect, was similar to that of which a figure is given by Mr. F. ; it was doubtless a species of Urocerus.

Now, although a part of the passage may have been eaten by the insect before it became a chrysalis, and some accidental cause may have retarded the appearance of the last insect beyond the usual period peculiar to the species; which cause may have affected the egg, or the larva, or the chrysalis; there can be no doubt that the egg was originally deposited in the wood of the tree. Many insects are furnished with efficient instruments for piercing the substances in which they are led by an over-ruling hand under the operation of instinct to deposit their eggs. The cause which operated to retard the changes of the last insect, may also have prevented the developement of the others long beyond the usual time. In the case of these insects we have no proof that any part of the passage was formed by the larva. A particular knowledge of the insect is necessary to determine the point. The larvæ of insects, though often most voracious, are not always so; as we know in the case of the locust, grasshopper, and others.

CHEMISTRY, PHYSICS, MECHANICS, &c.

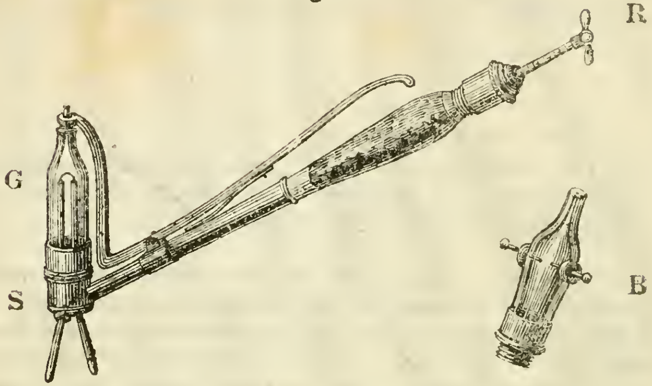
Art. IX.—*An Account of some Eudiometers of an Improved Construction.* By Robert Hare, M. D. Professor of Chemistry in the University of Pennsylvania.

In the second volume of the American Journal of Science, I published an account of some Eudiometers, operating by a mechanism which, previously, had not been employed in Eudiometry. A graduated rod, sliding into a tube through a collar of leathers, soaked in lard, and compressed by a screw so as to be perfectly air tight, was employed to vary the capacity of the tube, and at the same time to be a measure of the quantity of air, or of any other gas, consequently drawn in or expelled. About one-third of the tube was occupied by the sliding rod. The remainder, being recurved, and converging to a perforated apex, was of a form convenient for withdrawing measured portions of gas from vessels inverted over water, or mercury.

There were two forms of the sliding rod Eudiometer, one designed to be used with nitric oxide, or with liquids absorbing oxygen; the other, with explosive mixtures. The latter differed from the Eudiometers for explosive mixtures previously invented, in the contrivance for exploding the gases, as well as in the mode for measuring them; a wire ignited by galvanism being substituted for the electric spark, as the means of inflammation.

I now send you drawings of several Eudiometers, operating upon the principle of those above alluded to, with some modifications suggested by experience. Fig. 1. represents a hydro-oxygen Eudiometer, in which the measurements are made by a sliding rod, and the explosions are effected by the galvanic ignition of a platina wire, as in an instrument formerly described, excepting, that the method then employed of cementing the platina wire, in holes made through the glass, having proved insecure, a new and unobjectionable method has been adopted.

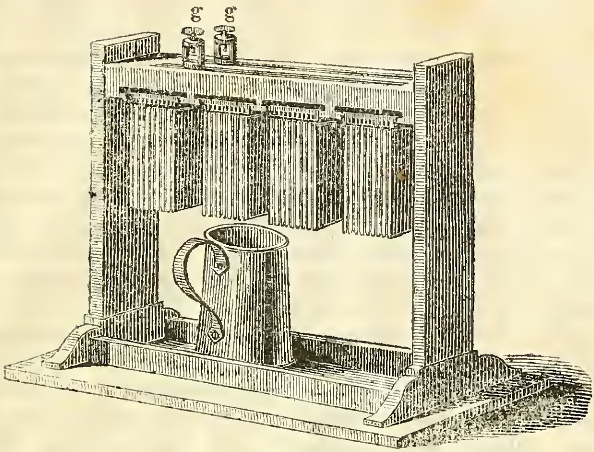
A Fig. 1.



In the instrument represented by the preceding cut, the igniting wire is soldered into the summits of the two brass wires (WW), which pass through the bottom of the socket (S), parallel to the axis of the glass recipient (G), within which they are seen. One of the wires is soldered to the socket, the other is fastened by means of a collar of leathers, packed by a screw, so that it has no metallic communication with the other wire, unless through the filament of platina, by which they are visibly connected above, and which I have already called the igniting wire. The glass has a capillary orifice at the apex (A), which by means of a lever and spring (apparent in the drawing) is closed, unless when the pressure of the spring is counteracted by one of the fingers of the operator. The sliding rod (seen at R) is accurately graduated to about 320 degrees.

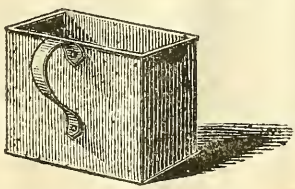
So easy is it to manipulate with this instrument, that any number of experiments may be performed in as many minutes. The ignition of the platina wire, is caused by either of four calorimotors, each consisting of four plates of zinc, and of five of copper. They are all suspended to one beam, as may be seen in fig. 2. following.

Fig. 2.



Two furrows are made in the wood of the beam, one on each side. These are filled by pouring into them melted solder, after having caused a metallic communication between one furrow and all the copper surfaces of all the four calorimotors; also between all their zinc surfaces and the other furrow. The acid for exciting the plates is contained in the jug below, which may be so uplifted as to surround with acid either of the calorimotors. Hence, while one is in operation, the others are by repose, recovering their igniting power.

Fig. 3.



Or by using a vessel (Fig. 3.) large enough to receive, and containing acid enough to excite, two of the calorimotors at once, the igniting power may be doubled. The vessels for holding the acid are made of copper, covered with a cement of rosin, rendered tough by an adequate admixture of mutton suet.

In order to use the Eudiometer, it must be full of water, and free from air bubbles, and previously proved air tight,* the rod being introduced to its hilt, and the capillary orifice open, in consequence of the pressure of the finger on the lever by which it is usually closed. Being thus prepared, let us suppose that it were desirable to analyze the atmosphere. Draw out the rod 200 measures; a bulk of air, equivalent to the portion of rod thus withdrawn, will of course, enter at the capillary opening; after which the lever must be allowed to close it. Introduce the recipient into a bell glass of hydrogen, and opening the orifice, draw out the rod about 100 degrees; close the orifice, and withdraw the instrument from the water. Apply the projecting wires (WW) severally to the solder (in the two furrows in the beam, fig. 2.) communicating with the poles of the four calorimotors, then raise the jug so as that it may receive one of them, and subject it to the acid. By the consequent ignition of the wire, the gas will explode. The instrument being plunged again into the water of the pneumatic cistern, so that the capillary orifice, duly opened, may be just below the surface; the water will enter and fill up the vacuity caused by the condensation of the gases. The residual air being excluded by the rod, the deficit will be equivalent in bulk, to the portion of the rod remaining without; and its ratio to the air subjected to analysis, may be known by inspecting the graduation.

In the case of the gaseous mixtures above described, the deficit has, in my experiments, been 126 measures. Where-

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* To prepare the instrument and prove it to be in order, depress the glass receiver below the surface of the water in the pneumatic cistern, the capillary orifice being uppermost, and open; draw the rod out of its tube, and return it alternately, so that at each stroke, a portion of water may pass in, and a portion of air may pass out. During this operation, the instrument should be occasionally held in such a posture, as that all the air may rise into the glass recipient, without which its expulsion, by the action of the rod, is impracticable. Now close the orifice, (at the apex A,) and draw out a few inches of the rod, in order to see whether any air can enter at the junctures, or pass between the collar of leathers and the sliding rod. If the instrument be quite air tight, the bubbles extricated in consequence of the vacuum produced by withdrawing the rod will disappear, when it is restored to its place. This degree of tightness is easily sustained in a well-made instrument.

as, according to the theory of volumes, it ought to be only 120. But I have not as yet operated with hydrogen, purer than it may be obtained from the zinc of commerce; and some allowance must be made for the carbonic acid of the air, which may be condensed with the aqueous vapour produced by the oxygen and hydrogen.

In the invaluable work on the Principles of Chemistry, lately published by Dr. Thomson, it is suggested, that in order to obtain correct results in analyzing the air with the hydro-oxygen Eudiometer, more than 42 per cent. of hydrogen should not enter into the mixture. I am not as well satisfied of the correctness of this impression, as I am generally with the results of the wonderful industry and ingenuity displayed in the work above-mentioned

If oxygen is to be examined by hydrogen, or hydrogen by oxygen, we must of course have a portion of each in vessels over the pneumatic cistern, and successively take the requisite portions of them, and proceed as in the case of atmospheric air.

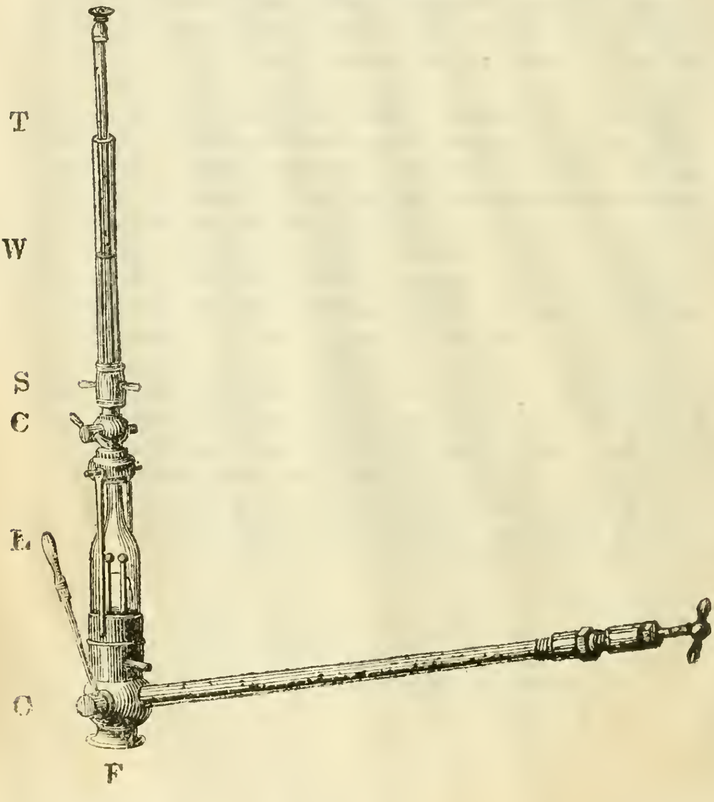
B, fig. 1. represents a glass with wires inserted through small tubulures, in the usual mode for passing the electric spark ; should this method of producing ignition be deemed desirable for the sake of varying the experiments, or for the purpose of illustration. This glass screws on to the socket S, the other being removed. The wires (WW) remain, but should be of such a height as not to interfere with the passage of the electric spark; and the instrument is operated with as usual, excepting the employment of an electrical machine, or electrophorus, to ignite the gaseous mixture in lieu of a calorimotor. For the travelling chemist, the last mentioned mode of ignition may be preferable, because an electrophorus is more portable than a galvanic apparatus.

In damp weather, or in a laboratory where there is a pneumatic cistern, or amid the moisture arising from the respiration of a large class, it is often impossible to accomplish explosions by electricity.

Of the Mercurial Sliding Rod Eudiometer, with a Water Gauge.

The Eudiometer which I have described, though satisfactory in its results, and in its conveniency, when used with water, has not been found so when used over mercury. The great weight of this fluid caused the indications to vary in consequence of variations of position, during manipulation, too slight to be avoided. The instrument represented in the following cut, (fig. 4.) is furnished with a water gauge, which being appealed to, enables us to render the density of the gases within, in equilibrio with the air without. Hence we can effect their measurement with great accuracy.

Fig. 4.



Let us suppose that this Eudiometer has been thoroughly filled with mercury, the sliding rod being drawn out to its greatest extent; and that it is firmly fixed over a mercurial cistern in the position in which it is represented in the drawing, the little funnel-shaped part at the bottom, descending into the fluid to the depth of half an inch. Above this part is seen a cock (C), the key of which, in addition to the perforation usual in cocks, has another, at right angles to, and terminating in, the ordinary perforation. When the lever (L) attached to the key of this cock is situated as it is seen in the drawing, the tube containing the sliding rod communicates with the recipient, but not with the mercury of the reservoir. Supposing the lever moved through a quarter of a circle, to the other side of the glass, the tube in which the rod slides, will communicate at the same time with the recipient and the reservoir. By means of the gauge-cock (C), the passage between the gauge and the recipient is opened or shut at pleasure.

As subsidiary to this Eudiometer, another is provided with a rod and graduation exactly similar,* excepting its being shorter. (See fig. 5.)

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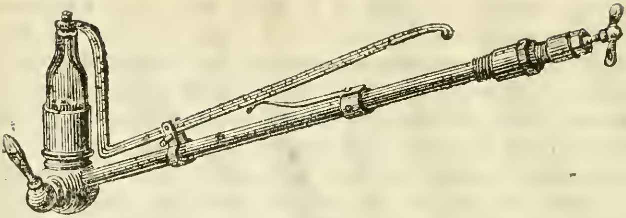
* In order to ensure accuracy in the measures of gas, made by the subsidiary Eudiometer, it is necessary to attend to the following precautions. In the first place, the instrument must be proved air tight, and free of air bubbles, by the means prescribed already in the case of the Eudiometer for water. (See note, page 70.) The presence of air bubbles is always indicated by the extent of the vacuity which appears, when the glass recipient is held uppermost, and which disappears when it is held lowermost, the weight of the mercury acting upon the elasticity of the tubes, always causes a minute change; but by the smallest bubble of air, the effect is very much augmented. The Eudiometer should be introduced into the vessel whence the gas is to be taken, about ten per cent. more than is necessary being drawn in by opening the orifice and duly drawing out the rod. The Eudiometer being lifted from the mercury, with as little change of position as possible, the rod may be adjusted accurately to the point desired. A momentary opening of the orifice causes the excess to escape. The gas thus measured and included, is then easily transferred to the principal Eudiometer, by introducing the apex of the subsidiary instrument under the funnel, (see F, fig. 4.) opening the orifice, and forcing the sliding-rod home.

Fig. 5.



The method of analyzing atmospheric air by means of these instruments, is as follows. Supply the subsidiary Eudiometer with its complement of hydrogen gas, by introducing the apex of the glass recipient into a bell glass containing, over mercury, the gas in question, and drawing out the sliding rod, the orifice being kept open only while above the surface of the mercury, and inside of the bell.

The gauge cock (C, fig. 4.) of the principal Eudiometer being closed, and that which opens a communication between the recipient and the funnel F open, and the instrument having been previously thoroughly filled with mercury, and placed over the mercurial cistern, as already mentioned, introduce into it, through the funnel, the gas which had been included in the subsidiary instrument (fig. 5); next shut off the communication with the mercurial cistern, re-establish those between the recipient and the rod and gauge, and push the rod into its tube up to the hilt. The re-entrance of the rod, by raising the mercury into the recipient, forces the hydrogen in bubbles through the water of the gauge, and displaces all the atmospheric air which it previously contained. Now shut the passage to the gauge, open that which communicates through the funnel with the mercurial cistern, and draw out the rod to its utmost extent. Into the Eudiometer thus situated and prepared, introduce successively 100 measures of hydrogen and 200 measures of atmospheric air, by means of the subsidiary Eudiometer: then closing the passage to the mercurial cistern, and opening the passage to the gauge, push in the rod, until the water in the gauge indicates that the pressure on the gases included is equivalent to that of the external air. The gauge cock being closed, the gases are ready to be exploded. The explosion is produced by galvanic ignition, as in the case of the Eudiometer for water (fig 1.), excepting that instead of carrying the Eudiometer to the calorimotor, the circuit is established by lead rods severally attached to the galvanic poles, by gallows and screws. (see gg fig. 2.) One of the lead rods terminates in a piece of iron, immersed in the mercury, the other is fastened to the insulated wire of the Eudiometer. Under these circumstances, one of the calorimotors is surrounded with the acid contained in the jug, and an explosion almost invariably succeeds. Before effecting the explosion, the number of the degrees of the sliding-rod, which are out of its tube should be noted; and it must afterwards be forced into the tube, in order to compensate the consequent condensation of the gases, as nearly as it can be anticipated. A communication with the gauge must then be opened gradually. If the water is disturbed from its level, the equilibrium must be restored by duly moving the rod. Then deducting the degrees of the sliding-rod, remaining out of the tube, from those which it indicated before the explosion, the remainder is the deficit caused by it; one-third of which is the quantity of oxygen gas in the included air. Or, the residual air being expelled by the rod, and the quantity thus ascertained deducted from the amount included before the explosion, the difference will be the quantity condensed.

It may be proper to mention, that as other metals are almost universally acted upon by mercury, the cocks, sockets, screws, and sliding-rods of the mercurial Eudiometers, are made of cast steel. The tubes containing the rods, are of iron.

Since the drawings (figs. 1 and 4) were made, verniers have been attached to the screws, through which the sliding-rods pass; so that the measurements are made to one-tenth of a degree.

I have alluded to the water gauge without explaining its construction. It consists of three tubes. A small tube of varnished.copper, (which is fastened into the only perforation which communicates with the cock, and of course with the glass recipient,) passes up in the axis of a glass tube (T. fig. 4.) open at top, cemented into a socket, (S, fig. 4.) which screws on to the cock. A smaller glass tube is placed in the interstice between the external glass tube and the copper tube in its axis. This intermediate glass tube is open at its lower termination, but at the upper one is closed or opened at pleasure by a screw. The interstices between the three tubes are partially supplied with water, as represented in the drawing (W, fig. 4.) When the passage between the gauge and the recipient is open, if the pressure on the included air be more or less than that of the atmosphere, the water will rise in one of the gauge tubes, and sink in the other. Other liquids may be substituted for water, in the gau e. when desirable.

In addition to the principal collar of leathers, and screws for rendering that collar compact, there is in the mercurial Eudiometers, a small hollow cylinder, (a piece of a gun-barrel,) with an additional collar of cork for confining oil about the rod, where it enters the collar of leathers; otherwise in operating with mercury, the leathers soon become so dry as to permit air or mercury to pass by the rod.

It may be proper to point out. that in operations with the hydro-oxygen Eudiometer, accurate measurement is necessary, only, with respect to one of the gases. In analyzing an inflammable gas by oxygen gas, or oxygen by hydrogen gas, it is only necessary that the quantity of the gas which is to be analyzed, and the deficit caused by the explosion, should be ascertained with accuracy. The other gas, which must be used in excess, sometimes greater, sometimes less, must, in using the Mercurial Eudiometer, be made to occupy the gauge. In analyzing the air, or any mixture containing oxygen, the gauge is filled with hydrogen gas, as already stated; but, in examining inflammable gas, the atmospheric air may be left in the gauge, as its only active qualities are those of oxygen gas

Figs. 6 and 7 represent those forms of the sliding-rod Eudiometer which I have found most serviceable for experiments with nitric oxide gas; with the solutions of sulphurets; or those of sulphate, or muriate of iron, saturated with nitric oxide.

Fig. 6.

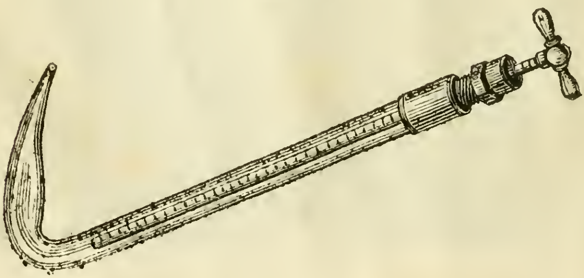
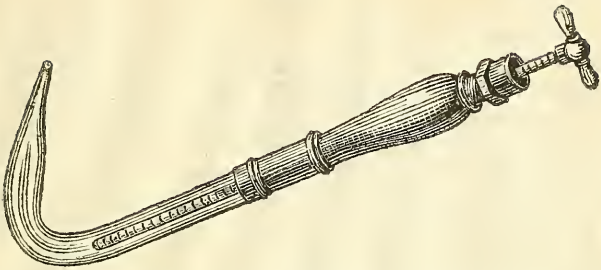
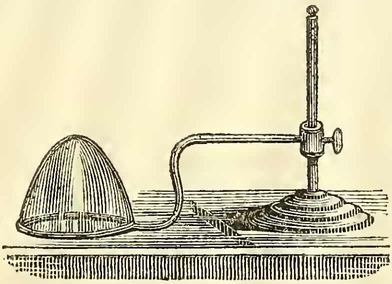


Fig. 7.



The receiver (fig. 8.) shaped like the small end of an egg, is employed in these experiments, being mounted so as to slide up and down upon a wire.

Fig. 8.



This vessel being filled with water, and immersed in the pneumatic cistern, the apex being just even with the surface of the water, one hundred measures of atmospheric air and a like quantity of nitric oxide, are to be successively introduced. The residual air may then be drawn into the Eudiometer, and ejected again into the receiver through the water, to promote the absorption of the nitrous acid produced. Lastly, it may be measured by drawing it into the instrument, and ejecting it into the egg-shaped receiver (fig. 8.), or into the air, when the quantity of it will appear, from the number of degrees which the sliding-rod enters during the ejection. That in this way gas may be measured with great accuracy, may be demonstrated by transferring any number of measures, taken separately, into the semi-oval receiver, and subsequently re-measuring them.

The Eudiometers (figs. 6 and 7.), with the accompanying semi oval glass vessel, (fig. 8.) may be employed with the dissolved sulphurets, or with solutions of iron, impregnated with nitric oxide in the following way. Let a small phial, with a mouth large enough freely to admit the point of the Eudiometer, be filled with the solution to be used. Introduce into the bottle, over the pneumatic cistern, 300 measures of the air or gas to be examined. Transfer the bottle, still inverted, to a small vessel containing water, or a quantity of the absorbing fluid used in the bottle, adequate to cover the mouth of the phial, and compensate the absorption. When there has been time enough for the absorption to be completed, transfer the residuum to the receiver (fig 8.), and measure as in the case of nitric oxide.

As soon as I can make a sufficient number of satisfactory observations with the various Eudiometers, of which I have now given an account, I will send them to you for publication.

Art. X.—*General Reflections on Heat.*

TO THE EDITOR OF THE AMERICAN JOURNAL OF SCIENCE.

Dear Sir,

The following observations on heat, formed originally one of the concluding lectures of a course of chemical instruction. I beg leave to retain the form in which it was addressed to my pupils, on account of the difficulty I have experienced in attempting to mould the matter into the shape of an essay. I am induced to offer it for publication, not with the hope of instructing proficients in the science of Chemistry, (who will find in it little that is new) but with the belief that it presents some considerations, which may be interesting to another class of your readers, who are not professionally devoted to this science.

Most respectfully yours,

A. X.

LECTURE, &c.

GENTLEMEN,

I have several times asserted, that Heat is the most important agent in the Natural World,—at least of all those agents that come under the cognizance of the chemist. Its influence over matter is surprisingly extensive; its effects are exceedingly diversified. To the phenomena of Heat your attention was called at an early period of our course; but it is only at an advanced stage of chemical studies, that one is qualified to appreciate the full importance of this agent.

Let us then take a general review of the effects of heat, as they are exhibited in combustion and natural temperature; as the great source of power in the physical world; as controlling chemical phenomena; and as allied with the principle of life itself.

1. Familiarity with the process of COMBUSTION, has brought us to behold it under its *ordinary* forms without emotion: I say under its *ordinary* forms; for when it is presented to us under any unusual shape, we still contemplate it with delight and admiration. Among the numerous and diversified experiments, that accompany a course of chemical lectures, I have never found any class appear to interest the spectators so much, as those attended by combustion, especially when supported by oxygen gas. Indeed, the taper, which is the first object that arrests the infant eye; the bonfires, that raise such ecstasy in the days of childhood; the illuminated city, that proclaims the joys of peace; conspire to testify how pleasing is this spectacle to the eye of man. Exhibited also, as it sometimes is, in the burning of a forest by night, or in the conflagration of a city, where can we find objects that comprise more elements of the true sublime?

It is no wonder therefore, that to account for the phenomena of combustion, has been an object of long and earnest inquiry. Indeed the attempt to explain it formed almost the first philosophical theory, that was ever instituted to account for a class of chemical phenomena; and various other attempts, more or less successful, have been made in later times.

Combustion was at first accounted for by ascribing it to the agency of Phlogiston, a name given to a supposed principle of inflammability, residing in combustible bodies. This explanation amounted to little more than to say, *combustion is caused by the principle of combustion.* In the same manner we might account for the origin of light, by ascribing its phenomena to the *illuminating* principle; which is obviously no explanation at all. There was no proof of the existence of such a substance in inflammable bodies as Phlogiston was supposed to be, and there were certain phenomena, already familiar to you, which were inconsistent with the supposition that bodies lose an ingredient in their composition during combustion. When a more rigorous mode of reasoning was introduced into our science, by those master spirits that laid its present foundations, the fallacy of this explanation was fully perceived; and the hypothesis would probably have been much sooner abandoned by its advocates, had not the discovery of *hydrogen* furnished them with a real substance, which they could substitute for the unmeaning phrase "inflammable principle." According to the Phlogistic theory, thus modified, "combustion is owing to the separation of hydrogen." Almost all those combustibles which burn with flame, do in fact contain hydrogen; and flame, it is true, is commonly nothing more than burning hydrogen, either alone or in combination with carbon. Still there are combustibles, as phosphorus and sulphur, which burn with flame, and yet contain no hydrogen,—facts which are quite sufficient to overthrow the hypothesis, that combustion is owing to the separation of hydrogen. Indeed, if it could be proved, that in all cases of combustion, hydrogen is separated, combustion itself would remain unaccounted for. This discovery would teach us *what it is that is burning*, but it would not tell us *what makes it burn.* What would they say of hydrogen itself? Does that burn *by the extrication of hydrogen?* It is evident that the burning of hydrogen, as well as that of every other combustible, is an effect, a consequent, dependent on some cause which had not at that time been discovered; for if hydrogen were admitted to be the substance on fire in every case of combustion, the questions would still recur, what sets it on fire? what keeps it on fire?

The discovery of oxygen gas led the way to the first rational views that ever were entertained respecting the cause of combustion. It ascertained the immediate agent on which this process depends. But in order to render the observations which I propose to offer on Lavoisier's Theory of

Combustion, more intelligible, it will be necessary to institute the inquiry, *When is a physical fact or phenomenon adequately accounted for?* It is accounted for when it is shown to be similar to a number of other phenomena, which are already arranged under a general fact, with which they are known to be invariably connected, and which is therefore considered as their cause. Thus we account for the sound of a violin by *classing* it among those phenomena which are known to be invariably connected with vibrations of the air: and since this circumstance—namely, vibrations of the air—has been found to be connected with all those cases of sound which have been investigated, we are led to believe that it is *invariably* connected with it, and therefore denominate it, universally, the cause of sound. It is evident that we account for the sound of the violin, merely by *classing* it among phenomena that are known to be connected with vibrations of the air; for in this individual instance, we do not examine to see whether the air undergoes vibrations or not.

If we proceed one step further and inquire why vibrations of air upon the organs of hearing should produce the sensation of sound, we are utterly unable to assign the reason: this inquiry leads us to *ultimate* causes, which are known to exist by their effects, but their existence is all that we can learn respecting them. In most cases before we reach the ultimate cause, we pass through a series of causes and effects, or antecedents and consequents, and deem each effect in order adequately accounted for, when we show its invariable connexion with its immediate antecedent. Thus we account for the movement of a steam-boat by the turning of the wheels in the water; for the motion of the wheels, by the ascent and descent of the piston; for the ascent and descent of the piston, by the elastic force of steam, and its power of forming a vacuum by condensation; and, finally, for the elasticity of steam, by the agency of heat. This brings us to one of those general forces in nature, whose existence is known from their effects, but to which we can assign no antecedent. Here then our series of antecedents and conseqe n ts, or causes and effects, terminates; and we in vain look for a reason why heat should impart elasticity to steam. The principal difference between philosophers before and since the time of Lord Bacon, consists in the different order they would pursue in investigating phenomena like the foregoing. The ancient chemists would have begun at heat, and would have endeavoured to deduce all the phenomena from reasoning on the nature of that agent; the modern chemists, pursuing the reverse order, end at heat, satisfied that they have accounted for each effect, when they have ascertained its invariable antecedent.

We may assert in general, then, that a fact in chemistry is adequately accounted for, when we have ascertained its invariable antecedent; but since the process would be tedious to do this for every chemical change, by an analytical examination of the result, we refer each particular change to a class of phenomena which it resembles, of which a sufficient number *have been* examined, to show their invariable connexion with their antecedent. Thus, when we hold melted lead over the fire in a ladle, we account for the dross that forms on its surface, by saying that the lead has combined with oxygen; not because we have, in this instance, ascertained the fact, but because its external appearance is such as to justify us in classing it among similar phenomena, where the fact has been ascertained by actual experiment. This is another fact to show, that our explanations of phenomena are little else than mere classifications. The same remark holds true in every department of physics: we account for a physical fact by assigning its proximate cause or antecedent; but we ascertain this, not sofrequently by actual experiment, as by reducing the fact in question to a class of phenomena, whose cause has been ascertained by actual experiment.

With these principles in view, let us now proceed to inquire how far Lavoisier accounted for the phenomena of combustion.

It appears to me, that Lavoisier must have been considered as adequately accounting for combustion, provided that the combination of oxygen with a base had always proved to be, as it appeared to him, an invariable antecedent to that process. In the progress of our science, however, a number of examples of combustion have been discovered, in which no oxygen is present. Thus certain substances burn in an atmosphere of sulphuretted hydrogen, or chlorine, or iodine; and even certain solids into which no oxygen enters, as sulphur and iron filings, or sulphur and copper filings, exhibit similar phenomena in their action on each other. Oxygen therefore has now lost its character of *invariable* antecedent, and its combination with inflammable bodies can no longer be pronounced *the* cause of combustion.

It now ranks only as one among a class of agents, which by their combinations can produce that phenomenon. By the discovery of other similar or analogous bodies, oxygen, which before stood at the head of a *genus*, stands at present only at the head of a *species*, although the cases of combustion included under it are far more numerous than those of all the other species.

But Lavoisier, having observed that oxygen was absorbed in every process of combustion that fell under his notice, and that, in general, the vigour of the process was proportioned to the rapidity of the absorption, was justified in his inference, that combustion is *universally* owing to a combination of oxygen with an inflammable base. Though we cannot now employ the term *universally*, yet the proposition is still true in all those instances adduced by Lavoisier.

If we are asked, however, *why* the absorption of oxygen should produce light and heat, and communicate to the inflammable body the power of spontaneous and vehement consumption,—circumstances which chiefly characterize this process,—we may fairly reply, that we cannot tell, and that we are not bound to tell. It is demanding of us to explain the *connexion* between the cause and the effect, which we are generally unable to do. To call upon us to say *why* the absorption of oxygen produces light and heat, is like calling upon us to say why the action of light upon the optic nerve produces vision, or why the vibrations of the air upon the organs of hearing produce sound. Lavoisier's definition of combustion was the best that could possibly have been derived at the time when it was given, though subsequent discoveries have shown, that oxygen is not the only agent in combustion. If we demand that the cause assigned for this phenomenon shall explain the reason of the heat and light exhibited, this, and probably every other explanation of the same process, will be found inadequate; but if we deem it sufficient, in accounting for a physical fact, to specify its invariable antecedent, then we must admit that Lavoisier reduced by far the greater number of cases of combustion to a species under their proper head: that is, he accounted for all those cases of combustion which depend on the agencies of oxygen gas, though he failed to assign a cause which embraces not only these, but every other possible case in which this process occurs. In the present state of our knowledge, the phenomena of combustion admit of a higher classification, as

I shall attempt to show by and by; but Lavoisier's doctrine will still be only *limited* and not *discarded*.

When, however, we meet with a list of the different theories which have been proposed to account for the same thing, and see how each one supplanted all its predecessors, and was itself supplanted in its turn; when we see, moreover, that the theory of Lavoisier, though at one time held to be a demonstration, is nevertheless still deemed erroneous by some and inadequate by others; we are apt to imagine that this is no better than those that have gone before it, and that it will ere long share the same fate. But let us reflect, that Lavoisier differed from all his predecessors in the knowledge of oxygen, whose agency in most cases of combustion is unquestionable: that he reasoned from a known cause; they entirely from hypotheses and imaginary causes. We are therefore by no means to distrust his explanation, because so many false explanations had gone before it.

In order to show how much more confidence ought to be reposed in those who argue from facts than in those who argue from hypotheses, Fontenelle, a French writer of great vivacity, borrows a happy illustration from the representations of the stage. "Let us imagine," says he, "all the sages collected at an opera, the Pythagorases, Platos, Aristotles, and all those great names which now-a-days make so much noise in our ears. Let us suppose that they see the flight of Phaeton as he is represented carried off by the winds; that they cannot see the cords to which he is attached; and that they are quite ignorant of every thing behind the scenes. It is a *secret virtue*, says one of them, that carries off Phaeton. Phaeton, says another, is composed of certain *numbers*, which cause him to ascend. A third says, Phaeton has a certain *affection* for the top of the stage. Phaeton, says a fourth, is not formed to fly; but he *likes bet er to fly than to leave the top of the stage empty*, and a hundred other absurdities of the kind, that might have ruined the reputation of antiquity, if the reputation of antiquity for wisdom could have been ruined. At last come Descartes and some other moderns, who say, Phaeton ascends, because he is dr wn by cords, and because a weight, more heavy than he, is descending as a counterpoise."* In the same manner I regard La-

* Brown's Lectures on Intellectual Philosophy, i, 104.

voisier as the philosopher who argued for the ascent of the figure, from a knowledge of the machinery that was worked behind the scenes, but which was entirely concealed from those who had attempted the same explanation before him.

If then we admit that it is a true mode of reasoning, and a *sure* progress in science, to collect a number of individual phenomena into a class and arrange them under a common antecedent, we must allow great merit to Lavoisier for having discovered, that the absorption of oxygen was the antecedent of nearly all the known cases of combustion. If, however, we demand something more in explanation of this class of phenomena than the discovery of their invariable antecedent, we may pronounce all chemical facts as still unexplained, and may rest assured that they will for ever remain so. Sometimes the immediate antecedent may be traced one, two, three, or four links back; but the chain will uniformly terminate in a cause to which we can assign no antecedent. But with humble views of the power of man to ascend the scale of Omnipotence, we may rest contented with the *last fact* in the series, that we have ascertained, and instead of vainly attempting to penetrate into secrets which were never designed for us to know, we may now examine to see to what manifold purposes the knowledge of causes that we have already acquired, may be applied. "Newton stopped short at the *last fact* which he could discern in the solar system; that all bodies were deflected to all other bodies, according to certain regulations of distance and quantity of matter. When told that he had done nothing in philosophy; that he had discovered no cause, and that to merit any praise, he must show *how this deflection was produced;* he said, he knew no more than he had told them; that he saw nothing causing this deflection; and was contented with having described it so exactly, that a good mathematician could now make tables of the planetary motions, as accurate as he pleased, and with hoping, in a few years, to have every purpose of navigation and philosophical curiosity completely answered." (Life of Newton, Encyclopædia.) Thus the most ignorant man knows as well as the greatest philosopher, that light is essential to vision, and the latter knows but one fact more in the series; all beyond is as incomprehensible to him as to the other. This additional fact is, that light enables us to see external objects, by its power of undergoing refraction in passing through lenses, so as to form an image of them on the retina of the eye. But the knowledge of this fact has enabled him, with the telescope, to carry the range of his dim eye beyond the stars; or, with his microscope, to read, with no less astonishment, the wondrous volume of terrestrial nature. Who does not know that heat will convert water into steam? Yet it was the philosopher only who, by studying all the circumstances or laws of this change, taught how, with this substance, to bear the loftiest ship through the waves, and to disembowel the earth itself.

But Lavoisier, ambitious to account for every thing, and not, like Newton, being ready to rest satisfied with the *discovery* of causes merely, without attempting to explain their connexion with the effects which they produced, proceeded to attempt an explanation of the reason why the combination of oxygen with a combustible base should produce light and heat. This he did, by referring it to the *condensation* which the gas was supposed to undergo, its base only entering into combination, while the light and heat that were before united with it, were set at liberty. Condensation, however, is by no means an *invariable antecedent* to the production of light and heat in combustion. In the course of our experiments, gentlemen, you have witnessed a number of examples of this process where the evolution of light and heat was attended with a great *rarefaction* of the ingredients. I need only refer you to the inflammation of gunpowder, to the explosion of the fulminating powders, to the action of nitric acid on spirits of turpentine, and of the solid nitrates on the metals, as that of nitrate of copper on tin foil, or of nitrate of potash on melted tin. But even if it could have been shown, that condensation is always an antecedent of light and heat in combustion, it would only be ascertaining a general fact exactly analogous to this, that oxygen is an invariable antecedent to the same process. We can no more assign a reason why condensation should produce light and heat, than why the combination of oxygen with a combustible base should do it. The idea that the heat is mechanically forced out by compression, like water from a sponge, is "a crude idea," wholly incompatible with the known subtilty of that agent; and, moreover, that there is no *necessary* connexion between condensation and the production of light and heat, is manifest from the fact, that light and heat sometimes, as in several cases cited above, accompany rarefaction.

In the present state of our knowledge, since we have discovered that oxygen is not the only supporter of combustion, we are prepared for a new *classification* of these phenomena, and must search out some circumstance in which all the cases of combustion agree. We shall find that they all agree in a rapid combination of chemical elements. In some cases, as in the fulminating powders, considerable masses enter into new combinations instantaneously; in all other cases of actual combustion, the union of the elements is more or less rapid; and finally, it is a general law, that the union of the same elements. as oxygen and iron for instance, will take place, when slow, without, and when rapid, with combustion. In order therefore to express the only invariable antecedent, with which we are acquainted, to all cases of combustion, I see no objection to our defining this process, with Professor Brande, thus: COMBUSTION IS THE RESULT OF INTENSE CHEMICAL ACTION. It has been objected to this definition, 'that it explains nothing;' and that is true; it does not explain, or attempt to explain, *why* combustion should result from intense chemical action; it merely states the fact, that this is, so far as we can see, the invariable antecedent under which the several species of combustion may be united in a class.

The length into which we have been drawn in reviewing the important subject of combustion, has made us almost lose sight of the other topics which we proposed to consider, in our general reflections on heat. Let us now contemplate this agent in its relation,

II. To Natural Temperature.

We can hardly find any thing in the natural world more evincive of design, or more indicative of the wisdom of the Creator, than the means used to keep up that uniform temperature, which, with some slight variations, is constantly maintained at the surface of the earth. You are well acquainted with the power of heat to be accumulated by natural means far beyond what mortals could endure; and you are aware also of the fatal effects which would result from the reduction of temperature below its ordinary limits. But, accustomed to see the variations of temperature on the surface of the earth limited to so small a scale, you might content yourselves with thinking that this was the natural course of things, without ever taking the trouble to inquire, whether any machinery of the natural world were adjusted on purpose to support this equilibrium of temperature. But this happy adjustment was by no means accidental; we can even see the springs by which it is effected.

In the first place, heat manifests the strongest tendency to diffuse itself in every direction. Let us concentrate it in any given spot, and it flies off with inappreciable velocity; and, unless the intensity be maintained by constant additions of heat, that spot or body shortly becomes reduced to the same temperature with surrounding bodies. Upon this agent itself, therefore, is impressed a character, that restrains the violence which it seems constantly prone to exercise.

In the second place, the AIR, by its elasticity, affords the means of conveying off all excesses of beat. This cause operates in maintaining the equilibrium of temperature on a most extensive scale. We see its action, at one time, in gentle gales and breezes; at another, in the northern blast; at another, in dreadful hurricanes, that sweep around this solid ball. All these, whatever partial evils they involve, contribute to this grand benevolent design; to keep the raging element of fire within its own narrow bounds.

In the third place, the vast collections of WATER, which cover so great a part of the globe, furnish another means of regulating the temperature of the earth So happily does it conduce to this object, that were the art of navigation still unknown, we might fancy that lakes and seas and oceans, were made on purpose to be reservoirs of heat in winter, and fountains of cool breezes in summer. The multiform changes of state which water undergoes, including congelation and liquefaction, evaporation and condensation, are all made subservient to the same end. These operations are the special barriers which Providence has set on the terrestrial part of the globe to check sudden excesses of heat and cold; and few instances of the proofs of intelligent design in the works of creation, among all those happy illustrations which Dr. Paley has collected, ever struck me as more convincing than these. On the approach of a cold night, it is pleasing to watch the thermometer and note the progress of its descent. Perhaps a sudden change of weather has caught the mercury at a high degree You may see it descend rapidly to the freezing point; and, were you unaccustomed to the result, you might imagine that a most terrible frost was at hand. But the mercury no sooner reaches the freezing point than its course is suddenly checked; congelation itself is made to contribute a portion of heat sufficient to mitigate the severity of the impending frost; and hours, instead of minutes, are occupied in carrying the mercury through a few degrees below. In like manner, it is pleasing to remark, how retarded are its movements, as it approaches the extremes of heat. A hot day is passing over our heads, although, as often happens, the morning was cool and temperate. In two hours, perhaps, we have seen the thermometer rise from 50 to 80 degrees. Will the heat of two hours carry it forward 30 degrees more to 110? Experience alone could ensure us against the approach of such a consuming fire. But what prevents it? The evaporation of water from the entire surface of the earth, is now set on foot, with hurried progress, hastening its speed as the heat increases, until it brings to a stand the furious element.

By these mutual agencies of evaporation and condensation, of congelation and liquefaction, the excesses of heat and cold, to which the temperature of the surface of the earth is alternately prone, are so nicely balanced, that, among many thousand degrees that lie between the known extremes of heat and cold, the whole range of natural temperature is only 90 or 100 degrees. Pleasant and delightful as is this little space in the vast scale of temperature, where all animals so securely dwell, and where the flowers of spring bud and blossom and the fruits of autumn are matured, still it lies, like a small island in a sandy desert, between two regions of desolation and death, which seem about to blast it, on the one hand, with withering frosts, or to consume it, on the other, with devouring fire. The causes which we have just enumerated are those effectual barriers that Omnipotence has placed, to guard this blooming animated spot against the dangers that encompass it. And among all the innumerable causes that are continually at work to disturb this equilibrium of temperature, we may rest assured that no essential irregularity will occur, until, in the sublime language of Young,

> "All the formidable sons of fire,
> Eruptions, earthquakes, comets, lightnings, play
> Their various engines; all at once disgorge
> Their blazing magazines, and take by storm
> This pure terrestrial citadel of man."

III. It is an idea which has often struck me most forcibly, and I have often wondered at not seeing it more noticed in authors,* that heat is the ultimate source of all the grand exhibitions of POWER in the natural world. This is the immediate agent in producing *elasticity;* and nearly all the exhibitions of power in nature arise, either directly or indirectly, from elastic æriform matter suddenly expanding itself. Hence the winds that roar through the sky and convulse the ocean; hence the earthquake and volcano, that shake and rend the solid globe; hence the desolating whirlwind that bears the tempest on its wings.

But it is not in these sublime and astonishing scenes of nature alone, that we become acquainted with the energies of this omnipotent agent. Is not every thing great in art, that depends on motion, also the offspring of its power? Among all the ministers of art, none is to be compared in energy with the elastic power of steam. M. Dupin, a distinguished member of the French Institute, has recently afforded the following forcible illustration of the potency of this agent. The great pyramid of Egypt required for its erection, the labour of 100.000 men for twenty years. Its weight is estimated at 10,400,000 tons. By a fair calculation, the steam engines now at work in England, would constitute a force adequate to the accomplishment of the same object in *eighteen hours.* To have raised the pyramid in eighteen hours, at the rate at which the Egyptians proceeded, would have required 974,000,000 of men; to man the engines in England are required not more than 36,000 hands. By the aid of the steam engine, therefore, one man can now accomplish as much labour as could have been performed by 27,055 Egyptians, aided by such machinery as they could command.† Until a very recent period, Lord Bacon seems to have been the only philosopher, who had formed any adequate conceptions of the dominion which man would ultimately acquire over matter, by studying the laws by which it is controlled. His Novum Organum is full of anticipations, of which the pre-

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* The idea, however, did not escape Black and Fourcroy, both of whom made forcible mention of it.

† Not having access to the work of Dupin, the writer is dependent for the data on which the foregoing statements are founded on extracts in the public Journals.

sent is a bright reality. But whence does steam derive this power? What renders its force so omnipotent, that, as in Perkins's engine, a bubble can lift a ship over the waves? I answer, it is HEAT.

IV. Over the laws of CHEMICAL AFFINITY, the same agent exerts a powerful control. If we attentively consider the *state* in which all bodies are found, whether solid, liquid, or æriform, whichever of these forms the body is in at any given moment, depends on the quantity of heat that happens to be combined with it. Were it not for this agent, all bodies, if we could suppose them to exist without it, would be in the state of solids. Water and all liquids, air and all gases, are maintained in their respective states by its influence alone. In the production of all chemical phenomena, indeed, no agent is of so frequent recurrence as this. Some elements we unite into a compound by heat; some compounds we resolve, by the same means, into their elements. It is owing to this dominion which heat exerts over chemical affinity, that it becomes the chief resort and dependence in so many of the processes of the arts, both the useful and the ornamental. The greater number of the arts, indeed, are so entirely dependent on this power, that they can advance hardly a step without it. Iron, from its intimate relation, and indispensable utility in all the mechanical operations, has been properly denominated 'the soul of the arts;' but if we go one step further, we shall find that iron itself is not, and could not be, either reduced from its ores, or wrought into the forms of utility and ornament, without the aid of heat. To pass over its agency in communicating to steam that elastic force, by which, in the most improved operations, it is made to lift the ore from its subterranean bed, let us suppose it raised to the surface, and thence let us trace it through the transmutations to which it is afterwards subjected. What fires are kindled over it to bring it to the metallic state! These are renewed to convert it into steel. By heat it is manufactured into those numberless forms that every where meet our eyes. Fourcroy sums up the uses of fire in the following comprehensive sentence: "It is with fire," says he, "that man prepares his food, that he dissolves metals, vitrifies rocks, hardens clay, softens iron, and gives to all the productions of the earth, the forms and combinations which his necessities require."

V. But our attention has been hitherto engrossed with contemplating the agencies of heat on the unorganized forms of matter, without reflecting that this is also that principle by which LIFE itself, both animal and vegetable, is nourished and sustained. Dr. Black, at the close of his incomparable lectures on heat, has noticed this subject, in his usual plain but impressive language. "Its influence," he observes, "is manifestly so universal, and its action so important and necessary to the progress of all the operations of nature, that, to those who consider it with some attention, it will appear to be the general material principle of all motion, activity, and life, in this globe. Heat is inseparably necessary to the existence of vegetables and animals. Without it they want the power to attract their nourishment, or to set it in motion through their system, or to refine and ripen it in their different parts. Their vigour and life depend on its influence. It is only when enlivened by heat that they make it assume the various forms and qualities, which we find in the wood, the root, the leaves, the juices, the fruit, the seeds, and the beautiful forms and colours displayed in the flowers. They decay and die when heat departs. Nor is animal life less dependent on heat for support, than vegetable. Heat is the main-spring in the corporeal part of an animal, without which all motion and life would instantly stop."

After referring us to the vivifying influence of heat exhibited in the incubation of an egg, the same excellent author proceeds: "But, after the animal is thus brought into existence, heat is still necessary for its support. If heat be diminished to a certain degree, although no visible damage be produced, all motion and life are quickly extinguished. The animal is seized with a sleep and insensibility, under which it expires." He goes on next to enumerate some of the endless changes which occur in nature in consequence of variations of temperature, and thus concludes: "But, in this succession of forms and operations which water undergoes, you will perceive that it is set in motion and adapted to these ends, by the nice adjustment, and gentle vicissitudes of heat and cold, which attend the returns of day and night, and summer and winter. Were our heat to be diminished, and to continue diminished, to a degree not far below the ordinary temperature, the water would lose its fluidity, and assume the form of a solid hard body, totally unfit for the numerous purposes which it serves at present; and, if the diminution of heat were to go still further, the air itself would lose its elasticity, and would be frozen to a solid useless matter like water; and thus all nature would become a lifeless, silent, and dismal ruin. On the other hand, were the heat which at present cherishes and enlivens this globe allowed to increase beyond the bounds at present prescribed to it, beside the destruction of all animal and vegetable life, which would be the immediate and inevitable consequence, the water would lose its present form, and assume that of an elastic vapour like air; the solid parts of the globe would be melted and confounded together, or mixed with the air and water in smoke and vapour; and nature would return to the original chaos."

ART. XI.—*Remarks on Mr. Quinby's article on Crank Motion; in the last number of this Journal.*

TO THE EDITOR.

SIR,

MY reply, in one of your former numbers, to Mr. Quinby, charging him with misrepresenting a passage in the North American Review, has drawn a long answer from that gentleman, which may be thought to require some notice. With that part of Mr. Quinby's paper, which combats the opinions of the writer of the article Steam Engine, in Rees' Cyclopedia, I have no concern. I quoted that article for its facts merely, and these I believe Mr. Quinby will not be able to overthrow.

The question between Mr. Quinby and myself is very narrow. I had stated that there was in the steam engine a loss of power, in changing the direction of its action, from rectilinear to rotary, as appeared from Messrs. Leans' reports of the performance of the engines used at the mines in Cornwall; and I further specially stated that this loss "was not very satisfactorily accounted for." Mr. Quinby having a short time after, made the very new discovery "that the *crank* occasions no loss whatever of an acting power," it suited his purpose to suppose that I attributed the loss in question, to the use of the crank, which is now most commonly one of the agents in changing the direction of the motion. Your readers can construe the passage in question, as well as Mr. Quinby, or myself; and determine whether I attribute the loss to the crank, any more than to the fly wheel, the connecting rod, or any other, the most insignificant part concerned in the motion. The loss was said to belong, not to engines of any peculiar structure, but was extended to all the methods in "common practice;" thus including engines in which the rotation is produced by the sun and planet wheels, and which consequently has no crank about it, as well as those in which a crank is used. The fact was rested on Leans' reports, in which it is stated that taking an average of a vast number of the engines used in Cornwall, those which raise their load directly by the working beam perform a great deal more work, from the consumption of a given quantity of coals, than those in which the force is transferred from the working beam through another mass of machinery, in which it keeps up a continuous rotary motion; the engines being alike in other respects, except indeed in size, it being declared that they were of the peculiar construction of Watt or Woolf. It is true thet in the particular cases stated the force was transferred through a crank, yet this being in any position merely an arm of a lever, and consequently only capable of modifying without destroying force, a fact known sometime before Mr. Quinby's "demonstration of the *crank* problem," namely, in the age of Archimedes; such general terms were used as indicated the loss under the conditions in which it happened, without fixing it to any mere instrument by which the change of motion was produced.

In my answer to Mr Quinby, I disclaimed attributing the loss in question to any mechanical agent, and it seems that Mr. Quinby cannot conceive to what I did attribute it. I can give him no aid in his dilemma, as I professed in the beginning that I would not undertake to account for it.

But Mr. Quinby has discovered, after doubting the fact of the loss in question, circumstances which to him satisfactorily account for it. These are "*first* the injudicious or wasteful application of the coal consumed; and *secondly*, the want of a constant and sufficient load in the buckets during the time the engine is in action." It seems to me very clear that a wasteful application of coals would not belong exclusively to the rotary engines, but that the pumping engines would suffer in the same degree. That it would, at least in some solitary instances of the numerous ones cited, happen that the greatest waste of coals in the worst pumping engine, would equal the least waste in the best rotary one; thus furnishing a case where the work was equal, if the difference arises from a waste of coals. But this does not happen in any instance. The pumping engines always perform much better than the rotary ones. the parts concerned in the formation of the steam being of like structure. As to the load in the buckets being too light, it is a sheer assumption of Mr. Quinby, not warranted by the statement of a single fact, and subject to the obvious general objection that I have made to the assumption of a waste of coal, which is that some of the pumping engines are just as likely to be in the same condition, of working with an insufficient load. But this is not all. for presuming the superintendents of the mines have a common share of judgement and capacity of observation, and being in the constant habit of working their engines; experience alone would inevitably teach them very nearly the load for a maximum effect, and interested as they are in making every possible saving, we may be certain that they would take the means to have their engines worked with the proper loads to produce it. But there are, in Cornwall even, men of high endowments, familiar with every thing relating to the construction or working of engines, striving with each other to produce the greatest effect with their different machines; and is it to be supposed that this fact, which would be before their eyes every day, has been so long unperceived or neglected? Does Mr. Quinby himself believe his own statement to be true? His very paper furnishes evidence enough of his want of confidence in it; because if the engines are worked as he supposes them to be, the loss must follow as a necessary consequence; yet he doubts the fact of any loss, a doubt certainly applicable to that, which, if it existed, must inevitably produce loss.

Mr. Quinby's next shift is that the consumption of coals is not an accurate measure of the power produced. A very short examination will show us the weight of this objection. It is very evident to every one, that in any two engines, similarly constructed in all the parts concerned in the production of steam, the same quantity of coals of like quality will vaporize equal quantities of water, under a like pressure. In practice, the quantity of water vaporized by one bushel of Newcastle coals, is placed by Mr. Watt within the limits of from eight to twelve cubic feet, and the steam thus produced is found capable of raising, with Woolf's pumping engine, an average of thirty-four millions of pounds one foot high; with Watt's pumping engine, an average of twenty-eight millions of pounds one foot high nearly; while with the rotary engine it never exceeds eleven millions of pounds raised one foot. "as appears from the reports of the performance of the engines used at the mines in Cornwall." It happens also, that the consumption of coals is the only practicable measure by which the work of different engines, through any length of time, can be compared. Mr. Quinby tells us that "with a view to clearness, and for the information of the writer of the article in the North American Review, I shall here give a definition of the power of a steam-engine. The power of a steam-engine is the product of the elastic force of the steam employed, and the surface [area I suppose] of the piston upon which it acts." But every body knows that the pressure of the steam upon the boiler, is no certain indication of the pressure in the cylinder, or upon the piston; and although an instrument has been contrived for determining the pressure in the cylinder, yet it appears to have been rarely used, owing probably to its complicate structure and the trouble of obtaining from it the mean of the constantly varying pressure in the cylinder.* But even if the force of the steam in the cylinder and in the boiler were exactly the same, during the time the induction pipe is open, still from the constant variations of the intensity of the fire, constant observation of the gauge would be required to obtain the mean pressure; nor would this be all, for a constant knowledge of the perfection of the condensation, would also be required But the best of the matter is, that Mr. Quinby's *definition*, introduced with no small flourish, is not sufficient for the end proposed. The power of a steam-engine cannot be determined by it, even for any instant of time, or during any part of the stroke, as he has neglected to notice the negative effect of the elastic fluid in the condenser; and instead of "defining" the force to be the excess of the pressure of the steam upon one end of the piston, over the pressure of the elastic fluid upon the other end, which is the

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* No account of this instrument appears to have been published until the year 1822, and although the invention of it is ascribed to Mr. Watt, he seems to have been satisfied with the measure derived from the consumption of coals for all comparative purposes.

true and whole force, leaving friction out of the question, with which the piston moves, he declares it equal to the whole elastic force of the steam acting upon the piston.

Mr. Quinby next "takes the liberty to state that there is not in Messrs. Leans' reports one word that justifies, or even makes admissible, the assertion that there is in the steam-engine a loss of power in changing the direction of its action from rectilinear to rotary, by the methods in common practice! In Tilloch's Philosophical Magazine we have the whole series of reports on the performance of the engines used at the mines in Cornwall, by Messrs T and J. Lean, commencing August 1811, and ending November 1818; and in these reports the case noticed by the writer of the article Steam-engine, Rees' Cyclopedia, is not mentioned." This looks like something quite decisive of the question; but unfortunately for its bearing upon the case, *it is not true.* Tilloch's Philosophical Magazine does not contain the whole series of repo.ts on the performance of the engines used at the mines in Cornwall. The short notices in that magazine are professedly nothing more than *extracts* from Leans' reports. No comment seems necessary on this statement. The writer in the Encyclopædia states the cases, as formerly quoted by me, with all the circumstances, and declares them to be taken from Leans' reports. Mr. Quinby charges him, or me, or both of us, with falsehood almost in so many words, because the same facts are not mentioned in a certain set of extracts from the same reports.*

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* As corroborative of the truth of the statement made from Leans' reports, that the rotary motion is not obtained without loss of force, I may quote from the report of the committee of the House of Commons, made after a long investigation of the subject of steam-boats, the following passage. "There is also considerable loss in converting the alternate motion of the piston into the rotary motion of the paddles." A great many authorities might be brought forward upon this subject; but as I I am not answerable for the truth of Leans' reports, I have thought it not necessary to pursue the subject.

Regarding the general question of loss, some individuals have no doubt believed, as every absurdity finds some believers, that the crank "occasioned a loss of power," but it is by no means true, as Mr. Quinby has stated it, that "all the attempts that have been made to apply the action of the steam directly to a wheel, or to construct rotary engines, have been instituted with the hope, and for the *single* purpose, of obviating the very great loss of power which different individuals have *supposed to result* from the application of the *crank.*" Indeed I

Having already taken up more room than the subject demands, I will conclude with merely noticing Mr Quinby's last paragraph. This, setting aside what is personal and in the form of a challenge, appears a curious attempt to pass off a light proposition, by covering it with two of full weight and current value. He says "can the writer of the article in the North American Review invent a right angled [why right angled?] plane triangle whose three angles shall not be equal to two right angles? Can he invent a steam engine that shall be able to impart to the appending machinery more power than is applied? It is now established that all double stroke engines do impart to the appending machinery all the power that is applied, and consequently a saving of power can only be effected by the invention of a machine that shall impart more power than is applied to it; and this, in the judgement of the writer of this reply, is not possible." I object to the last paragraph, if Mr. Quinby means it to be understood in a general sense, and on the authority of Leans' reports; I repeat that the rotary engine does not impart at the working point, a force equal to that of the simple pumping engine through a long space of time (other things being equal) But perhaps Mr. Quinby means it only as another edition of the phrase "that the *crank* occasions no loss whatever of the acting power." Taking it in this sense, however, I should yet *hesitate* to make the conclusion which Mr. Quinby wishes to establish from it, namely that because in every triangle the sum of the three angles is equal to two right angles; and because no machine can impart more power than is applied; and because "the *crank* occasions no

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cannot conceive how any one should suppose himself so well acquainted, not only with what the whole host of projectors have *supposed*, but with what they have not supposed, as to make so round an assertion. So far as information is to be obtained from the specifications of the patents for inventions of this kind, it is very clear that a desire to get rid of the vis nertiæ of the working beam, and the constant variation of the mechanical advantage, which a force acting through a crank necessarily has; and likewise to make a more simple engine, have had great influence with the projectors of rotary engines. But it is enough to show the inacuracy of Mr. Quinby's statement, to remind the reader that the engine of Brancas, that of Amontons, in both of which the force was applied to a wheel, and the wheel-engine of Mr. Watt, described in the 5th section of his specification of 1769; were all constructed and abandoned before the application of the *crank* to the steam-engine.

loss whatever of the acting power;" therefore the steam-engine cannot be improved.

THE WRITER OF THE ARTICLE ON IMPROVEMENTS IN MACHINERY, NORTH AMERICAN REVIEW, VOL. V. NEW SERIES.

July 30th.

ART. XII.—*Remarks on Art.* 24, *of No.* 2, *Vol.* IX. *of the Amer. Journal of Science and Arts.*

So many cavils and objections have been made, in past times against the doctrines of the infinite divisibility of matter, or rather of extension, and the arguments opposing it have been so completely refuted by Mathematicians, that one could hardly expect a revival of them after a slumber of more than a century. The men of genius of the present day would do well not to depend entirely on that exalted faculty. A knowledge of what has been done by others, on any subject, ought ever to precede any attempts towards its extension, or improvement. Had the writer of the 24th Art. of the last number of the Journal, read, and fully comprehended the irrefragable arguments of Keil, in his introduction to Natural Philosophy, it is presumed he would not have considered the infinite divisibility of extension as an impossibility, because he had conceived a case of motion apparently inconsistent with it, and made that the basis of an argument, neglecting the most essential attribute, and measure of motion, viz. *Time.*

It is a well known principle in mechanics, that the space passed over by a body in uniform motion, is to be estimated by the time and velocity conjointly, or $s=tv$, and that whatever the kind of motion may be, we shall always have $\dot{s}=\dot{t}v$. Now assuming these principles, which are the fundamentals of all mechanics, we shall have $t=\frac{s}{v}$, and $\dot{t}=\frac{\dot{s}}{v}$, and if we take the case proposed by the author, suppose a body in motion to have commenced its motion at A and to proceed in a right line towards B, A————————a————b————B. and that this motion be considered as made by intervals, first by the passage over $\frac{1}{2}$ the line, or from A to a, and then over $\frac{1}{2}$ of what remains, or a to C, and again over $\frac{1}{2}$ the remainder, and so on continually;

on the supposition of the infinite divisibility of the line, the absurd inference is drawn, that the body will never arrive at B, whereas if the motion be uniform, nothing can be more certain, than that it will arrive at B in a time expressed by $t=\frac{s}{v}$, and that the time can never be infinite unless $v=o$, or there be no motion.

The fallacy of this statement consists in this, that the same time is allowed for the passage of the body over the least bipartite space, as for the greatest, or the time of passing over $\frac{1}{2}$ the line, is the same as over $\frac{1}{4}$, $\frac{1}{8}$, or any of the least conceivable of its divisions, consequently as the number of divisions is supposed infinite, the time of passing over them must be infinite. But let us view this subject mathematically. The body in passing from A to B, while it describes one half of the line AB, with a uniform motion, consumes half the time of describing the whole line; in moving half the remainder, or from *a* to *b*, the time will be one half of the other half, or $\frac{1}{2}$ of $\frac{1}{2}=\frac{1}{4}$, &c. The spaces being divided by supposition according to the series $\frac{1}{2}$, $\frac{1}{4}$, $\frac{1}{8}$, $\frac{1}{16}$, and the times, in uniform motion being as the spaces, the times will also be divided according to the same geometrical progression; that is the time of the body's moving from A to B is not what the writer of the article asserts *infinite, or never to arrive at B*, but a finite quantity, viz: that which is to the whole time of describing AB, as the series $\frac{1}{2}$, $\frac{1}{4}$, $\frac{1}{8}$, $\frac{1}{16}$, $\frac{1}{32}$, &c of AB=to 1 ×AB=AB to AB, that is, the times are equal, consequently the infinite divisibility of the line does not involve the absurdity of a body in motion requiring an infinite time to describe a finite space; as, however, the space passed over by a uniform motion, and the time are reciprocally the measures of each other, and if one be infinitely little, the other will be so also, it follows that if the time be nothing, the space passed over will be nothing, so that in an instant of time corresponding to a point in geometry, the motion even of a cannon ball is nothing. This shows the absolute necessity of taking *time* into consideration in all our inquiries concerning motion.

The problem at the end of the article, which proposes to divide a line into indivisible parts, proceeds on the unmathematical and inconsistent assumption, that a point has parts, or that it is an indivisible portion of extension, and that a line may be made up of such indivisible portions, a surface of lines, and a solid of surfaces; a circle, therefore, filled with the peripheries of other lesser circles cutting a diameter, shows nothing more than the assumption itself, which is, that points have extension and that a given line is made up of such points. But that a point has any parts, or dimensions, or that a line has any breadth, or thickness, is directly contrary to the very definitions of geometry. Points, lines, and surfaces are merely the terms, or limits of extension, and constitute no part of that species of magnitude of which they are the limits. No number of points can constitute a line, and if we even suppose that to be infinite, such a condition would not give to them any other property than that included in the definition, viz: an infinite number of boundaries of no magnitude. From the same definitions, it results, that even an infinite number of peripheries of lesser concentric circles, would not fill or make up the area of a given circle. The supposition of the author is, therefore, mathematically inconsistent, and impossible.

I know full well, that the notion of indivisibles has been employed by mathematicians of eminence, not pretending that they have an actual existence, with a view of aiding our conceptions, and illustrating difficult subjects relative to the quadratures, cubatures, and rectifications of curves, &c. Cavallerius, Terricallus, Wallis, and others, employed such principles in the solution of problems; but no legitimate deduction could be made from them, but by assuming an infinite number of terms, which necessarily implies, that each must be infinitely little, or infinitely divisible.

The subject of infinites as defined and understood by Mathematicians, being that, on which the *Metaphysique*, or ultimate principles of the higher and more difficult branches of the mathematics are based; it is of importance, that all objections and cavils, which may be made to the doctrine, should be obviated. Those which were started by Berkeley, and other ingenious men of the last century, have long since been annihilated, in the opinion of the learned, by the masterly productions of Keil, Robins, and Maclaurin. To their writings I beg leave to refer those, who are desirous of being enlightened on this subject.

M.

Art. XIII.—*Experiments on Anthracite, Plumbago, &c.* By Lardner Vanuxem. Read March 15, 1825.*

These experiments were undertaken with a view to determine whether the globules obtained by Professor Silliman, from the above substances, were owing to a fusion of their carbon, or merely to the impurities or foreign matter contained within them. They were long delayed by my waiting for some sheet zinc necessary to repair a Deflagrator intended to be used for the purpose of obtaining the globules; but this not arriving, I resolved to avail myself of the suggestion of Professor Silliman, namely, that of using the compound blowpipe which answered perfectly well. In the experiments with the blowpipe, the substances were placed upon platina foil, spread upon a lump of magnesia; the size of the pieces subjected to its action, was about ½ an inch in diameter, and ¼ of an inch in thickness. The light in the greater number of instances, was so intense, that I found it necessary to use double green glasses.

The mode pursued in the analysis of Anthracite and Plumbago was as follows. The presence of water was ascertained by heating a few small pieces of the substance in a glass tube, closed at one end; and the quantity of water by heating a given portion in a covered platina crucible. Another portion was pulverized in an agate mortar; then a given weight of it was put into a platina crucible, and kept without its cover at a red heat in a small French furnace, until the whole of the carbon was consumed; the residue was then boiled in water for an alkali; after this operation it was heated with caustic potash in a silver crucible: when the fusion of the mass was completed, water was added, and the whole then dissolved with nitro-muriatic acid. By evaporating the liquor to dryness, and adding acidulated water and filtering, the silex was obtained. To the liquor from this operation, ammonia in excess was added, and by this agent, the iron, manganese, and alumine contained in the liquor, were precip-

*From the Journal of the Academy of Natural Sciences of Philadelphia.

itated; the latter was separated from the two former by caustic potash. No attempt was made to ascertain the relative proportions of iron and manganese; this knowledge not being considered important. The presence of manganese was evidenced by the green colour of the alkaline fusion; and a rose colour, when acid was added to the liquor. No allowance was made for the difference in the degree of oxidation of the iron and manganese in the substances used, and the products obtained, as the amount was less than one per cent. where most abundant.

The first experiments made with the globules, were with potash, and with carbonate of soda on silver, and on platina foil; with these agents I could not produce much effect, but by using a small quantity of carbonate of lime, carbonate of soda and borax, on platina foil; their fusion, whether they were coloured or colourless, opaque or transparent, was effected in a few minutes.

Experiment 1st. A piece of the purest Anthracite of Lehigh, subjected to the blowpipe, presented numerous small white globules; few were tinged with violet, and two or three were blackish; the globules did not readily unite with one another; however, by long continued heat, some of the globules were obtained of the size of the head of a small pin; the greater number of them were but feebly translucent, and could be broken by a moderate force; others, though few in number, were transparent, hard, and not so brittle. The white globules were not magnetic, except when dark spots were present; the blackish ones were magnetic, and like the whole of them could be fractured by pressure. The surface of the mass whitened, as observed in the ordinary combustion of this coal, and presented veins or layers of the matter of the white globules; showing that the impurities of the coal were not regularly intermixed with its carbon, or, upon the supposition of its being fused carbon, that its production was extremely irregular.

With the flux before mentioned, the different kinds of globules were melted without difficulty. By heating a centigramme and a half of the globules in powder, for a long time, with caustic potash, about $\frac{3}{4}$ of a centigramme of silex was obtained. It manifested itself by its gelatinous appearance before the water was driven off.

The result of the analysis of this Anthracite, was

Carbon,			90.1
Water,*			6.6
Residue by incineration, of a dirty white colour,	3.3 consisting of	Silex,	1.2
		Alumine,	1.1
		Oxides of iron and manganese,	0.2
		Loss,	0.8
			100.0

Experiment 2nd. The Anthracite of Rhode Island, by the action of the blowpipe, presented a brownish appearance after cooling, (owing to manganese.) The surface exhibited numerous globules, larger than those of the Lehigh; some of them were transparent, colourless, and very brilliant by reflected light; others, and the most abundant, were black and opaque, and were strongly attracted by the magnet; a few were coloured white and black in spots; the white spots resembling enamel. The surface of the mass presented minute veins similar to those of the Lehigh.

Some of the black globules were heated for a long time on platina foil, with carbonate of soda; the mass was yellowish, but became black when immersed in water. By heating and dipping into water several times, the globules whitened; I could not effect their fusion in this way, but with the compound flux they readily fused. With this flux the different kinds were tried, and with the same effect.

The analysis of this Anthracite from Rhode Island, gave,

Carbon,			90.03
Water,			4.90
Residue by incineration, which was of a light brick red,	5.07 consisting of	Silex,	2.14
		Oxides of iron and Manganese,	2.50
		Loss,	.43
			100.00

* It is rather singular that so great a quantity of water as is contained in Anthracite, should heretofore have escaped notice. It is my intention to examine all the different kinds of coal, to ascertain if this fact be general.

Another specimen from the same locality, whose colour was a little different, being of a deeper black, and which was not tried with the blowpipe, gave

Carbon,			77.70
Water,			6.70
Residue by incineration, colour the same as the former,	15.60 consisting of	Silex,	8.50
		Oxides of iron and manganese,	7.10
		Alumine a trace,	
			100.00

Experiment 3d. A specimen of Plumbago from Borrowdale, of great purity, as judged by its external characters and mechanical properties, was subjected to the blowpipe; the globules began to form immediately and in great number, attended occasionally by scintillations, owing to the combustion of iron; the globules were small; the greater part of them were black, opaque, and of great lustre; others were dull, of a brownish colour, and feebly translucent; almost all of them were attracted by the magnet. The surface of the heated part of the Plumbago was brownish.

The globules, though acted upon with great difficulty by soda, and by potash, readily yielded to the compound flux, and formed a limpid yellowish glass. A large globule, by repeatedly heating it with carbonate of soda, and plunging it into water, became rough, and finally opened in the centre; it then dissolved in nitro-muriatic acid. By evaporating the liquor to dryness, the yellow colour of the iron was very manifest; acidulated water took it up, leaving a white substance like silex, floating in the liquor.

The analysis of this Plumbago gave

Carbon,			88.37
Water,			1.23
Residue by incineration, colour, yellowish brick red,	10.4 consisting of	Silex,	5.10
		Alumine,	1.00
		Oxides of iron and manganese,	3.60
		Loss,	.70
			100.00

Experiment 4th. An impure specimen of Plumbago from the same locality, gave numerous and large globules; some of the size of small shot; they readily formed; the majority of them were translucent, shining, and of a light greenish-yellow, others were dark coloured; and some of them were dull externally. The dark globules, as well as the surface of the mass of Plumbago exposed to the flame, was attracted by the magnet; some of the light coloured ones were affected by the magnet, but only at the point where they had been attached to their support, owing to particles of the support adhering to them. During the combustion of the Plumbago, there were occasionally, scintillations; the heated surface of the mass was brownish.

A large globule of the lightest colour and magnetic only at one point, melted with ease when the compound flux was used; it formed a transparent mass when hot, and opaque and milky when cold. The black ones with the same flux were also fused; they were brownish when hot, and greenish when cold. They were aeted upon with great difficulty by caustic potash, and by carbonate of soda.

The analysis of this Plumbago gave

Carbon,			61.27
Water,			5.33
Residue by incineration, colour of a dirty yellowish-red,	33.4 consisting of	Silex,	10.10
		Alumine,	3.20
		Oxide of iron and manganese,	20 00
		Loss,	.10
			100.00

Experiment 5th. A specimen of Plumbago remarkably pure, from near Bustletown, Penn was tried with the blowpipe. The globules were formed with difficulty, probably owing to its foliated texture, the fused parts spreading over the surface. The colour in places was white and translucent, in others so dark as to be almost black.

With the flux before mentioned, the fused matter was reduced to a transparent glass.

The analysis of this Plumbago gave

Carbon,			95 40
Water,			0.60
Residue by incineration, colour light brick red,	5.0 consisting of	Silex,	2.60
		Oxides of iron and manganese,	1.40
		Loss,	1.00
			100.00

Similar experiments were made with Plumbago from several other localities; the results of which were no wise different, and therefore need no further mention.

Experiment 6th. A piece of charred mahogany, during its combustion by the compound blowpipe, presented numerous small, imperfect globules, owing to the force of the flame, which dissipated their support before they had time to form or to accumulate to any considerable size; many of them adhered together, ramifying like flos ferri, which they resembled; they were collected by placing a dish under their support. By the compound flux, they readily fused into a transparent glass.

Experiment 7th. A quantity of lampblack was pressed into a mould with great force, and made to assume the form of a cylinder of about $\frac{3}{4}$ of an inch in diameter, and $\frac{1}{2}$ an inch in thickness; it weighed seven grammes. This cylinder of lampblack was subjected to the blowpipe. It wasted away gradually without forming any globules or fused matter, visible to the naked eye or to the microscope. The heat was equally as intense in this experiment as in all the other instances, and no condition was wanting to produce the same effects, except the difference of composition. After burning the lampblack for as long a time as was thought necessary to make the experiment a fair one, it was again weighed, and found to have lost four grammes, $\frac{42}{500}$, for it weighed but two grammes, $\frac{58}{100}$.

Five grammes of the same lampblack heated in an open platina crucible, left after its incineration, one centigramme of white ashes, equal to $\frac{1}{500}$ of the mass.

From the analyses of the substances, used by Professor Silliman, from which the globules were obtained, it appears that they all contain foreign matter, as silex, iron, manganese, and some of them also alumine; that when lampblack was used which contained but $\frac{1}{500}$ of fixed impurities, no distinct globule or melted matter was formed; although the heat was sufficiently great, and the combustion slow enough to admit of the forming of globules, if their production was owing to the fusion of carbon, and not to extraneous matter. From my own experiments I always found that the more impure the substance was, the more numerous and the larger were the globules produced.

All the globules from the different kinds of substances used, were readily fused by the compound flux, and underwent little change when it was not used; although the heat was, in this case, of longer continuance. Matter similar to the impurities discovered in the substances used, was detected in them.

From these facts it would appear, that the globules produced from the combustible substances operated upon, did not arise from the fusion of their carbon, since they can otherwise be accounted for; particularly as no experiment has been made which unequivocally leads to that conclusion. The experiment upon which Professor Silliman relies, as a proof of the globules being fused carbon, is one which is not satisfactory to me; if it had been, it would have given me great pleasure; for no one, I trust, feels more interested in the scientific prosperity of his country than I do; and if Professor Silliman were right, it would indeed be a triumph for America.

The experiment just alluded to, (see vol. vi. p. 347, Journal of Science,) is the heating some of the coloured globules in oxygen gas by the solar rays, with a lens. The following is an extract from the papers.

"To detach any portion of unmelted Plumbago which might adhere to them, I carefully rubbed them between my thumb and finger, in the palm of my hand. Although they were in the focus for nearly half an hour, they did not melt, disappear, or alter their form; it appeared, however, on examining the gas, that they had given up a part of their substance to the oxygen, for carbonic acid was formed which gave a decided precipitate with lime-water,"

That this experiment is equivocal appears certain, as particles of the support might have been attached to the globules; for, from my own observations, I found that in a great number of instances, some of the white globules at the point of junction with their support, had small dark particles attached to them, and when the surface from which they were detached was magnetic, they were attracted by the magnet when it was presented to those parts; I could not disengage those particles by rubbing the globules with my fingers one against another. It is very evident that, as the globules underwent no change, (unless a reduction of volume, which is not mentioned) as the description clearly shows, the carbonic acid obtained, might have been produced by the combustion of portions of the support adhering to them externally, and penetrating them to a certain extent.

In the experiment detailed in Vol. V. p 363, of the same Journal, the carbonic acid found, probably had a similar origin, and the disappearance of the globules may have been owing to their incorporating themselves with the piece of brick upon which they were placed, as the brick was vitrified at the point where they were placed.

Professor Silliman seems disposed to lay great stress on the loss in my examination, of the globule, sent by Dr. Macneven. I thought I had well accounted for it, as the particle was small, action violent, and I merely wished to show chemically, the presence of iron. I could not, for one moment entertain the idea that carbon existed in it, in any notable proportion; for I know of no combination of iron and carbon at common temperature, which could give a product possessed of the malleability and toughness which the globule possessed.

I was sorry to observe that Professor Silliman in his reply to my paper, seems offended that I did not notice his communications upon the subject of these globules, particularly as the discovery was his, and was justly entitled to such consideration. My silence certainly appeared uncourtly, but it was not owing to ignorance of his labours, or a want of regard to him personally, or as a chemist; Professor Silliman's merit is too well known to be affected by me.*

Art. XIV.—*Papers relating to the fusion of Carbon.*

I. *Remarks by the Editor.*

In the spring of 1823 Professor Silliman published, in this Journal, an account of some experiments on the fusion of charcoal and of other forms of carbon; which statements were

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* It was not Mr. Vanuxem's omission to mention the claim to the discovery of "these globules," but his omission to mention *any name* in connexion with the subject of *fused carbon*, that was regarded as uncourteous, especially when, not possessing the means of obtaining fused carbon, he omitted to apply for it to the person most interested, who could and would have furnished what he believed to be such. We should then have avoided the awkward result of having something which charcoal does not contain in any considerable quantity, presented as a proof that charcoal was not melted.—Editor, Sept. 28, 1825.

controverted by Professor Lardner Vanuxem, in a paper published in the Journal of the Academy of Natural Sciences, of Philadelphia, for April 1824. Some remarks in reply were published by Professor Silliman in this Journal, Vol VIII. p. 147; and others by Professor Hare, p. 288 of the same volume. These observations of Professor Hare had been previously communicated by that gentleman, to the Philadelphia Academy, for insertion in their Journal, but the committee of publication refused to insert them, although Dr. Hare, and Professor Silliman, were members of the Academy. Dr. Hare then sent his paper to the American Journal, but from delicacy* to the Academy, the report of the committee which refused to insert Dr. Hare's paper, together with certain strictures upon it, was omitted. It was thought proper however to republish Professor Vanuxem's paper in the American Journal, that the public might there see both sides of the question, although they were permitted to see only one in the Journal of the Academy. A second memoir of Professor Vanuxem, on the same subject, appeared in the Journal of the Academy for June 1825; but a reply, by Professor Hare, to this paper, has been also refused an insertion in the same Journal.

It will appear among the papers contained in this article: and, that we may not return the measure which is meted to us, Professor Vanuxem's recent memoir is published in this number. As the substance of the reports of the committee of the Academy who acted on Dr. Hare's paper, has been communicated by Dr. Hare, and will now be published, the whole subject will be before the public, who will of course form their own opinion. Controversy, especially where it involves considerations personal to ourselves, is one of the last things about which we could wish to be employed, but it seems impossible to avoid the course now pursued.

The reader will pardon the necessary repetition of some things formerly published.

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* The perseverence of the Academy in this course, absolves us from obligations of this nature.

II. *Strictures by* ROBERT HARE, M. D. *Professor of Chemistry, &c. &c. upon Professor* VANUXEM'S *Memoir on Plumbago. Anthracite, fused Carbon &c. published in the Journal of the Academy of Natural Sciences, for June* 1825. *Also a Letter from Dr.* HARE *to Professor* SILLIMAN, *respecting some proceedings of the Academy of Natural Sciences.*

Professor Vanuxem, in a letter to Isaac Lea, Esq. which has been lately read before the Academy of Natural Sciences, endeavours to prove that the fused products obtained by Professor Silliman, were none of them carbon;—first, by analyzing anthracite and plumbago;—and secondly, by exposing those substances, or mahogany charcoal, severally to the compound blowpipe, which he was necessitated to use in consequence of not having a Deflagrator.

The analyses thus given are interesting, so far as they may afford correct views of the composition of anthracite and plumbago. The only possible bearing which they can have on Professor Silliman's experiments, is in showing what every chemist would have anticipated, especially in the case of plumbago, that there may be some ferruginous, as well as earthy matter, in the minerals in question, and consequently that this matter, when exposed to intense heat, may be fused into globules. This result is confirmed by the actual production of globules from anthracite, and plumbago, on due exposure under the compound blowpipe.

The fusion, however, of some ingredients in a compound does not prove the infusibility of others. If another ingredient, subjected to ignition at the same time, be not fused, it may show that it was not to be fused under the circumstances of the experiment in question; but it does not prove that under other circumstances it would be insusceptible of fusion.

The flame of the compound blowpipe, necessarily supported by oxygen gas, is very unfit for the fusion of charcoal, which when exposed to heat and oxygen, passes off in the form of carbonous oxide, or carbonic acid gas;—but the opposite is true, of the ignition of the Deflagrator, in producing which oxygen has little or no agency, and with whose effects it cannot materially interfere, both on account of the excessive rarefaction, and the vapour of carbonaceous matter, produced by the extreme heat.

The fusion of plumbago by the former was readily effected by me more than twenty years ago, as may be seen in my memoir on the supply and application of the blowpipe. The same result was subsequently accomplished by Professor Silliman, and now agreeably to the memoir before us, by Professor Vanuxem himself. According to the analysis mentioned in this memoir, in which plumbago is thus admitted to be fusible, it differs from carbon only in containing three parts in a hundred of iron. Upon what ground then has Professor Vanuxem been so incredulous, respecting the fusibility of carbon, as to believe more readily that Dr. Macneven had obtained from it a globule of iron, than that Professor Silliman could accomplish its fusion?

Dr. Hays stated, before the Academy of Natural Sciences, at their last meeting in March, that at the time of sending to Judge Cooper the globule analyzed by Mr. Vanuxem, it was represented as a product of mahogany charcoal.* Professor Vanuxem has not as yet acknowledged himself, or Dr. Macneven, to have fallen into any error in treating malleable iron as a possible *extemporaneous* product of mahogany. He has not even done me the honour of noticing the paper in which it was demonstrated that in so treating it he had made a mistake. We are of course to infer that he still adheres to the position that wood charcoal may yield, during a transient exposure to ignition, a globule of iron in its metallic form. Under these circumstances, it must surprise every reader, that he does not by an analysis of mahogany charcoal, endeavour to prove that iron exists in it in such quantity, as that such a ferruginous globule may be in such manner obtained from it. If the negative proof founded on his neglect to analyze this substance, on which the observations of Professor Silliman were chiefly made, be combined with the positive evidence furnished by his own analysis, that even in plumbago, which is considered as a carburet of iron, this metal does not exist in quantity adequate to have produced a globule principally ferruginous, during a momentary ignition, it seems to me that the late memoir of Professor Vanuxem tends to prove the fallacy of

* Professor Macneven has recently stated the same fact, in conversation with the editor, September 1825.

that already published by him, [see Vol. VIII. p. 292, and p. 102 of the present Vol. of this Journal,] much more than it disproves any of the allegations of Professor Silliman.

Mr. Vanuxem justifies himself for resorting to the compound blowpipe, in order to invalidate results obtained by an instrument extremely different in its character, by saying that he has done so in obedience to a suggestion of Professor Silliman. If any evidence be requisite to prove that Professor Silliman never intended to sanction such a procedure, it may be found in the following passage, concluding his observations on the results obtained by this instrument. He says,

"I would add that for the mere fusion of plumbago, the blowpipe is much preferable to the deflagrator; but a variety of interesting phenomena, both in relation to the plumbago and the charcoal, are to be exhibited by the latter, but not by the former."

In another place he observes, "Were the diamond a good conductor, it would be melted by the deflagrator; and were it incombustible, a globule would be obtained by the compound blowpipe."

It is evidently therefore the opinion of the author of this passage, that carbon, even in its most incombustible state, as in that of the diamond, is still too combustible to yield globules with the instrument which Professor Vanuxem has used for that purpose.

To conclude: It appears to me that the grounds upon which the results of Professor Silliman have been assailed by Mr. Vanuxem, are utterly untenable. The animadversions of his first memoir were founded on an analysis of a globule, which being proved by himself to be malleable iron, was of course erroneously treated as an *extemporaneous* product from a minute portion of wood charcoal. In the memoir now under consideration, he adduces experiments performed by the compound blowpipe, in order to invalidate observations made by means of an instrument of a very different character.

So far as respects the curious and interesting phenomenon of a projection arising on the charcoal attached to the negative pole of the deflagrator, I am fully prepared to bear witness to the correctness of the description given by Professor Silliman. There has been no conclusive analytic demonstration that the excrescence which thus arises is pure carbon; and had it been supposed, or proved, to contain a minute portion of iron, it would not have surprised me.

With respect to the colourless globules, resembling diamond, Professor Silliman has never treated them as carbon unquestionably; and I have no evidence to offer from my experiments with the deflagrator which has any tendency to prove that diamond globules can be produced. I am not of course disposed to deny that there is much room for skepticism on this subject.

III. *Letter from Dr.* HARE *to the Editor, respecting the proceedings of the Academy of Natural Sciences. September* 1825.

That two memoirs on fused carbon have been inserted in the Journal of the Academy of Natural Sciences, of Philadelphia, while answers to them have only appeared in other Journals, may excite some surprise—especially as all the parties immediately concerned in the discussion are members of the Academy. It may be proper that the scientific world should be informed, upon what grounds the persons who have assumed the control over a public channel of information, can justify themselves for allowing only one of the parties in a discussion to be heard.

Those readers who can call to mind the impressions received by them on perusing my "remarks" upon Professor Vanuxem's memoir on fused carbon, (published in this Journal, Vol. VIII. p. 288,) will smile on reading the following report of a committee, by which it was denied publication, because I could not conscientiously admit that it contained passages personally offensive to Mr. Vanuxem.

I will alternate, with the allegations of the report, such animadversions as may occur to me. It commences with alleging: "*That this paper seems to them to prove that the substance examined by Professor Vanuxem was not the same as that procured and described by Professor Silliman, and that it ought on this account, to be introduced into the Academy's Journal, both in justice to the chemist, and for its own intrinsic interests. They would not therefore hesitate to recommend its publication, did it not unhappily contain expressions and passages calcu-*

lated to give offence to our former correspondent, at the same time that they are unnecessary to the scientific discussion of the subject.

The Committee object, in the first place, to the word "erroneously," *as introduced into the title of the paper.*"

The title was "Remarks respecting Mr. Vanuxem's memoir on a fused product, erroneously identified with the fused carbon of Professor Silliman."

The committee admit that my paper "appears to prove that the substance examined by Mr. Vanuxem was not the same as that procured and described by Professor Silliman." It follows then, that it was untruly treated as the same; either through error or design;—I have sincerely said it was through error. Would the committee prefer the only other alternative?

" *Secondly—The Committee object to the following passage, as peculiarly offensive*: "*Mr. Lardner Vanuxem communicates his observations on a supposed specimen of fused charcoal, sent to Professor Cooper by Dr. Macneven of New-York, which appears to have been iron*; *and the author* appears to have received, and evidently intends to convey the impression, *that the substances considered as fused or volatilized carbon by Professor Silliman, must have been similarly constituted.*" *If the Committee understand the force of language, this passage contains a very direct insinuation, that Professor Vanuxem may have wished to* convey *an impression that he had* not *received.*

I am astonished, that words, so innocent in their import, and so well intended, should be construed into an insinuation foreign to my thoughts.

" *Thirdly—The Committee object to the passage which accuses Professor Vanuxem of having given* ' *a broad and unreserved, though indirect contradiction to Professor Silliman's representations.*' *The Committee do not perceive in the paper of Mr. Vanuxem, any contradiction to the* representations *of Mr. Silliman.*"

Professor Vanuxem makes statements, and advances opinions, irreconcilable with the representations of Professor Silliman, although he does not name him. This I call an indirect contradiction—and I say it was broad and unreserved, because its force was not restricted, nor its final influence on the reader suspended, by any expression of doubt of his own premises or conclusions, nor of any deference for those which he controverted.

"*Fourthly—The Committee object to the following passage: "It ought not to have been so readily supposed that in scrutinizing the substances which he (Professor Silliman) had obtained, with a view to communicate the result to the public, any advantageous employment of the magnet, the hammer, the file, or the mineral acids, had been omitted." The Committee cannot think it so entirely evident, that Mr. Silliman must have employed all these tests, (none of which he mentions in his paper,) that the Society's correspondent should be called to task for having supposed the contrary possible.*"

It appears from Professor Silliman's Memoir, (vol. 5, page 363, American Journal of Science,) that he did employ boiling sulphuric, and boiling nitric acid; and moreover, it is evident that the products which he represented as fused carbon, could not have been iron, both on account of their habitudes with these acids, and on account of their disappearance when subjected to the solar focus in oxygen gas. Of course no "*advantageous*" application of the magnet could have been made. In examining the globules produced upon plumbago, when exposed to the deflagrator, it will be found that Professor Silliman did resort to the magnet. Iron being a constituent of plumbago, it was in that case rational to expect that the globules might be magnetic. The magnet was also employed by him in testing the globules procured from anthracite, by means of the deflagrator.

The responsibility of the rejection of my remarks, must fall principally on Dr. Patterson, chairman of the Committee; since he wrote the report, in opposition to the opinion of his colleague, Dr. Troust, the principal founder, and first president of the Academy.

My strictures on the second memoir of Prof. Vanuxem on fused carbon, published in this number of the American Journal, page 102, have been denied a place in the Journal of the Academy, for the following reasons, advanced by the committee to whom it was referred:

1*st.* That, "*As the paper of Mr. Vanuxem is neither personal nor controversial, nor even argumentative in its character, it does not appear to have merited a reply of the nature of that submitted.*"

2*d.* That, "*If Mr. Vanuxem's paper be an attack, it is one made with the instruments of the Laboratory, and should be repelled by the same means.*"

3*d.* That, "*If the Academy is to be called in as a second in this literary contest, it should see that the antagonists use the same weapons.*"

4*th.* That, in a journal, "*established*" for the record of facts, "*it would be inconsistent*" to introduce "*a paper which* *although on an experimental subject, consists of arguments alone, whatever ingenuity these may exhibit.*"

Those who have read Mr. Vanuxem's last memoir, (page 102.) and my strictures upon it, will be enabled to judge how far this reasoning does honour to the body whence it originates. If it be indeed the duty of the Academy to see, that those who enter the lists upon the arena of their Journal, "*use the same weapons*," one of the combatants having come into the field with a deflagrator, his assailant ought not to have been allowed to arm himself with a compound blowpipe.

It must be evident, that the object of my strictures was, to expose two fallacious impressions, which Mr. Vanuxem had endeavoured to convey to his readers. First, that his inability to fuse carbon by a compound blowpipe, proved it infusible by a deflagrator; and secondly, that Professor Silliman had sanctioned this procedure. How were these fallacies to be corrected, agreeably to the views of the Committee? Were they to be met with the "*same weapons*," agreeably to one part of the reasoning; or, according to another part, by the "*instruments of the Laboratory*;" rendered so especially appropriate, by its being in a "*literary contest?*"

The latter passages of Mr. Vanuxem's memoir will show that it is both controversial, and argumentative; and that the commencing paragraph was intended to convey the erroneous impressions which it was my object to correct.

Mr. Vanuxem's friends opposed the admission of my strictures, upon the plea, that criticism is not permitted in the Journal of the Academy, which is, virtually, the same ground as that taken in the report, agreeably to the quotation which has been made from it; yet a reference to the pages of the work in question will show, that, in the late numbers, there is much criticism on Wilson's Ornithology; and, for an earlier instance, I would cite the paper of Mr. Say, Vol. I. page 405.

I cannot understand, how temperate criticism is to be excluded, without injury to the cause of truth. But if the Academy are resolved at all events, to deny its admission, they should not publish papers which, unaccompanied by it, must give false impressions.

This must always ensue, when correct observations or experiments are incorrectly associated or applied. Thus, in Natural History, one animal or plant, may be mistaken for another, and observations communicated, tending to mislead the public, until the mistake is exposed from the author's own statements. The errors which drew forth Mr. Say's strictures, to which allusion has been made, were of this kind, and are very analogous to the confusion of malleable iron, with fused carbon, or a compound blowpipe, with a galvanic deflagrator.

IV. *Examination of the projections which arise upon charcoal intensely ignited between the poles of a galvanic deflagrator.* By R. Hare, M. D. &c. &c.

While I conceive it impossible that a globule of malleable iron, of the size of that described by Prof. Vanuxem, should be derived from a portion of wood charcoal, small enough to be comprised within the sphere of intense galvanic ignition; I have never been of opinion, that there might not be a minute portion of iron in some kinds of charcoal. In my memoir on the supply and application of the blowpipe, published in 1802, it was suggested, that the dark colour acquired by some of the earths, during fusion, might be owing to a trace of iron in the coal. Dr. Clark, afterwards, sanctioned this conjecture.

About two years ago, in examining some projections formed on charcoal, pursuant to Professor Silliman's observations, it occurred to me, that there was in the texture, a resemblance to plumbago.

I have lately subjected several specimens of fused carbon, received from Prof. Silliman, to nitrate of potash intensely heated by different means. Sometimes, a small platina tray, containing the nitre and fused carbon, was made to complete the circuit of a large calorimotor; in others, it was subjected to the flame of the hydro-oxygen blowpipe. In either case, the deflagration of the carbonaceous product, with the nitre, was effected. When it had all disappeared, the tray was subjected to water, heated in a glass tube, until all the soluble matter was dissolved. Being thus cleansed from the salt, it was introduced into another glass tube, containing pure, colourless, muriatic acid. The acid instantly assumed a straw colour, and gave a blue colour with the prussiate of potash, although on mixture with the same test, before the tray had been exposed to it, the acid underwent no change of colour, on admixture with the prussiate. The soluble matter removed by the water, being assayed with lime water, gave a very copious precipitate. When one of the projections, held in a pair of slender forceps, was exposed to the hydro-oxygen flame, it burned readily, leaving scarcely any residue.

The quantities of fused carbon, with which these experiments were made, were too limited, to admit of my ascertaining the ratio of the iron to the carbon; but, the proportion of the metal was evidently very minute, being productive only of a slight and partial discolouration of the platinum.

From these experiments, it would seem, that the substances examined, are carburets of iron. The copiousness of the precipitation with lime water, indicates that the nitrate of potash had met with enough carbon in the fused product, to generate a considerable proportion of carbonic acid, which combined with the potash, and was afterwards yielded up to the lime; while the discolouration of the prussiate of potash, and the minuteness of residuum occasioning it, prove, that a small proportion of iron existed also in the subject of examination.

I beg leave here to reiterate the opinion advanced at the close of my strictures on Prof. Vanuxem's memoir, that the presence of a minute portion of iron, in the projection arising on charcoal exposed to galvanic ignition, cannot materially diminish the interest excited by the fact, that matter, so fixed and infusible, should be thus mysteriously accumulated on one pole, at the expense of the other.

The combustion of the fused product of charcoal, by the flame of the compound blowpipe, as mentioned above, demonstrates the impropriety of using that instrument, to obtain such products, agreeably to the course pursued by Prof. Vanuxem.

V. *Notice of some recent experiments on Charcoal, &c.* By Prof. Silliman.

Ever since the publication of the experiments on this subject in 1823, I have been anxious to prosecute the inquiry further, but have been prevented by want of health, and by indispensable duties. Even now, I am not prepared to present that full view of the subject, which is desirable, but a few facts may be stated on this occasion.

I carefully prepared a sufficient quantity of the best maple charcoal, by selecting that which had been made from young and vigorous limbs—sawing it into cylinders of convenient size, and igniting it thoroughly, in a black lead pot,* covered by another of the same kind—the whole being placed in a powerful wind furnace. Other pieces of the same kind of charcoal were treated in the same manner, after being previously boiled in distilled water, or in diluted muriatic acid, the object of which obviously was to remove alkaline, ferruginous, or other soluble impurities. I may observe, once for all, that there appeared to be no difference in the sensible phenomena attending the experiments or in the results, whether one kind of charcoal or another was employed, or whether it had been boiled with acids and water or not: after boiling, it was always re-ignited in the furnace, before it was used in the deflagrator.

A leading object of the experiments now to be stated, was to ascertain whether there was any change of weight in the ignited charcoal.

March 4th, 1825, charcoal being used, which had been boiled in weak muriatic acid, afterwards in distilled water, and finally ignited intensely in close vessels in the wind furnace.

I ought perhaps to mention that the deflagrator formerly described, had been enlarged by the addition of eighty of the compound coils suspended on two parallel beams and dipping into their appropriate troughs; thus the surface of metal was doubled, and the power of the instrument very considerably increased. No difference however was observed in the phenomena, except in the rapidity and energy with which they were produced. It should also be observed that the word positive here refers to the zinc, and the word negative to the copper pole. These terms having been erroneously applied, when the instrument was first invented, and the error not being discovered until after my former experiments were published; the designation of the poles is therefore opposite, in these remarks, to that employed in the former papers.

1. The points of charcoal were instantly fused, with a crackling of the charcoal, the result exactly resembling hematite—the projecting cone or cylinder being formed rapidly on the negative, while a corresponding cavity was produced in the positive charcoal.

2. The same.

* No sand was used to cover the pieces.

3. The same.

4. Two plumbago points were employed, and the usual appearances resulted: the two weighing 11 grains lost $\frac{1}{2}$ a grain.

5. The positive pole of charcoal, and negative of plumbago: the charcoal lost nearly a grain; the plumbago remained the same.

6. The positive charcoal weighing 6 grains; negative plumbago weighing 11 grains: the latter gained $\frac{1}{2}$ a grain and was covered with a tuft of melted charcoal; the positive having a corresponding hollow, and losing half a grain, exactly the amount transferred to the negative.

7. The charcoal, 6 grains for the negative side, and that for the positive weighing 17 grains and $\frac{3}{10}$: the former gained one fifth of a grain; and the latter lost $\frac{9}{10}$ of a grain.

8. Positive charcoal 6 grains; negative plumbago 6 and $\frac{3}{10}$: melted charcoal accumulated upon the plumbago, and below were perfectly limpid white globules; weight the same as before; the charcoal broke, and could not be weighed.

Experiments on Charcoal which had been ignited but not boiled in acids, March 5, 1825.

1. Negative pole 14 grains $\frac{7}{10}$; positive 11 grains: lost in one minute half a grain; the negative gained nothing, nor did it lose.

2. Negative $10\frac{1}{2}$, and positive 10: lost in one minute $\frac{7}{10}$ of a grain, and the negative lost $\frac{1}{10}$.

3. Positive 9 grains; negative 10 grains: lost $\frac{1}{5}$ of a grain; the positive lost $\frac{3}{10}$, in one minute.

4. Negative $9\frac{6}{10}$; positive $8\frac{7}{10}$ of a grain: negative gained $\frac{2}{10}$; positive lost 1 grain.

5. Positive $7\frac{1}{2}$; negative $9\frac{1}{2}$; the same pieces as used in (No. 4.): positive lost $\frac{7}{10}$; negative weighed the same.

6. Negative 9 grains; positive $6\frac{8}{10}$: negative lost $\frac{2}{5}$ of a grain; positive lost $1\frac{2}{5}$ grains.

April 12, 1825—Obtained several projections a quarter of an inch long; one of them $\frac{1}{16}$ of an inch in breadth, and nearly $\frac{3}{10}$ of a grain in weight.

The points being connected at right angles in a globe, excluding the external air, the accumulation was at right angles, shooting off in a curvilinear form, and at last straight, till it was $\frac{1}{2}$ an inch in length.

April 13—1. Negative weighed 4 grains; positive $4\frac{1}{2}$ grains: being brought together in a small globe at right angles,—vivid ignition—negative weighed the same; the positive $3\frac{7}{10}$.

2. Negative 4 grains; positive $3\frac{7}{10}$: the same points as the last used in the globe. On bringing the points together, there was a considerable explosion which blew out one of the corks—the positive lost $\frac{6}{10}$ of a grain, and the negative weighed the same as at first: this kind of explosion (arising probably from hydrogen) occurred several times.

3. Positive weighing $3\frac{9}{10}$; and the negative $3\frac{2}{10}$: in this, and in many of the preceding experiments, there was a production of prussic acid, evident from the smell—positive lost $\frac{7}{10}$; and the uegative gained $\frac{2}{10}$. In no instance, when the spark was taken in a globe, did the negative lose; but in some it gained. In one case the weight of the charcoal in the negative was $3\frac{2}{10}$: it gained $\frac{3}{10}$ more; the melted charcoal which had accumulated in that case weighed $\frac{3}{10}$.

4. Positive pole weighed - - $15\frac{1}{10}$.
Negative do. do. - - - $7\frac{6}{10}$.

After the experiment.

Negative do. do. - - - $7\frac{6}{10}$.
Positive do. do. - - - $13\frac{7}{10}$. Lost $1\frac{4}{10}$.

5. Positive do. do. - - - $11\frac{3}{10}$.
Negative do. do. - - - $7\frac{3}{10}$.

After the experiment.

Negative do. do. - - - $7\frac{3}{10}$.
Positive do. do. - - - 11.

The white fume formerly observed being condensed in a glass globe, changed the *red* tincture of alkanet to *blue*, and was therefore probably alkali: but a similar white cloud arises from points of plumbago and is probably not alkaline.

From the preceding experiments it follows that both in the open air and in close vessels, the positive pole always loses weight decidedly and rapidly, and always evinces a part of this loss by the cavity formed on the ignited point. The negative pole in the open air sometimes loses weight also, but in a much smaller degree than the positive pole. In close vessels the negative pole does not lose weight and it sometimes gains. The most decided results were obtained when the charcoal points were connected in a small glass tube; then the projection formed on the negative pole with great rapidity—became half an inch or more in length, and a deep cavity was formed in the positive pole. It is impossible to doubt the existence of a powerful current flowing from the positive to the negative pole. Wherever the projection on the negative pole was allowed to touch the opposite charcoal, the two strongly adhered, thus evincing the softened state of the matter on the points.

In estimating the changes of weight, the following circumstances are to be taken into view.

Volatile matter, hydrogen, aqueous vapour, &c. (arising in part from unavoidable reabsorption after the preparatory ignition) are expelled by the intense heat, and the carbon itself is probably exhaled in vapour, and when the air has access, some portion of it is burned, so that only a part (a part which will of course vary with circumstances) of the matter lost by the positive pole can be expected to be found upon the negative. The negative being subjected to similar causes also loses weight, probably in every instance, if we speak of its own proper matter—but, as matter from the opposite pole invariably accumulates upon the negative, this substance is sometimes just sufficient to restore the weight lost from the other causes, and at other times it is more than sufficient, thus causing a positive increase in weight. The reason why these facts are more observable in close vessels obviously is, that the air being in a great measure excluded, there is no waste by combustion, which, although materially obstructed by the extreme rarefaction of the air, and the vaporization of the charcoal, (as suggested by Dr. Hare,) still I suspect goes on in a degree.

There appears to be little waste of the points, exactly where they are opposed, but considerable (and more considerable than I had formerly supposed) on the laterally ignited portions of the charcoal.

Does the melted matter accumulated upon the negative pole consist in whole or in part of carbon?

The examination of this subject by Prof. Vanuxem, as stated in his first memoir, (p. 292, Vol. 8, of this Journal.) is entirely irrelative ; for the thing examined was not the same with what I have called melted charcoal. It was clearly a different substance, and it cannot be expected of me to explain how the mistake arose. It is true that in my earlier publications, I did not mention trying the melted masses with the magnet. Although there was no reason to expect any thing more than a very slight trace of iron, in any matter obtained from charcoal, I have frequently subjected the melted matter obtained by the deflagrator from charcoal to the action of powerful magnets, and never could I perceive the slightest action either upon the melted masses, or even upon the finest powder obtained by pulverizing them. Much less could I discover the malleability, toughness, impressibility by a file, capability of receiving a polish, &c. mentioned by Mr. Vanuxem. The magnet has failed to act upon this substance after it has been exposed to acid, salts, alkalies, &c. and if there is iron in it, which is probable, it is in too small quantity to be discovered in this way. Much less can we suppose that any matter procured from the fusion of charcoal should present iron, for one half of the whole matter upon which the examination was begun, and nearly five sixths of all that was accounted for.*

I transmitted to Prof. Hare some of the largest of the melted masses obtained in the experiments described above, and he made the trials upon them which he has related, and which decidedly prove that they contain carbon in notable quantity, with traces of iron, and possibly other impurities of the charcoal.

It would appear from the experiments of Dr. Hare, that charcoal, in common with many vegetable substances, affords traces of iron capable of being indicated by delicate chemical tests, but probably too inconsiderable to be easily appreciated by weight : at any rate there is nothing in his results analogous to those obtained by Professor Vanuxem. The mere traces of iron cannot justify this inference as observed by Dr. Hare, any more than it would be proper, from the small portions of iron which most minerals afford, to infer that they are similar to the proper ores of that metal.

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* See the result of Prof. Vanuxem's first memoir.

The following experiments were suggested by those of Dr. Hare. I melted some chlorate of potash in a silver spoon, to drive off the water of crystallization, taking care not to expel its oxygen gas by raising the heat too high.

Seven grains of this melted chlorate of potash were mixed with one grain of the melted matter from charcoal, and the two were triturated together in a mortar; the powder was then put into a glass tube, bent into the form of a retort well luted about the sealed end, where it was about $\frac{1}{2}$ an inch in diameter. The luted end was then heated in a small French earthen furnace, connected with a small *Pneumatic cistern.* The tube was scarcely red hot when the gas came over with very great rapidity, and so much sooner than was expected, that a considerable quantity, probably two-thirds, was lost; that which was caught was received in flasks filled with lime-water, which it precipitated instantly and very abundantly, not only when agitated with the lime-water, but each bubble as it passed indicated its course by a distinct trace of white flocculi of precipitated carbonate of lime; the heat being raised, gas continued to come, although much more sparingly, but every bubble to the very last, continued abundantly to precipitate the lime-water, and the precipitate, when the vessels were set aside, formed a dense stratum as it settled to the bottom of the flask. My object being merely to ascertain in general whether carbon existed in the fused matter, I did not take the precautions requisite to decide on the proportion, and can therefore state only this fact that the precipitate of carbonate of lime collected and dried, weighed two grains implying one fourth of a grain of carbon, and if we allow for the gas which was lost there can be little doubt that the greater part of the melted matter was carbon. The only objection which can be made to this conclusion is that the carbonic acid might have been derived from charcoal adhering to the melted masses. But most of them, when examined by a good magnifier, appeared entirely destitute of any such appendage; and if any adhered, the quantity was evidently so small that it could not have seriously affected the result. The residuary salt in the bent tube still contained portions of the melted matter dispersed about in the mass; they were not affected by the magnet, and my engagements have not allowed me to examine them any further. Whatever impurities exist in charcoal are probably to be found in them also, but whether they contain more carbon I cannot say without renewing my trials upon them. It would be useless to examine for silex, &c. which might obviously be derived from the glass tube. Perhaps it is not necessary to mention that the residuary gas, after the carbonic acid was washed out, was oxygen gas. I objected to the conclusion of Mr. Vanuxem, stated in his first memoir, that he found no carbon in the matter which he examined, on the ground that he did not collect the gaseous products, in which alone, in his method of operating, the evidence of the existence of carbon would have been found. The experiments which I have just related will probably be thought to confirm this opinion.

Half a grain of the fused charcoal was boiled in half an ounce of strong nitric acid in a flask with a bent tube, and communicating with the pneumatic cistern; as soon as the air of the vessel was expelled, the gas which next came gave a decided precipitate with lime-water, but much less so than in the preceding experiment: the acid being boiled away, the vessel broke; and although there was matter remaining, it was lost in the fire, and I could not renew the experiment. I am aware that the above experiments are imperfect; many things more, (too obvious to require being mentioned at this time,) ought to be done in order to give precision to this inquiry. If the work is not accomplished by some abler hand, I shall hope to resume it in due time; at present I see no reason to doubt that the charcoal has been fused, and of course whatever impurities it contains. But it would be singular indeed, if the impurities alone were transferred from one pole to the other; if they alone were subjected to the current of igneous and electrical influence, while the carbon made its escape.

The discovery of siliceous, ferruginous, and other impurities, in the globules obtained by the blowpipe operating upon plumbago and anthracite, certainly renders it probable that those obtained by myself in a similar manner and possessed of a similar appearance had also a similar constitution. I did not examine them chemically, owing to causes which have been stated; and I distinctly admitted the *possibility* of the results obtained by Professor Vanuxem, as stated in his late memoir.

Art. XV.—*Remarks on the cutting of steel by soft iron, in a letter to the Editor, from* Thomas Kendall, Jr.

As the subject of cutting steel by soft iron, has excited considerable attention, and seems not yet to be exhausted, I take the liberty to communicate such facts connected with the subject, as have come under my own observation, together with some remarks, which are at your disposal. In the cutting of *revolving iron* by tempered steel, experience proves that there is a certain velocity beyond which it cannot be well and freely done. Much depends on the purity and state of the iron, much on the form, temper, and sharpness of the cutting instrument, much whether the work is performed dry or kept constantly wet with water or oil, and also much on the *disposition of the particles of iron to chip.* There is a great difference in different samples of iron in that respect, but much more difference in copper and its alloys, some of which, although sufficiently soft, can scarcely be wrought by turning, filing, drilling, or grinding. Whenever the steel or cutting tool, from any cause, ceases to act on the iron, and the heat is perhaps at the maximum, the iron if revolving will act on the steel; the greater the velocity the more freely it acts, and the progress is marked by different appearances corresponding with the different velocities. In the case of cutting a saw plate with soft iron, if moving with a velocity barely sufficient to act on the steel, this becomes heated beyond the cutting tool to a blue colour; if moving with greater velocity, no change of colour is seen except on the burr raised by the tool; if with greater still, no change of colour is perceived, although the movement is attended by the *combustion* of most of the particles disengaged. These become ignited because, being connected with, and forming a part of the plate, they are by the motion disengaged with a velocity that does not admit of the transmission of the heat to the other parts of the steel. Perhaps the ignition is commenced and carried to that degree denominated black heat, before the particles are separated, and is completed by the friction attending the separation. It is a fact, perhaps not generally known to those who have written on the subject, that *at the heat called black heat,* (but which is in fact nearly or quite a red heat in the dark,) *steel is broken or separated by fracture,* with much less force than when heated less or more*, the requisite temperature varying probably in proportion to the carbon contained in the steel.

The result of the copper wheel mentioned by MM. Darier and Colladon having no action on the steel, goes far to prove that the effect depends at least as much on *heat softening the steel*, to a certain degree, as on *percussion*, copper having but little disposition to generate heat under any circumstances, a fact duly appreciated by the manufacturers of gunpowder.

The reason why "the heat should be nearly all concentrated in the steel and scarcely perceptible in the iron," I think to be this; the percussion against the steel is *continual*, but against any one part of the iron cutter, perhaps not more than from $\frac{1}{300}$ to $\frac{1}{600}$ part of the time; consequently the heat received by each would be in an inverse proportion of the *thickness* of the steel to the *circumference* of the iron, after making the proper allowance for what may be thrown off from the circular cutting iron in its passage through the air, which must be considerable.

P. S. As evidence of the absence of heat, it is stated in the memoir of MM. Darier and Colladon that the small particles of steel adhering to the edge of the cutter, "seen through a lens, did not appear as if untempered, and when tried with a file, were found as hard as the best tempered steel."

I have never observed the appearance of the particles, or examined their temper, but have examined the burr raised in cutting a plate of steel, which before the operation was sufficiently soft to file with ease, but in the operation became hardened on the outer edge much harder than before, which was evidently caused by the great heat and by being suddenly cooled by the current of air caused by the motion of the cutter; the same would be the case with particles disengaged by heat, or when hot, and adhering to the edge of the

* The disposition to be easily separated by *fracture* at a *particular heat* exists in carbonized or cast iron, in the alloys of copper and of tin, is very perceptible in flint glass, and perhaps in all factitious metallic compounds; some requiring a moderate, and others a more intense heat.

cutter; the process of hardening in air is applied by artists to the hardening of very small drills.

New Lebanon, Aug. 8, 1825.

Art. XVI.—*On the motion of water-wheels*—extract of a letter from Prof. Cleaveland, to the editor, dated Brunswick, May 30, 1825.

My Dear Sir,

In a former letter, I mentioned the opinion existing in this part of the country, that saw-mills move faster during the night than the day. The explanation usually given by the workmen is that the air becomes heavier after sunset.

I selected a fine day in August, and requested that all the mill-gates might remain stationary for twelve hours. At 2 o'clock P. M. I suspended a Barometer in the mill; the pressure of the atmosphere was equal to 30.19 inches; the temperature of the water just before it passed the mill-gate was 72° Fahr.—The log was then detached from the saw, and the number of revolutions of the wheel, being repeatedly counted by different persons, was 96 in a minute. At midnight, I again visited the same mill. The Barometer stood at 30.26 inches, the *pressure* of the atmosphere having *increased* seven hundredths of an inch. The temperature of the water was 72°, the same as at the preceding observation, although it had been a little higher during the afternoon.—The log being detached, as before, the wheel was found to revolve precisely 96 times in a minute, showing the same velocity as at the preceding noon. The depth of the water was the same during both experiments. The workmen were satisfied that the result of the experiment was correct; but still they seemed to believe that it would be different in a cloudy night.

ART. XVII.—*Notice of the Brewster wool spinning frame*—in a letter written in answer to inquiries from the Editor, by S. D HUBBARD, Esq. and dated Middletown, July 25, 1825.

DEAR SIR,

IN reply to your inquiries in your favour of the 21st respecting the Brewster wool spinning Frame, of which the Sanseer company of this place are the sole proprietors and builders, I have obtained the following brief, but I trust satisfactory statement from the Secretary of the company.

The Brewster Frame, deriving its name from the inventor Mr. Gilbert Brewster, a distinguished mechanist and native of this State, is so constructed that by the continued rotary motion of the main shaft, to which the moving power is applied, all the operations that are performed by the hand on the single domestic wheel, of drawing out, twisting, and winding up the yarn, to form the cap are perfected, leaving to the attendant no other labour than that of joining the threads as they may occasionally break. The direction of the draft being vertical, the frame occupies not more than one sixth of the space required for jennies doing the same amount of work, and enables the attendant to mend the threads with much greater convenience. The length of the draft or quantity of slubing to be drawn out and the time of throwing in and continuing the twist being comprehended within the principle of the frame, they may be varied at pleasure. It is only necessary for the person in attendance, after ascertaining the description of yarn, she is wished to spin, whether fine or coarse, hard or slack twisted, to adjust the frame with a wrench to the quality, shortening or protracting the period of the closing of the jaws on the slubing as she may wish it finer or coarser, and varying the time of carrying on and off the belt from the twisting cylinder, according as she may desire her yarn hard or slack twisted. When once adjusted, the frame continues in the same state producing a uniform thread, and possesses the additional advantage from its mechanical construction, and the uniform regularity of its movements, of furnishing, if required, a thread slacker twisted for filling, and for warp, one harder twisted than can be spun on a jenny. The expense of keeping a frame in repair, and the power necessary for its successful operation, are not greater than is required by power jennies doing the same work. A frame of 300 spindles will spin 300 runs, 1600 yards to the run, per day, and will with ease turn off 100 lbs. of four run yarn in twelve hours. Two girls of sixteen years of age, will attend a three hundred spindle frame one on each side.

Art. XVIII.—*Analysis of the Maryland Aerolite.* By George Chilton, Lecturer on Chemistry, &c.*

The piece of Maryland ærolite subjected to examination, weighed 228.30 grains in air, and lost 62.25 grains by immersion in water, at 60° temperature. Its specific gravity is therefore, 3.66. The external crust was taken off, and the remainder powdered, not very finely, and separated into two parts by the magnet ; 40 grains were obedient to the magnet, 25 of which were taken for examination. The same quantity was taken of the unmagnetical portion.

Examination of the unmagnetical *portion of the Maryland Aerolite.*

Process 1.—The 25 grains were digested in dilute nitric acid ; an undissolved part floated, which, together with the solution, was decanted from a heavier part, which remained at the bottom of the flask. To this last, muriatic acid was added, and digestion continued till every thing soluble was taken up. The two insoluble parts managed in the usual way, and carefully dried, weighed 15.87 grains. During exposure to a red heat, in a crucible, sulphur burnt off with its usual blue flame, and left siliceous earth which weighed 14.6 grains.

Process 2.—The acid solutions were mixed together and evaporated slowly to dryness; during which portions of

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* A notice of the fall af this ærolite was published in our last number, see Vol. IX. p. 351. For a more particular description of the stone, and for illustrative remarks respecting it, see the end of this paper.—Ed.

matter fell down, which, together with a portion left after treating the dry mass with water, weighed 0·7 gr. at the common temperature. On further examination, they proved to be silica and oxide of iron. By estimation, 0.3 silica, and 0.2 oxide of iron, in the perfectly dried state.

Process 3.—Bi-carbonate of potassa was added to the solution, which was heated a little. The precipitate was separated by the filter, washed and digested in pure potassa. The caustic liquor, drawn off by the syphon, super-saturated with muriatic acid, and treated with carbonate of ammonia, yielded a precipitate which after ignition weighed 0.1 gr. It appeared to be alumine contaminated with oxide of iron.

Process 4.—The filtered solution, from which the first precipitate in the last process was separated, was boiled; a gray earth fell down in flocks. The addition of potassa occasioned a farther deposite. On heating, it changed to a cinnamon-brown colour; dilute sulphuric acid, added in excess, dissolved it, with the exception of a brown residue, which weighed, after ignition, 0.2 gr. Before the blow-pipe, with borax and phosphoric salt, this brown matter yielded yellow beads—indicating nickel?

Process 5.—The sulphuric solution of the last process was evaporated to dryness, and heated further, to drive off the excess of acid. On adding water, a *part* only dissolved; on adding more water, the whole dissolved, except a portion of a brown colour, which by solution in muriatic acid, and subsequent precipitation by ammonia, yielded oxide of iron weighing 0.2 gr.

Process 6.—The last watery solution was gently evaporated to a small compass; sulphate of lime fell down during the evaporation. On leaving it to exhalation in the open air, sulphate of magnesia crystallized. These crystals, together with the deposited sulphate of lime, were exposed to a dull red heat. The weight, while warm, was 9 grains. On adding a saturated solution of sulphate of lime, to dissolve out the sulphate of magnesia, a portion was left, which weighed after ignition 1.1 grains. This subtracted from the weight of the mixed sulphates, leaves for sulphate of magnesia 7.9 grains.

Process 7.—The precipitate, (process 3,) which had been digested in pure potassa, was re-dissolved in muriatic acid.

Ammonia added in excess threw down oxide of iron, which after ignition, weighed 3.9 grains.

Process 8.—The last ammoniacal solution, which had a bluish green colour, was evaporated to dryness. After the further application of heat, to volatilize the ammoniacal salt, a residue was left of a dark brown colour, which, on solution in nitric acid and precipitation by potassa, gave a bulky apple-green precipitate, which turned to a dark-brown by heating it to ignition. It weighed 0.3 gr.

Process 9.—The liquor, from which the apple-green precipitate had been separated, had a wine-yellow colour, thereby affording a suspicion that it contained more metal. Neutralization and heat were both tried without effecting a further separation. Hydro-sulphuret of ammonia threw down a black precipitate. This precipitate heated, re-dissolved in nitric acid, and precipitated by potassa, gave another apple-green precipitate, which, ignited, weighed 0.2 gr. The solution, being still a little coloured, was again treated with hydro-sulphuret of ammonia, re-dissolved in nitric acid, and precipitated by potassa. By this treatment another precipitate was obtained which weighed 0.1 grain.

Process 10.—20 grains of the same unmagnetical ærolite were mixed with an equal weight of nitre, and heated in a bright red heat. On dissolving out the matter of the crucible, and neutralizing the solution, it neither produced a yellow with nitrate of lead, nor a red with nitrate of mercury—hence it contained *no chrome.*

From the 25 grains there were obtained by these procesess

14·6+0.3	=Silica	14.90
7.9 Sulph. Mag.	=Magnesia	2.60
1.1 Sulph. Lime	=Lime	0.45
3,9+0.2+2.0+0.5	=Oxide of Iron	6.15
0.2+0.3+0.2+0.1	=Oxide of Nickel	0.80
	Sulphur	1.27
	Alumine	0.05
		26.12

It would seem superfluous to remark, that the increase of weight in this, and the following analysis, must be accounted for from the change of condition of the iron, with respect to oxygen.

Examination of the magnetical *portion of the Maryland Aerolite.*

Process 1.—25 grains exposed to the action of nitro-muriatic acid left, by the usual management, 3 grains of silica, after ignition.

Process 2.—Ammonia, added to excess, threw down from the acid solution, oxide of iron, which weighed, after ignition, 24 grains.

Process 3.—To the ammoniacal, which had a bluish-green tinge, potassa was added. On the application of heat a portion of earthy matter precipitated, too trifling for examination. Hydro-sulphuret of ammonia threw down a black precipitate, which, heated, re-dissolved in nitric acid, and precipitated by potassa, yielded an olive-green precipitate, which ignited weighed 1.70 gr. and had a light-brown colour.

a. Nitric acid added to this precipitate, did not dissolve the whole of it. Muriatic acid was added without effecting a complete solution. The mixture was heated and evaporated nearly to dryness. On standing till the next day it formed a gelatinous mass of a green colour. Water was then added, and the insoluble portion separated by the filter. It weighed 5 grains, and had a gray colour.

b. Ammonia was added to the nitro-muriatic solution (*a.*) in excess, which re-produced the bluish-green tinge. By evaporation to dryness, and exposure to a red heat for some time, the ammoniacal salts were volatilized, and a yellowish brown oxide left.

c. Before the blowpipe, with borax and phosphoric salt, beads were produced of a brown colour, and opaque when the oxide was in considerable proportion to the salt, but when diluted with more salt, blood-red globules formed, which changed on cooling, to hyacinth-red, and when entirely cold had a fine yellow, with, in some instances, a slightly reddish cast. The undissolved portion produced the same appearances, nearly, but less distinctly. Regarding, therefore, the precipitate 1.70, in process 3, as oxide of nickel contaminated with siliceous earth, perhaps 1.25 may be put down for oxide of nickel; we shall then have, as the result of analysis of the magnetic ærolite,

Oxide of Iron - - -	24.00
Oxide of Nickel - -	1.25
Silica with other earthy matter	3.46
Sulphur a trace.	
	28.71

The presence of sulphur was indicated by the odour of sulphuretted hydrogen, on the first addition of the acid.

Additional notice of the physical characters of the Maryland Aerolite.

As the visits of these extraordinary strangers to our planet are frequent, and their origin is not yet satisfactorily explained, it is obviously proper to register carefully all the facts respecting them, that thus we, or those who follow us, may, by and by be in a condition to reason correctly respecting them.

We hastened to lay before our readess the account which we received of the fall of the Maryland ærolite,* but as no specimen had then been received, it was not possible to give at that time either a description or an analysis. Mr. Chilton has supplied the analysis. We add the following notice of the appearance of the stone.

An excellent specimen for which we are indebted to Dr. Samuel D. Carver, weighs four pounds five ounces. Its dimensions are seven inches by three and four; its form is that of an irregular ovoidal protuberance, nearly flat where it was detached from the larger mass, and bounded by irregular curves in the other parts of the surface. In all parts, except where it has been fractured, it is covered by the usual black vitreous coating, which, in this case, especially when it is viewed by a magnifier, has more lustre than is common. This coating is severed by innumerable cracks running in every direction, and communicating with each other, so as to divide the surface into polygons resembling honey-comb or madrepore, and no undivided portion of the surface exceeds half an inch in diameter.

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* Vol. IX. page 351.

This circumstance is much less apparent upon the ærolites of Weston (1807,) L'aigle (1803) and Stannern in Moravia (1808) : it appears to have arisen from the rapid cooling of the external vitreous crust after intense ignition. It is impossible to doubt that this crust is a result of great and sudden heat. In the Maryland ærolite it is not quite so thick as the back of a common penknife, and, as in that of Weston and Stannern, it is separated by a well defined line, from the mass of the stone beneath. The mass of the stone is, on the fractured surface, of a light ash gray colour, or perhaps more properly of a grayish white ; it is very uniform in its appearance, and not marked by that strong contrast of dark and light gray spots, which is so conspicuous in the Weston meteorolite. The fractured surface of the Maryland stone is uneven and granular, harsh and dry to the touch, and it scratches window glass decidedly, but not with great energy. To the naked eye it presents very small glistening metallic points, and a few minute globular or ovoidal bodies scattered here and there, through the mass of the stone. With a magnifier all these appearances are of course much increased. The adhesion of the small parts of the stone is so feeble, that it falls to pieces with a slight blow, and exhibits an appearance almost like grains of sand. The metallic parts are conspicuous, but they are much less numerous than the earthy portions, which, when separated, are nearly white, and have a pretty high vitreous lustre, considerably resembling porcelain. They appear as if they had undergone an incipient vitrification, and as if they had been feebly agglutinated by a very intense heat. I cannot say that I observed in them asM. Fleuriau de Bellevue did in the ærolites of Jonzac (Jour. de Phys. tome 92, pa. 136) appearances of crystalization, although it is possible there may have been an incipient process of that kind, especially as the small parts are translucent.* The Maryland stone is highly magnetic ; pieces as large as peas are readily lifted by the magnet, and that instrument takes up a large proportion of the smaller frag-

* This vitreous appearance I believe has not been observed before (at least as far as appears in any account that I have seen.) It seems to have resulted from intense heat ; the some doubtless, which covered the exterior, with the black crust, and the difference of the two is probably to be ascribed to the one being covered and compressed, and to the other being on the outside.

ments. The iron is metallic and perfectly malleable ; although none of the pieces are larger than a pin's head, still they are readily extended by the hammer. The iron in the crust is glazed over, so that the eye does not perceive its metallic character, but the file instantly brightens the innumerable points, which then break through the varnish of the crust, and give it a brilliant metallic lustre, at all the points where the file has uncovered the iron. The same is the fact with the Weston stone, and with that of L'Aigle, but not with that of Stannern in Moravia ; specimens of all of which and of the meteoric iron of Pallas, of Louisiana, and of Auvergne, are now before me. The ærolites of Gonzac and of Stannern as stated by M. Bellevue, are the only ones hitherto discovered that do not contain native iron, and do not affect the magnet ; still their analysis presents a good deal of iron, which is probably in the condition of oxid.

The iron in the metallic state is very conspicuous in the Weston stone, sometimes in pieces of two inches in length, and both in this stone and in that of Maryland, it is often brilliant like the fracture of the meteoric iron of Pallas and of Louisiana.

In the analysis of the Weston stone published in 1808, I did not discover chrome, although it was afterwards announced by Mr. Warden. I have desired Mr. Chilton to re-analyze the Weston stone and he has nearly completed the labour, the result of which may be given hereafter but he writes that he has not been able to discover any chrome. I am not quite sure that I discover pyrites in the Maryland ærolite, although it is mentioned by Dr. Carvor in his letter in the preceding volume.—Editor.

October 4, 1825

MISCELLANEOUS.

Art. XIX.—*On the North-West Passage.* By Isaac Lea.

Perhaps no geographical problem since the discovery of America, has excited a more general sensation than the possibility of discovering a passage round the northern part of this continent. A deep interest was at a very early period felt by those concerned in the commerce of the Indies, and expeditions were fitted out with strong hope of opening a way that would prove more direct, and shorten the voyage to those countries at least one third of the time it took to double the Cape of Good Hope.

Robert Thorne, a merchant of Bristol, in 1527, first suggested the practicability of this passage, and two ships were sent out by Henry VIII. One only of those ships returned, but with what success we are not informed.

Since that period, nearly one hundred expeditions have been fitted out by different nations to obtain the desirable object, few of which met with even partial success. Among the most important are those of Hudson in 1607, Baffin in 1614, and Parry in 1819. The idea of a passage had during this period scarcely ever been abandoned. The interruption by the ice alone restrained most of those enterprising voyagers from pushing their barks into the waves of the Pacific Ocean. That the water of this ocean flows through Behring's straits and the Polar sea into the Atlantic, there cannot now be a doubt.

The constant current, according to Cooke, Burney, and Kotesbue, which flows from the Pacific through Behring's straits, must carry a vast body of water towards the North Pole. The undeviating direction of the current in Baffin's bay and Davis's straits, to the S. E. carries off this flow of water into the Atlantic. Large quantities of drift wood are thrown on the southern shores of the Aleutian islands, which stretch from the western coast of America to Asia, about the parallel of 53° N. lat. The same current carries drift wood to the polar basin, and deposits it along the N. coast of this continent, as well as along the W. coast of Greenland.

Capt. Clarke, who accompanied Capt. Cooke, observes that they collected enough in Behring's straits to serve for fire wood, for the Resolution and Discovery, and what is curious it was not in the least water soaked. Some large trunks of the trees of mahogany and logwood have been picked up on the coast of Greenland. The Governor of Disco, a settlement on the west side of Greenland, has in his possession a table of mahogany made from a plank drifted on the coast. These are productions of the tropics and could have been brought here only through Behring's straits from the N. W. coast of America ; in corroboration of this, the wood is frequently found perforated with worms, a circumstance which never takes place in the northern seas.

We have much reason to believe that there is no great extent of land approaching the north pole. Whales that have been harpooned in the Greenland seas, have been found in the Pacific ocean. They have been taken with stone lances sticking in their fat (a kind of weapon used by no nation now known,) both in the sea of Spitzbergen and in Davis's straits. The following relation is given by Scoresby. "A Dutch East India Captain of the name of Jacob Cool, of Sardam, who had been several times at Greenland, and was of course well acquainted with the nature of the apparatus used in the whale fishery, was informed by Tischal Leeman of India, that in the sea of Tartary there was a whale taken, in the back of which was sticking a Dutch harpoon, marked with the letters W. B. This curious circumstance was communicated to Peter Jansz Vischer, probably a Greenland whaler, who discovered that the harpoon in question had belonged to William Bastiaans, Admiral of the Dutch Greenland fleet, and had been struck into the whale in the Spitzbergen sea."

The Russians to the N. E. of Korea frequently find the harpoons of the French and Dutch, who practice the whale fishery in the north of Europe, in the whales they capture. The crew of the Volunteer Whaler, in July 1813, found in the fat of a whale "a lance of a hard gray stone of a flinty appearance, about three inches long and two broad—two holes were pierced in one end of it by which the handle was secured." The master of the vessel showed Mr. Scoresby this weapon.

These facts, I conceive, sufficiently prove the existence of a water communication. It remains now to examine what are its obstructions? These are many and difficult, but may perhaps be overcome, though not to serve any useful commercial purpose.

The Russians have sailed along the north of Asia, from Archangel to Behring's straits, beyond the 75° of N. lat. One half that distance would take us from Baffin's bay to the same point, in the same parallel of latitude. Why then, it will be asked, have all the voyages for that purpose failed?

The numerous bodies of ice that exist throughout the year, west of Greenland, render the navigation difficult and dangerous. We have every reason to believe that Greenland and all the land west of it to Behring's straits form a great chain or congregation of islands, and that Baffin's bay, Hudson's bay, Prince Regent inlet, and other waters of the same description, are arms of the polar sea. The numerous islands discerned by Parry and by Franklin fully illustrate this idea, the existence of those islands displays to us at once the source of such a constant supply of ice. It is admitted by most persons who have made observations on this subject, that ice is seldom formed at sea. The currents in Baffin's bay and Davis's straits are uniformily from the N. W. and Capt. Parry observed, that a N. W. wind always cleared the southern shores of the north Georgian islands, and gave him a clear sea to navigate in. These numerous islands are prolific nurseries for the creation of ice. The quantity of earth and stones found attached to the icebergs, must satisfy us they have been formed in inlets and under cliffs, and we may safely conclude, if once launched from the shore, there is little to be apprehended by getting to the north of them.

The whalers uniformily agree in their statements relative to the diminution of ice beyond the 80° of N. lat. and as Mr. Scoresby is of the most respectable authority, I quote the following passage from him, " Our latitude on those occasions, in the month of May (1806) as derived from observations taken with a sextant by myself and my father, was 80° 50′ 81° 2′ and 81° 12′; after which we sailed so far to the northward as made about 81° 30′." Here Mr. S. could not have been repelled by the ice, or he would have mentioned it. He does not assign any cause for returning—it is to be presumed that his fishing required his attention.

The Hon. Daines Barrington collected much valuable information on this head, which he read before the Royal Society 1774.—From this paper I have extracted the following narration.

" Mr. George Ware, now living at Erith in Kent, served as chief Mate in the year 1754, on board the Sea Nymph, Captain James Wilson, when, at the latter end of June, they sailed through floating ice from 74° to 81°; but having then proceeded beyond the ice they pursued the whales to 82° 15′; which latitude was determined by Mr. Ware's own observation.

As the sea was now perfectly clear, as far as he could distinguish with his best glasses, both Mr. Ware and Capt. Wilson had a strong inclination to push further towards the pole; but the common sailors hearing of such being their intention, remonstrated, that if they should be able to proceed so far, the ship would fall in pieces, as the pole would draw all the iron work out of her.

On this Capt. Wilson and Mr. Ware desisted, as the crew had these very singular apprehensions; especially as they had no whales in sight to the northward, which alone would justify the attempt to their owners. It need scarcely be observed, however, that the notion which prevailed among tne crew, shows that the common seamen on board the Greenland ships conceive, that the sea is open to the pole; they would otherwise have objected on account of the ice being supposed to increase. It should seem also, that the practicability of reaching the pole is a point which they often discuss among themselves.

In *this same year and month*, Mr. John Adams, who now is master of a flourishing Academy at Waltham Abbey in Essex, was on board of the Unicorn, Capt. Guy, when they anchored in Magdalena bay, on the western coast of Spitzbergen, and north latitude 79° 35′. They continued in this bay for three or four days, and then stood to the northward, when the wind freshening from that quarter, but the weather foggy, they proceeded with an easy sail for four days expecting to meet with fields of ice to which they might make fast; but they did not encounter so much as a piece that floated. On the 5th day the wind veered to the westward, the weather cleared up, and Mr. Adams had a good observation, (the sun above the Pole) by which he found himself three degrees to the north of Hakluyt's Headland, or in north latitude 83°—Capt. Guy now declared, that he had never been so far to the northward before, and crawled up to the maintopmast head, accompanied by the chief mate, while the second mate together with Mr. Adams, went to the foretopmast head, from whence they saw a sea as free from ice as any part of the Atlantic ocean, and it was the joint opinion of them all, that they might reach the north pole.

The ship then stood to the southward, and 12 hours afterwards Mr. Adams had a second good observation (the sun beneath the Pole) when their latitude was 82° 3′. In both these observations, Mr. Adams made an allowamce of 5′ for the refraction, which he says was his captain's rule, who was now on his fifty-ninth, or sixtieth voyage to the Greenland seas."

Daines Barrington made a numerous and respectable collection of facts, but he was an enthusiast, and we must receive his opinions with great caution; he did not hesitate to believe that many of the whalers who reported themselves to have been in 80° or 84° with a clear sea could have sailed to the Pole withont difficulty. The approach to these high latitudes, it will be observed, was always made to the north of Spitzbergen, in the longitude of which the sea appears to be more free from ice than any other place of the same latitude. But may we not conclude by analogy, if we have a "clear sea" in this longitude from 80° to 85° N. latitude, that a passage might be made from Baffin's bay to Behring's straits between 70° and 85°? I should presume that a barrier of land was as much to be feared as a barrier of ice, and this I hope to show is not likely to be insurmountable. The interesting points of Icy Cape, Mackenzie's river, Copper-Mine river, Cape Turn-again (discovered by Capt. Franklin) and Repulse bay along the parallel of 70°, are beacons that declare the continuity of an ocean which washes their shores. In corroboration of this idea it may be mentioned that whales inhabit the waters along the coast at the mouth of Mackenzie's and Copper-Mine rivers and that harpoons made of fish bones and of stone have been taken out of them killed in the Greenland seas. These could have received their wounds only in the Polar Ocean along the northern part of America.

Mackenzie's and Copper-Mine rivers are important auxiliaries to the evidence in favour of the existence of this ocean. If we cast our eyes over the map of N. and S. America we shall find that all the great rivers disembogue in some extensive sea. Copper-Mine river is but 200 miles long, and cannot therefore discharge much water into this ocean; but the majestic river of Mackenzie, leaving its fountains near the sources of Columbia river, pursues its lonely course, washing the feet of the Rocky mountains, and falls into its parent ocean at the distance of 2000 miles.

I will now call the reader's attention to the most interesting spot in those latitudes; I mean Cape Dundas 114° west longitude from London, being the extreme point W. obtained by Capt. Parry. This cape forms the S. W. part of Melville island. Let us examine the bearings and distances from this to other important points of this sea. The mouth of Copper-Mine river lies due south 450 miles; Mackenzie's river S. W. about the same distance; Point Turn-again S. S. E. less than 400. The explored part of Repulse bay S. E. 700. Icy Cape of Cooke nearly W. 1000 miles. Repulse bay lies S. of Prince Regent's inlet 350 miles, and Point Turn-again S. W. about 400. After viewing these several points with relation to each other, I think it may be safely concluded that they are all embraced in the same ocean.

The practicability of passing west of Melville Island on account of the ice may be doubted, but because Capt. Parry met in 1820 with an impenetrable barrier of floating ice it is not conclusive that this passage should be shut every succeeding year. He accomplished the distance from Winter Harbour to Sir James Lancaster's sound (600 miles) on his return, in six days, which required five weeks to traverse in the opposite direction. What is Capt. Parry's own opinion of the N. W. passage? He says "of the existence of such a passage, and that the outlet will be found at Behring's straits, it is scarcely possible on an inspection of the map, with the addition of our late discoveries, and in conjunction with those of Cooke and Mackenzie, any longer to entertain a reasonable doubt." In addition to this we have the respectable opinion of Capt. Franklin, that enterprising officer, who has lately added so much to our geographical knowledge by his discoveries E. of Copper-Mine river.

"Our researches," he says, "as far as they have gone, seem to favour the opinion of those who contend for the practicability of a north west passage.

The general line of coast probably runs east and west, nearly in the latitude assigned to Mackenzie's river, the sound into which Koteshue entered, and Repulse bay; and very little doubt can, in my opinion, be entertained of a continued sea, in or about that line of direction. The existence of whales too, on this part of the coast, evidenced by the whalebone we found in Esquimaux coves, may be considered as an argument for an open sea; and a connexion with Hudson's bay, is rendered more probable from the same kind of fish abounding on the coasts we visited, and on those to the north of Churchill river. I allude more particularly to the Capelin or Salmo Arcticus, which we found in large shoals in Bathurst's inlet, and which not only abounds as Augustus the Esquimaux told us. in the bays in his country, but swarms in the Greenland Friths. The portion of the sea over which we passed is navi gable for vessels of any size; the ice we met, particularly after quitting Detention harbour, would not have arrested a strong boat. The chain of islands affords shelter from all heavy seas, and there are good harbours at convenient distances. I entertain indeed, sanguine hopes that the skill and exertions of my friend Capt. Parry will soon render this question no longer problematical."

In conclusion I have only to observe that a few years may decide this import geographical question; three parties by wintering one season near the coast could each take a portion of it and investigate it.—First party from Copper-Mine river E. to Repulse bay—second party from the same river, W. to Mackenzie's river—the third party from this river, W. to Icy cape or Kotesbue's sound. The navigator who first accomplishes this passage will be second only to Columbus, and the enterprising Capt. Parry is at this time on his 3d voyage for the purpose with the hopes and wishes of all the world for his success. The recent return of Capt. Lyon militates not against the probable success of his former commander.

The recent scale of rewards offered by the British government may induce individuals engaged in the fisheries to hazard its accomplishment.

1st. To the first ship belonging to any of his majesty's subjects, or to his majesty, that shall proceed to the longitude of 110° west, or to the mouth of Hearne's or Copper-Mine river, by sailing within the arctic circle, £5000; to 130° west, or to the whale island of Mackenzie, £10,000; to 150 west by sailing westward within the arctic circle £15,000; to the Pacific ocean, by a north-west passage £20,000.

2d. To the first ship, as aforesaid, that shall sail to 83° of north latitude, £1000; to 85°, £2000; to 87°, £3000; to 88°, £4000, and to 89°, as before allotted, the full reward of £5000."

ART. XX.—*An Epitome of the Improved Pestalozzian System of Education, as practised by William Phiquepal and Madam Fretageot, formerly in Paris, and now in Philadelphia; communicated at the request of the Editor.* By WILLIAM MACLURE, Esq.

THE great and fundamental principle is, never to attempt to teach children what they do not comprehend, and to teach them in the exact ratio of their understanding it, without omitting one link in the chain of ratiocination, proceeding always from the known to the unknown, from the most easy to the most difficult, practising the most extensive and accurate use of all the senses, exercising, improving, and perfecting all the mental and corporeal faculties by quickening combination; accelerating and carefully arranging comparison; judiciously and impartially making deduction; summing up the results free from prejudices, and cautiously avoiding the delusions of imagination, the constant source of ignorance and error.

The means of effectuating the above are, first, a careful examination and inspection of the objects themselves, or of tangible and visible instruments, calculated to demonstrate their properties and bring them within the reach of the senses. If these cannot be obtained, then accurate designs, or representations, and books, and descriptions, although imperfect substitutes, are employed; but these are not to be resorted to until every possible means of acquiring the first two has failed.

They learn mechanism by the machines or exact models of them; arithmetic, by an instrument called the arithmometer; geometry, by an instrument called the trigonometer, and another called the mathemometer, by which the most useful propositions of Euclid are reduced to the comprehension of a child of 5 or 6 years old; mathematics, by the help of the last mentioned instruments; and all the mathematical forms in substance, by solid figures. Natural history in all its branches, is learned by examining the objects in substance, or accurate representations of them, in designs or prints; anatomy by skeletons, preparations, and wax figures; geography by globes and maps, most of the last of their own construction; and hygiene, or the preservation of health, by their own experience, in attending to the consequences of all the natural functions. They are taught the elements of writing and designing by the freedom of hand, acquired by a constant practice, in forming all kinds of figures, with a slate and pencil put into their hands, when they first enter the school, on which they draw right lines, dividing them into equal parts, thereby obtaining an accuracy of the eye, which, joined to the constant exercise of judging of the distances of objects and their height, gives them a perfect idea of space, and practises them in a rapid and correct coup d'œil, so necessary in the useful arts and manufactures, and on which the accurate knowledge of the properties of every species of matter depends. They learn music by the distinct difference of sounds, through the medium of an organ constructed for the purpose, and a sonometer; and first, learn sounds before they are taught the notes or signs of those sounds; gymnastics, or the exercise of all muscular motions, they acquire by the practice of all kinds of movements, always preferring those that may lead to utility, such as marching, climbing, the manual exercise, &c. &c. They are taught the greatest part of those branches at the same time, never fatiguing the mind with more than an hour's attention to the same thing, changing the study, and rendering it a play by variety. The pupils learn as many modern languages as there are different languages spoken by the boys of different nations at school, each instructing the others in the vocabulary of his language, while he acquires the words corresponding in the language of those he converses with, until he has a complete vocabulary in his head, when he begins translating his own language into the foreign, and the master, when he corrects his translation, gives him the rules of grammar, by which he is guided in the correction, by which means the pupil learns the practice and theory of grammar at the same time; and while the rule is imprinted on his memory, he has a tolerable idea of the reason and utility of the rule confirmed by the example in his translation, and supported by the explanation of the master, which avoids the dry, disagreeable, and disgusting study of the theory of grammar, than which nothing can be more irksome, tiresome, and unpleasant to the learner, or more difficult for the schoolmaster, to command attention to; and often renders correction and punishment necessary, to force the pupils to choose the lesser evil.

Education ought to be the apprenticeship of life, and children ought to be taught what imperious necessity may force them to practice when men, always preferring the useful to the ornamental; preparing them to withstand the reverses of fortune, leaving the choice of their amusement and pastime, until their pecuniary independence shall permit them to make a choice of their pleasure.

To court pleasure and avoid pain, includes the greatest part of the motives of human actions; to accomplish which, children ought to be taught to avoid remorse, fear, misery, and ennui. To prevent the first, act always honestly and uprightly; do as you would wish to be done by: secondly, retain all your instinctive courage and view every thing as it really exists: thirdly, allow a moderate indulgence of the natural appetites, and enjoin a total prohibition against acquiring any artificial tastes or appetites; observe frugality, and the strictest economy in the smallest expenditure, recollecting the old proverb, "take care of the pence, the pounds will take care of themselves:" fourthly, obtain a knowledge of the objects of nature and art, and an early habit of receiving pleasure from the examination of them.

Hume's definition of man, that he is a bundle of habits, is as true as laconic, and points out the advantages that instructors of youth might derive from that propensity, namely, that of acting from habit. By constantly and habitually associating pleasurable sensations with all the useful and necessary operations of life, we thus turn the common occupations which the wants of man require into amusements; and form the life of man into an agreeable pastime. If we examine how the trifling diversions of hunting, fishing, gaming, &c &c. become pleasures, we shall find the cause to exist in habit, and frequent use, which might be more easily attached to some useful employment, the advantages of which would be permanent and lasting, and not finishing when the action was performed, or productive only of remorse and repentance, like nine tenths of the fashionable amusements. Upon this great and powerful lever of the mind, which as yet has been employed only by crafty politicians, and by that portion of ecclesiastics who have abused religion for their selfish and anti-social purposes, volumes might be written to explain its beneficent connexion with all the ramifications of society; but this digression would take us too far from our present purpose.

Two of the best gifts of nature to man are, health and time; and perhaps the total neglect and abuse of both may be the cause of most of his miseries and misfortunes, both moral and physical; to rectify which, as far as precept, example, and experience, can do it, ought to be one of the principal objects of instruction. This is to be effected by adopting the most effectual means of preserving the one, and making the best possible use of the other, before it is too late; for unfortunately the youth of all countries have squandered the greatest part of both before they have learned their value.

The immense advantage of the energy and exertion springing from free will, over the cramped and snail-paced progress produced by coercion and force in the government of men, as well as of the animal creation, must be evident to the most superficial observer; but in no case does the evil so materially injure and destroy the best and most valuable interests of society, as in the coercion and punishment of children during their education.

This is the source from which spring all the violent malignant passions of anger, revenge, hatred, &c.; this is the destroyer and exterminator of all their amiable and benevolent sentiments: it is the corruptor of the heart; it stupifies the head, and suppresses all talent and genius, breaks down the spirit of natural independence, and fits men for slaves, by exaggerating their propensity to crime, and annihilating all the fine feelings that lead to great and benevolent actions. All these fatal consequences are avoided by the nature of the system, not requiring any such barbarous means of execution, and rendering the substitution of reason in place of coercion, both easy and agreeable to master and pupil; their natural curiosity is encouraged and excited, when the gratification of it is a pleasure both to the instructor and learner. Never being forced do any thing they do not like, all their actions are bottomed on free will, and united with agreeable sensations. Their most complicated studies are but an amusement which increases with the difficulties they encounter; and this concatenation of pleasurable ideas with moral study never ceases, and is the cause of their being at school during their whole lives; and the progress of their knowledge and improvement finishes only in the grave.

The boys learn at least one mechanical art; for instance, to set types and print; and for this purpose there is a printing press in each school, by the aid of which are published all their elementary books, all of which are constructed upon the contrary principles from those of the old school: viz. taking the most direct and easiest road to arrive at the end proposed, in place of the circuitous metaphysical method adopted by the old system, as if teachers were afraid of giving knowledge too cheap. By setting types they practice accurate spelling, and become familiar with the construction of all the languages which they print. and they can earn their bread in case of necessity. It is also a great source of economy to the school, and answers all the purposes of a recreation from more difficult studies.

The immense advantages of the system are more evident when applied to the great bulk of mankind; namely, the productive. labouring, and useful classes. Those who from conquest, force, fraud, or the industry of their ancestors, are left with a sufficient revenue to live without labour, may remain in a state of ignorance. Perhaps this may be the fact without injuring materially the state of civilization in the mass of society, as the ignorance of the class spoken of facilitates and accelerates the division of property, a state of things so necessary to general happiness, and to the elevation of mankind to the highest condition of moral and physical perfection. The pupils are capable of obtaining an accuracy of sight, which they acquire by a constant practice of measuring distance and dimensions. which gives them, when they leave the school, an experience equal to the acquirements of many years of instruction of an artisan, as they can, at a glance, decide whether a horse-shoe, a nail, a board, or any other piece of iron, wood, &c. will answer the purpose for which it is intended, without the trouble of trying.

They learn natural philosophy by the most improved and simple instruments; chemistry by the latest and most accurate experiments, never departing from the golden rule of proceeding from the most simple to the most compound, from the easiest to the most difficult, from the known to the unknown, and preferring the useful to the ornamental, making at the same time the application of all the necessary arts and occupations, that their utility may not be lost sight of for a moment.

One of the advantages attached to the system is the facility of forming professors. The popish attribute of infallibility being exploded, the master loses none of his influence with his pupils by acknowledging that he is ignorant of the subject in question, but will learn it along with them, according to system, in accomplishing which, he has only to keep one lesson before the class, and the boys have a better chance to learn that particular science or art well, than if the master had been an old professor; for by learning it himself so recently, he is instructed in all the difficult places, and i more capable of teaching the children how to get over them ; an advantage which the Lancasterian or monitorial system has over the old method.

Lithography being the best, cheapest, and easiest mode of making accurate representations of every thing, and this system requiring so great a number of exact representations, as they are in all possible cases substituted for books or descriptions, the pupils are all taught how to design on the stone or cartoons and how to make the proper ink and pencils, as well as all the manipulation of printing and working the press, &c. &c.

The advantages of calculating in the common way of reckoning by cyphers is the smallest part of the great and beneficial mental improvement, gained by the calculation on memory, without the aid of any artificial figures, as it exercises, improves, and accelerates the combinations, and renders comparison easy and accurate ; while it accustoms the young mind to rapid deductions, facilitates the drawing of just and accurate consequences, and lays the foundation for a quick, impartial, and logical judgement, in deciding on all questions of intricacy and difficulty, by furnishing to the mind the necessary elements to unravel the most complicated subjects.

The public are now generally informed that the Pestalozzian system of education has been introduced into this country by the public spirit and liberality of Mr. Maclure.

The following facts in relation to the actual state of the schools at Philadelphia were communicated by him in answer to the inquiries of the editor.

Extract of a letter dated Philadelphia, August 19, 1825.

Madam Fretageot's school has been established here 4 years next October, has 32 pupils, as many as she can take. and several are waiting for vacancies; she has already completed the education of some, whose parents thought them sufficiently instructed in all useful and necessary information.

Mr. Phiquepal began his school a few months ago, has 18 pupils, and will very soon have as many as he wishes to take; as the method requires more constant attention on the part of the instructor than that of the old schools, particularly at first; as the greatest part of the scholars have been treated differently by previous education, and have got habits that must be changed before they can be effectually benefited by the system. It would be necessary, to reap the full advantage of the method, that the children should be sent before they were at any school, except being taught by the mother, who would be aided much by a small book published by Pestalozzi, called the Mother's Manual. I have always thought that children cannot be put too soon to school, and the present practice, commencing in many countries of Europe seems to sanction it.

I have seen nothing printed about the system except Neef's Sketch, which is all sold, and scarcely a copy is to be obtained in this country, although 18 volumes have been printed at Stuttgard in Germany, on the Pestalozzian method, which sold so well, that the printer gave Pestalozzi 60,000 francs for his share of the profits. The above epitome is too short, but I like short books with only the outlines; they afford room for reflection, to fill up the vacuum, and stimulate thought, which fixes the subject more firmly in the memory, besides flattering self-love, (one of the strongest passions,) by authorizing the reader to consider himself as author of all he reads or finds out by his own reflections. The fault I find with a great many books, is that mania of making things too plain, leaving nothing to cogitation, and treating too contemptuously the intellectual faculties of the reader.

Art. XXI.—*Notes on Ohio.* By Dr. Hildreth, in answer to inquiries, made by Caleb Atwater, Esq.

"The name of your town, or county its situation, extent, and number of acres; the history of its settlement; the number, general character, and manners of the first settlers; from whence they came, and at what time; the latitude and longitude of any particular place in your county?"

Marietta is situated at the junction of the Muskingum with the Ohio river, and lying on both sides of the Muskingum, but principally on the east side; that part of the town which lies on the west side, is usually called Point Harmar, in consequence of the fort built by Gen. Harmar, standing on that side. It is the seat of justice for Washington county, and lies in latitude 39° 28′ 42″ north, and in longitude 4° 20′ west of Washington.

The streets are wide and regular; the narrowest being seventy feet in width, and the broadest one hundred and twenty feet; there are nearly 1000 city lots, containing one third of an acre each, having a front of ninety feet, and extending back one hundred and eighty feet; the streets cross each other at right angles, thus forming squares, containing eighteen city lots; and these are again divided by an alley, running the length of the square, eleven feet in width. The commons are large, and the grounds reserved for public uses extensive. The public buildings are a court house, and jail, both under one roof;* four houses for public worship, two of brick, and two of wood; and one banking house, of brick—the public offices are, two post-offices, (one on Point Harmar,) recorder's office, U. S. register's and receiver's office; and that of the collector of non-resident taxes. The number of dwelling houses is one hundred and forty-five; forty of which are of brick; these are exclusive of the stores, mechanics' shops, and buildings for manufactories, &c.

The number of stores for retailing foreign goods, is seventeen; two cotton manufactories, the machinery of which is

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* In 1822 there was erected a brick court-house of good size, and having all the necessary offices.

set up in handsome brick buildings, erected for that purpose.

One large steam mill, of thirty horse power, built of free stone, for the manufacture of flour; it has also attached to it, two machines for carding fine and coarse wool. There are also two other carding machines in the town, which are worked by horses; a brewery is now building, and will be in operation, in the course of the summer; and one or two rope walks are in constant operation.

Boat building, including steam boats, is also carried on to considerable extent in Marietta and the neighbourhood.

The county of Washington, was the first organized county in the North Western Territory; it then embraced principally or quite all the inhabited part of the territory; it is now reduced to nearly constitutional limits; it extends, northward, on the Muskingum, 27 miles; and east and west, on the Ohio river, following the meanders thereof, 55 miles; it contains 448,000 acres, and is at present composed of the following townships, viz: Marietta, Union, Adams, Waterford, Watertown, Wesley, Barlow, Warren, Belprè, Fearing, Salem, Lawrence, Newport, and Grandview.

The first court was held in September, 1788, by judges Parsons and Varnum.

The settlement at Marietta, commenced the 7th April, 1788. This was the first that was made in the county, and indeed in that tract of country which now constitutes the state of Ohio. This settlement was begun under the direction of the Ohio Company. The emigrants were New-Englanders, from the states of Massachusetts, Rhode-Island, and Connecticut, forty-seven in number, and under the guidance and superintendence of General Rufus Putnam. That season they planted 50 acres of corn, and built a stockaded fort, or garrison, on the elevated plain near the Muskingum river, of sufficient strength to bid defiance to any attack of the Indians, should they prove hostile. In the summer and autumn they were joined by about twenty families; the first settlers, were principally revolutionary officers and soldiers, inured to fatigue, and habituated to danger. It was, I presume, owing to these military habits, that they suffered so little from the attacks of the Indians, in the war which broke out the third year after their settlement commenced; being always on their guard, and going into their corn fields with their guns near them, and one or two of their number elevated on a high stump, like a sentinel on his watch tower, they were always prepared for an attack, or surprise; circumstances which no way suited the Indian mode of warfare; they invariably preferring to attack the unwary and the unguarded, calculating on success more from the sudden and unexpected manner of attack, than on their own physical power.

On the eleventh of April, 1789, settlements were begun at Belprè and Newbury. The first is fifteen miles below Marietta, on the Ohio river; the latter is twenty-five miles. Strong garrison-houses were built at both these places, to which the settlers fled in any alarm; but the greater number lived within the garrisons so long as any danger from Indians was apprehended. There were three of these garrisons in Belprè; the strongest one was called "Farmer's Castle."

After the Indian war commenced in 1791, four or six rangers, or "spies," as they were then called, were kept in constant employ by the Ohio Company, whose business was to scour the woods daily, and make report immediately on discovering signs that Indians were in the neighbourhood; as soon as any thing serious or alarming was discovered, the "spies" gave notice, the alarm gun was fired, and every man hasted from the field, from the wood, or wherever he might be, directly to his post; the gates were shut, and in a few minutes all were ready for the expected attack. But the often threatened attack never took place. The "*yankees*" were always in preparation to recieve company; and of course the Indians did not choose to call; but would occasionally knock at the door to see who was at home.

The settlement at Belprè, however, lost a few of its number from individuals venturing too far from the garrisons, and not expecting any danger, as savages had not been seen lately in their vicinity.

In 1793, Major Goodall, a native of Massachusetts, was taken by the Indians, while hauling timber, with an ox team, from the adjacent forest; his team was destroyed, but of major Goodall no vestiges could be discovered. It was generally supposed that he was taken a prisoner, removed a considerable way into the wilderness, and murdered; as no tidings could ever be gained of his being a prisoner among them, when the different Indian tribes were in at Greenville, to form a treaty in 1795. His loss was a severe one to the settlement, as he was one of the most active and enterprising men they had amongst them. He left a wife and several children. Captain King was shot while chopping, a short distance from the garrison; he left a wife and two children, and was a native of Rhode Island. Jonas Davis was shot and scalped, near the mouth of Congress creek, about a mile from the garrison. Benoni Hurlburt, one of the spies, was shot, at the mouth of the Little Hockhocking, as he was returning from a scout, in the spring of 1791.

These were the principal losses the settlement at Belprè experienced from the Indians, which may be called almost miraculous, when we consider their exposed situation, being the frontier settlement, and entirely open for several years to the numerous tribes of Indians who inhabited the waters of the Scioto and Muskingum rivers. The settlement at Newbury was harassed considerably by the depredations of the Indians. One woman and two children were killed, and a child she had in her arms was tomahawked, but afterwards recovered of its wounds, as they were going to a party of men who were at work in a field, a short distance from the garrison. The Indians escaped without loss, although pursuit was instantly made.

In the year 1790, settlements were begun at the forks of Duck creek, at Waterford, on the Muskingum river, about 20 miles above Marietta, at the mouth of Meigs's creek, and at Big Bottom 35 miles up the Muskingum; another was commenced at Wolf creek, near the forks; these settlements were all of them on a tract of land called the Donation Lands, containing 100,000 acres, in lots of 100 acres, which lots were given to any person who would make an actual settlement thereon. These lands were first given by the Ohio Company, but were afterwards assumed by Congress, and other lands given to the Company in exchange. This tract lies a few miles north of the settlement at Marietta, and extends east and west across the waters of Duck creek, Muskingum River, Olive Green creek, Meigs's creek, and Wolf creek, affording many eligible situations for settlements. At the close of the year 1790, it was found that these several settlements, could muster four hundred and forty-seven men; one hundred and three of which had families. The number of children I have not been able to learn. The settlers were nearly all from the New England states, and many of them young men, without families. The settlement at Big Bottom was destroyed by the Indians, January 2, 1791. Fourteen persons were killed, and five were taken prisoners. Amongst the slain was one woman and two children; the remainder were young men. The settlement was composed of young men, who had drawn their donation lots, and had just commenced improvements upon them. They had built a block house, and two cabins, a few rods from the house, all of which were occupied. They were in no apprehension of danger from Indians, as the war had not yet commenced; and they visited the settlements in a friendly manner frequently. The Indians, it seems, had been watching the settlement nearly all day, from the top of a neighbouring hill, and just at dusk in the evening, they commenced their attack; one party approached the blockhouse, and at the same time another party approached one of the cabins, in a friendly manner. It was occupied by four men of the name of Choat; they entered it without noise, beckoned to the men to be quiet, or they would tomahawk them; confined them with cords, and made them prisoners. By this time the other party had reached the blockhouse. The men had just come in from work, and were busily occupied in getting their suppers; their arms were laid carelessly by in the corners of the room; a large Mohawk Indian led the van, pushed open the door, and held it in that position, until the other Indians had discharged their rifles upon its astonished inhabitants. No resistance was made except by the woman, who seizing an axe, made a blow at the big Mohawk, which cleaved the flesh from his scull to his shoulder; but before she could repeat the blow, the other Indians rushed in with their tomahawks, killed her, and all who survived the first fire. After the slaughter was over, the Indians proceeded to plundering, and under the beds, piled up in the corner of the room, they found a boy 14 or 15 years of age; him they saved alive, and took with their other prisoners to Detroit. The other cabin was occupied by two men by the name of Ballard, who hearing the firing at the blockhouse, rushed out, and made their escape just as the Indians were approaching, which they discovered by the cracking of the brush, as they were coming up in the dark. These two men reached the settlement at Wolf creek that night; by this timely notice, they were enabled to be in readiness for the Indians, who arrived early the next morning, but finding the settlers prepared to meet them, they retired without making any attempt. Had it not been for the fortunate escape of the two Ballards, this settlement would probably have shared the same fate with that at Big Bottom.

The settlement at Waterford was also attacked by the Indians; they were beaten off without any loss of lives; but they suffered a considerable loss in cattle, which the Indians drove away. It was afterwards discovered that one Indian was shot through the shoulder. In 1794, Abel Sherman was killed at Waterford; and in 1795, Sherman Waterman was killed on Little Wolf creek.

The settlement at Marietta suffered but little from the depredations of the Indians. Their cows would occasionally come home with arrows sticking in them, and sometimes they drove them off, or destroyed them. It was against the regulations of the settlement, for any horses to run at large, they being an object of plunder of the first consequence to the Indians, as they are not only easily removed, but also assist them in their retreat; this regulation, with two or three attempts, which they made on this settlement, proving disastrous, was the reason why they so seldom visited the place. A man by the name of Robert Warth, who was chopping in a field, within gun shot of the fort on Point Harmar, was killed by an Indian in open day, in the year 1792; the Indian escaped unhurt. Matthew Kerr was shot at the mouth of Duck creek, while crossing it in a canoe. About this time one of the "spies," by the name of William Rogers, was killed a few miles from Marietta, as he was returning from a scout, in company with another "spy" by the name of Henderson. The Indians waylaid the path, and fired upon them as they passed by. Henderson had a ball shot through his blanket as it hung at his back, but without injuring him. The Indians chased him several miles, but by his superior activity and bravery, he escaped unhurt.

The beginning of June, 1792, R. J. Meigs,* Jr. Esq. (since governor of the State of Ohio, and Post Master General) had a very narrow escape from the attack of two Indians. Mr. Meigs, in company with a man by the name of Symonds, and his black boy about 14 or 16 years old, was returning just at night, from his cornfield where he had been hoeing. The Indians had secreted themselves by the side of the path, between him and the fort, on the west side of Muskingum river; as he approached the river for the purpose of crossing it, some

* Since deceased.

turn in the path placed him with his back to the Indians. At this juncture, one of the Indians fired, and shot Symonds through the shoulder. Being an excellent swimmer, he took immediately to the river, and the black boy followed him; but the boy being unable to swim, was pursued by the Indian who had discharged his rifle, dragged to the shore, tomahawked and scalped. Symonds floated down the river, to the fort, was taken up and recovered of his wound. The other Indian, who it seems was only armed with a tomahawk, now approached Mr. Meigs with motions for him to surrender. Mr. Meigs presented his gun, which from some mischance happened to be unloaded, and approached the Indian at a pretty rapid pace; as he passed by him, he struck the Indian with his gun, and the Indian returned the blow with his tomahawk—it stunned him a little, but did not check his progress. The Indian immediately pursued, but being unable to overtake the object of his pursuit, he stopped, threw his tomahawk, which narrowly missed its aim, uttered the Indian war-cry, and gave up the chase.

Had Mr. Meigs tried any other expedient than that of facing his enemy and rushing immediately upon him, he must inevitably have lost his life. On his left was the river, on his right a very steep and high hill; beyond him the pathless wood, and between him and the fort, his Indian foes. To his sudden and unexpected attack, to his dauntless and intrepid manner, and to his dexterity in the race, Mr. Meigs undoubtedly owed his life. The Indians were immediately pursued from the fort and a number of shots were fired at them by the "spies" on the east side of the river, but they gained the hill which overlooks the town, and bidding defiance to their pursuers, escaped uninjured.

During the whole of the war, only two Indians were certainly known to have been killed. One of these was killed on the Little Muskingum, by Mr. Henderson, one of the "spies"--there were three Indians in company, when they were discovered lying in their camp. Henderson, with a party of men approached unnoticed,—one Indian was killed, the other two escaped.

One was also killed on Duck creek, about three miles from Marietta, at a spot where a settlement had been begnu, but abandoned on the breaking out of the Indian war.

Two Indians had been discovered the day before, on mill creek, a mile or two from Marietta, by one of the inhabitants, as he was returning with the cows. They were so intent on examining the path for the footsteps of passengers, that they did not see him, although only a few rods from him, he made a circuit round amongst the hills, and reached the garrison in safety. Early the ensuing morning, a party of men turned out in pursuit of the Indians. It was judged by the spies, that they would pass the night at the abandoned settlement on Duck creek. Approaching therefore with caution, the Indians were discovered without giving any alarm; one of them was amusing himself with turni g a large grindstone, to him probably a novel sight. The other had clambered up on the outside of a cabin, and was looking down the little wooden chimney, to see what discoveries he could make within. Hamilton Kerr, one of the spies, (and son of Mr. Kerr, killed at the mouth of Duck creek,) singled out the Indian on the cabin for his mark; the rest of the company fired on the Indian at the grindstone. The one on the cabin fell dead; the other escaped, uninjured; and taking to flight, baffled the exertions of his pursuers. Although the Indians were often discovered in the neighbourhood of the settlements, and were frequently pursued, they generally escaped with impunity. The reason why they so often escaped, was owing to their perfect acquaintance with the woods, through which they had so often pursued the deer and the buffalo; and to their selecting their most active, cunning, and brave warriors for transactions of this kind; and above all to that love of fame, so dear to the soldier, but far more dear to the heart of an Indian. Whoever knows the Indian character, must know, with what unremitting diligence he pursues his foe; whole days and nights, in cold and in rain, he will lie without fire, concealed in the forest, perhaps without food, waiting with untiring patience the favorable moment when he may spring upon his unsuspecting victim, without danger to himself. All eyes, all ears—he sees with astonishing quickness the smallest objects, and hears distinctly the most trifling sounds; his pliant limbs accustomed to activity, and strengthened by long marches, never fail him in the hour of trial—and his heart, unaccustomed to pity, never relents at the cries of innocent childhood, or softens to the supplications and entreaties of female beauty—his destroying arm knows no distinctions of age or sex—he can drink the blood of his enemies and feast upon their hearts. If he can return to his nation, from a hazardous enterprise, in triumph, and in safety, his fame is complete;—his person is highly respected, and his name enrolled among their heroes, is handed down to posterity, in their war songs, as an object of emulation.

Some of the settlements suffered severely from the want of provisions at the commencement of the Indian War. Their supplies had heretofore been principally brought from Pittsburgh; and the war broke out before they had land enough under cultivation to supply themselves, after which time it was very hazardous to navigate the river; the boats being often destroyed by the Indians, and all on board killed: and they were in constant danger, when attempting to open new fields. These difficulties had well nigh produced a famine; but, by the interposition of a kind Providence, they were enabled to overcome all their difficulties; and escaped without any very great losses, from their numerous enemies.

"The Indians that formerly inhabited your county—their number, condition, customs, manners, language, mythology, burying places, monuments, forts, tumuli or mounds, weapons, utensils, and other traces of their settlement; their history, migrations, traditions, character, trade, wars, and treaties; their names and places, and their signification?"

So far as I have been able to learn, the Indians had no fixed residence, within the present boundaries of Washington county. But the tract of country embraced within it was used as the common hunting ground of several different tribes, more particularly the Shawnees, the Delawares, and the Wyandotts. That tract of country embraced by the Ohio Company's purchase, is reputed to have been the best hunting ground, north-west of the Ohio river; and is remembered with regret to this day, by many of the old Indians. I have been told by some of the first settlers of this place, that the hills were literally covered with buffalo, deer, and wild turkeys; that the hunters made a business of killing the deer, for their skins and tallow only, and that one expert hunter could kill several hundreds in the course of a few weeks. At this time they have become scarce; the best hunters cannot kill, in a favourable time, more than three or four in a day, and perhaps not one in a day. The buffalo have been driven from the country many years since, and the race of turkeys is almost extinct.

I know of no regular burying places that they had, in this neighbourhood; but they seem to have been buried as the occasion required near the spot where they fell: this usually has been in the bottom lands near the rivers, their bones being often exposed to view from the falling in of the river banks, after freshets.

The remains of their stone hearths are also brought to light in the same way, near which are discovered vast heaps of calcined clam-shells, bones of fish, and of deer. This has been more particularly the case near the mouth of the Muskingum river. This spot, from the vast quantities of shells washed out of the bank, must have been a place of their occasional residence for many years. Such places are frequent on the Ohio river, and near them are often found bits of broken potter's ware, of a coarse construction, appearing to be made of pounded shells, and clay, in composition.

I once saw a perfect vessel of this kind; it would hold about two quarts, was handsomely proportioned, nearly the shape of a large cocoa-nut, and had four neat handles placed near the brim, opposite to each other. It was found in the bank, on an island in the Ohio river, near Belprè.

Arrow heads of flint, are found in ploughing the fields, scattered all over the bottom lands, some so large that they must have been used for spears' heads. Stone hatchets, and stone pestles for pounding corn, are also common. On the beach near the mouth of the Muskingum, was found a curious ornament, which from the neatness of the workmanship, must have belonged to some distinguished personage amongst that ancient race of inhabitants, who constructed those wonderful works in this neighborhood. It is made of white marble, its form a circle, about three inches in diameter. The outer edge is about one inch in thickness, with a narrow rim, the sides are deeply concave, and in the centre is a hole about half an inch in diameter. It is beautifully finished, and so smooth that I have no doubt it was once very nicely polished. It is now in the possession of David Putnam, Esq. of Marietta.

Ancient mounds are frequent all over the county of Washington; some are constructed of stone, and some of earth; others are composed of both stones and earth,—and I have been informed, from good authority, that there are some on the heads of Jonathan's creek, in Morgan county, whose bases are formed of well burnt bricks, of about four or five inches square. There were found lying on the bricks, charcoal, cinders, and bits of calcined bones; and above them the superstructure of earth composing the body of the mound, evidently showing that the dead had here been reduced to ashes, after the manner of several ancient nations, and that the mound of earth had been erected over the remains, to perpetuate the memory of some companion or friend.

Mounds are generally found on level land, and near streams of water, thereby indicating that the dead were deposited near their settlements. Some mounds are oval, and others circular. Those vast remains of mounds, elevated squares, parapets, ditches, &c. on the elevated plain, within the town plot of Marietta, have been so often described, that I shall not attempt it at this time.*

Art. XXII.—*Notice of* Dr. Thomson's *first principles of Chemistry; and extracts from foreign letters on various subjects, addressed to the Editor.*

It is not within our purpose, or present limits, to do any thing more than briefly mention the admirable work of Dr. Thomson. For more than twenty years, we have diligently followed this distinguished author, through all the numerous editions of his systematic Chemistry, in which he has shown himself the vigilant and faithful historian of the science; through his Annals of Philosophy, one of the best of the numerous scientific journals of this day, and through his smaller works, and separate memoirs, with which he has favoured the public; and we have listened, with high interest, to the instructions of his lecture room. But after all, predisposed, as we were, to expect much from a great effort of the mature age of such a master, our expectations have been more than equalled. There is nothing, the offspring of the present age, which, so far as we are informed, surpasses this "attempt to establish the First Principles of Chemistry by Experiment." The vast amount of labour performed—the patient and persevering repetition of tedious and often difficult pro-

* See the descriptions and drawings, by Caleb Atwater, Esq. in the first Vol. of the Archœologia Americana, where much very interesting information may be found.—*Editor.*

cesses, frequently to the eight or tenth time—the consummate skill discovered in devising and executing the experiments, and the surprising coincidence of the results of analysis, with the deductions of theory, excite our astonishment, and prove, beyond a question, that chemistry, if not founded in intuitive, is built on demonstrative truth. Dr. Thomson, after performing so much, might have well adopted a motto preferring higher claims than that which he has chosen: i. e. "Ut potero, explicabo; non tamen ut Pythius Apollo, certa ut sint et fixa, quæ dixero: sed ut homunculus, probabilia conjectura sequens." Tusc. Quæst. Lib. 1. c. 9.

Dr. Thomson has dedicated his work to those eminent philosophers, Mr. Dalton, Prof. Gay Lussac, Sir Humphrey Davy, Prof. Berzelius, Dr. Wollaston, and Dr. Prout, who have laboured so successfully in the same field, and notwithstanding some differences of opinion among these gentlemen, they will doubtless hail the work of Dr. Thomson as a vast acquisition to the Atomic theory. Dr. Thomson does not always agree with the views of Prof. Berzelius, but he does justice to the exalted merit of the Swedish philosopher, to whom the science of chemistry is under such great obligations.

The great fundamental truth is now established beyond all controversy, that every body enters into chemical combinations always with the same weight, or with a weight bearing an accurate arithmetical ratio, to the smallest weight of the given body which is capable of entering into combination: hence, some body being agreed upon as a unit, the weights of all others can also be expressed by numbers, which will always represent one proportion, or two, or more, of the combining body. Unfortunately the gentlemen who have written in support of the atomic theory have been divided between oxygen and hydrogen for the unit. This occasions considerable inconvenience to learners, because different numbers are of course used to denote the weight of the same body, but it affords no ground to assail the theory as untenable.

We annex some extracts from a letter received from Dr. Thomson, by which it will appear that he is still prosecuting this important inquiry, and that we may hope to hear from him again on the subject.

Extract of a letter from Dr. Thomson to Prof. Silliman, dated Glasgow, March 30, 1825.

Dear Sir,

I do myself the pleasure of sending with this letter a copy of a work of mine, just published, on what I consider the most important point which can at present occupy the attention of the chemist. It has cost me five years hard labour, and an almost infinite number of experiments. But I have been at so much pains to secure accuracy, and have repeated my experiments so frequently where I considered them as fundamental, that I entertain the fullest confidence of their almost mathematical accuracy. I have been delighted with the simplicity of the numbers, and with their connexion with each other. You will perceive that they raise chemistry to the rank of a mathematical science, and that henceforth chemical analyses may be subjected to the test of mathematical calculation.

I intend now to devote myself for some time to come, to examine the mineral kingdom. I expect to find the same simplicity in the composition of minerals, if we can by any means disentangle the true chemical compounds from mixtures. Berzelius and his pupils have done a great deal on that subject, and their labours will be of infinite use to me; though I do not approve of the method of calculation employed by Berzelius. Probably several years will elapse before I shall be in a condition to give any thing to the public on the subject. But I have already begun, and have made some little progress. I find for example, that our magnesian limestone is an exact chemical compound of

One atom carbonate of lime	-	6.25
One atom carbonate of magnesia	-	5.25
		11.50

It gives me much pleasure to see with what spirit you are going on in America in investigating the mineralogy of your vast continent. America will soon have to boast of many excellent mineralogists, and some accurate chemists.

Extracts of a letter from William Maclure, Esq. to the Editor, dated Paris, May 2, 1825.

1. *Commerce—its relation to knowledge and civilization.*—I am glad you have introduced the Belfast society to some one who will exchange specimens of natural history with them, as it is the easiest and most accurate mode of giving ideas, the commerce that tends more to the happiness of mankind than any other, and which will become of more consequence to all ranks, as civilization increases. Indeed one can foresee a state of society where the exchange of ideas would be the only commerce, where mankind will be so well informed, as to raise every thing they want themselves, and restrain those wants within the limits of their own productions. The commercial system has done good, but at present rather retards than advances improvement, because the merchant has an interest in opposition to that of all others; for it is his interest to gain upon the whole consumption of the community, and thus far he prefers of course that all should pass through his hands; as a merchant, he must wish that all should consume foreign produce, although it is evidently the interest of all other members of society to be independent of foreign supplies, always excepting those satellites of power, removed so far from a state of nature, as to be collectors of indirect taxes.

2. *Mr. Owen's Establishment and Improvements.*—It is fortunate that Mr. Owen has pitched upon a location, where prejudices will not have their force of combination to obstruct improvement: that is but too lamentably common in communities where there is a more dense population; for it would be exceedingly mortifying if our industrious producers of public and private wealth, should reject so great a benefit as the introduction of his plans must be to every kind of labour, and our disgrace and humiliation would be much aggravated, if the two establishments now forming in Britain were to succeed, and the attempt now making in America were to fail.

A prospectus of the British establishments, with the first lecture on human happiness, by John Gray, has been published: it places the present state of society, in a new and highly interesting point of view, extremely favourable to liberty.

Labour in some shape or other is the cause of all production; of course all the revenue of every society is created by those that work. The annual production of Great Britain, is estimated at £54 sterling for every man, woman, and child; but only £11 sterling per annum, falls to the share of those who produce it; viz. about $\frac{1}{5}$: the other $\frac{4}{5}$ go for tithes, taxes, masters, &c. &c. Such an order of things is neither reasonable nor just, and to rectify it as far as possible, by laying the axe to the root of the evil, taking away the temptation to avarice, cheating, and crime, is the object of the new system. It proposes to remedy the evil, by enabling the industrious producer to retain a far greater proportion of the produce of his labour, and removing the necessity of his working more than a few hours in the day, to obtain every necessary comfort, leaving the rest of his time for moral improvement and recreation. While the whole legitimate host of those that benefit by the present order of things are closely united and strongly combined, to support all abuses, it would be in vain for individual exertion to strive with such an array of well disciplined antagonists, and the only chance of succeeding is by a coalition of those useful and industrious producers, to retain as much of their own, for their consumption and benefit, as the nature and independence of their situation will admit. To obtain these great, good, and devoutly to be wished for, effects, the co-operative societies endeavour to establish rules and regulations. For instance, for the sake of economy and sociability, they eat all at the same table, and cook all in the same kitchen, by which they will save fully one half of the expenses, and nearly $\frac{3}{4}$ of the labour and fuel. Women are placed on an equality with men, for education, privileges, &c. and thus half of the human race, will be relieved from the inability of aiding in the great work of civilization. By a mutual guaranty of all the necessaries and conveniences of life, they annihilate the competition and struggle for riches and power, and that lust for dominion and command, which is the cause of envy, malice, hatred, cruelty, and of most of the miseries of mankind.

The only objection urged by the enemies of the system is, that it is impossible! the eternal cry against every thing new; for, say they, how can you eradicate the passions of men?—There is no intention of rooting them out; but the firm resolution is taken of not planting the violent antisocial passions, all of which are nourished, strengthened, and fortified from the cradle to the grave, by the unjust and cruel treatment of most of the rulers of mankind. The consequences of the new system to mankind will be so beneficial to the world, that it is at least worth a fair and impartial trial.

3. *Michaux's North American Sylva.*—Finding that Michaux intended to sell his whole edition of the American Sylva with coloured plates, and thinking it a useful book, that we ought to have in the United States, I bought the whole edition with the 156 Copper-plates, which I shall bring with me, and shall send a copy to the American Geological Society and give others to some of the Agricultural Societies, all of whom ought to have such a description of our forest trees, before they yield, and are eradicated by cultivation and civilization; for the greatest part of them will never be replanted, but be extirpated with the forests that at present support them.

4. *Thorn Fence.*—I think I have found a tree that has all the good properties of a hedge tree: viz. quick growth, from 6 to 10 feet in a year, and large spines, or prickles, pushing a great many lateral branches close to the surface. I shall make the experiment, when I get home to America. This is one of those changes, most wanted: viz. a substitution of some fence, that will grow and keep itself in repair, in place of those rails that are constantly decaying, and must soon cost too much, as wood grows more scarce.

Notice of the Scenery, &c. of some parts of France: extracted from a letter written to the Editor by an American gentleman, and dated Lyons, May, 14, 1825.

For the last two months I have been travelling in this country; and as most of my route was not in the part most visited by our countrymen, it may gratify you to learn some particulars of my journey. I left Paris on the 15th of March, in company with Mr. P. We travelled slowly, on account of the bad state of his health, and were compelled by unseasonable cold weather, to rest several days at Orleans. There was little there to gratify curiosity, except the cathedral. I have heard it called the finest in France, but it seemed to me inferior to that of Rouen, and I presume you have seen much grander churches in England. The country between Orleans and Tours, was very fine when we passed it, though the season was too early to exhibit all its beauties. From

Blois to Tours especially, the ride is one of the pleasantest that I know. The road runs upon the levèe, an embankment made to preserve the low grounds from inundation. On our right was a plain covered with corn, and bounded by a hill, which presented many a graceful curve and romantic precipice, and whose declivities were every where decorated with white houses, villages, and towns, scattered among the grain and vines. On our left was the river with its beautiful bridges and meadows, and the further bank, which was picturesque and wild in some parts, and then again cultivated like that on the right, but still with difference enough for agreeable variety. In the hill near Tours many houses have been formed by excavation. Their windows and doors are in the perpendicular side of the chalky cliff, the chimneys spring out of the green turf above, and over the roofs are gardens and fruit trees.

Tours is a neat, pretty town, inhabited by many English emigrants. It has a very fine street, in which the houses are nearly alike. The fronts are of hewn stone, and were erected by Louis XVI. at the expense of the nation, after a fire had destroyed a great part of the town. At this place we left the Loire, and turned southward in our way to Bordeaux. There was little between the two places to remark upon.

Bordeaux is one of the finest towns that I ever saw. I know of none whose private houses seem to me as good. They are here built of hewn stone, of that calcareous kind so abundant in France. At first it is almost as beautiful as marble, and even when turned brown by age, it has a grand appearance.

From Bordeaux to Nismes, our road led through one of the richest and most fertile countries that I have seen. Even the plain of Lombardy can hardly be more productive. It is cultivated more by the women than by men—I should think the proportion was certainly two, if not three, or four, to one. They get but twelve sous a day, and as our people express it, "find themselves." The languages of Guienne and Languedoc are very different from the French: I think them much more harmonious. That of Provence, too, has much of the softness of the Italian. They were all incomprehensible to me, and some of them are so to a Frenchman; but generally the inn-keepers and their servants understood enough of French to converse with me.

Nismes has some antiquities in excellent preservation. The *amphitheatre* is much more entire than the Coliseum, but it is much smaller as it could contain but 17000 people, while it is believed that 107,000 could at once witness the exhibitions in the latter. The '*Maison Sarcée*' is a beautiful temple, which is dedicated to Caius and Lucius adopted sons of Augustus. It has thirty fluted Corinthian columns. The *Pont du Gard*, about twelve miles from Nismes, is part of an aqueduct, which formerly supplied it with water, from a distance, measured by the windings of the water course, of 26 miles. It extends across a river from one high hill to another. It has three rows of arches one above another, and rises to the height of 150 feet. Its greatest length is more than seven hundred.

The face of the country in Provence is very different from that in Languedoc. Instead of the fertility which had every where surrounded us, we found, after crossing the Rhone, barren stones, and rocks most thickly scattered about, and sometimes rising into bleak desolate mountains. These hardly support a few blades of grass, though formerly they were covered with forests. Probably when the wood was cut down, the soil was dried up and blown away. Marseilles is a beautiful city, scarcely, if at all inferior to Bordeaux, but I have not room to give you any account of it.

INTELLIGENCE AND MISCELLANIES.

1. Foreign.

Foreign Literature and Science; extracted and translated by Prof. J. Griscom.

1. *Steam-Engines of extraordinary dimensions.*—The copper mines in the neighborhood of Redruth, in Cornwall, whose workings have been recently resumed, contain former workings of great extent, which it was necessary to drain out. Their length is about a mile, and their depth at the level of the canal, which conveys their water to the sea, is about 900 feet. In order to drain this old opening, and to dig deeper, Arthur Wolf has erected three steam engines; the one which is in the western part of the mine has a cylinder 70 inches in diameter, and moves pumps at the depth of about 400 feet. A second machine is placed in the middle and a third in the eastern part of the mine. These two last have cylinders 90 inches in diameter, and the motion of their pistons is ten feet. Each machine has six boilers, three of which are so disposed that they can be heated by two fires, and are sufficient to move the machine. The other three are in action when the first stand in need of cleaning or repairing. These three enormous machines, are constructed in the nicest manner, having all their parts in the most perfect proportion. Though they are the largest machines hitherto known, their motion is smooth, and free from shaking. The pistons making from ten to twelve strokes per minute, with perfect regularity.

The first of these machines consumed in 35 days 3800 bushels of coal, and lifts every day nearly 39,000,000 gallons of water, a result which surpasses that of any other machine known.

The weight of these gigantic machines is as follows:

The cylinder, without its cap and bottom, weighs 27,000 lbs. The stem of the piston and its axis weigh 56,000 lbs; that which moves the pumps and the iron connected with them, about 90,000 lbs. and if we add to this the column of water raised by the pumps, and half the weight of the great lever beam, we have a weight of nearly 220,000 lbs. on one side of the axis. This is balanced by counterpoises on the other side, making upon the pivot of the machine, a weight of 440,000 lbs.

The piston moves through 262 feet per minute, carrying this enormous mass with an astonishing regularity. These machines do honour to the genius and talents of Wolf; and the county of Cornwall is indebted to him for many improvements in steam-engines which have rendered the most important services to the country.

Bib. Univ. Feb. 1823.

2. *Large mass of Amber found in the Island of New-Providence.*—About the middle of last year a sailor being fatigued, sat down near the sea, on a block, which he supposed to be a stone. After having slept some time, in attempting to rise, he found himself glued to his seat. When he reached the vessel, one of his comrades remarked that he appeared to be scented with a very strong odour; and when he learned how it had happened, he invited him to return, and endeavour to bring away the stone. The former had at first no inclination to comply in consequence of its being too heavy; *so much the better* replies the other, you will make your fortune the sooner, for I believe it to be a large piece of Amber which will sell for a large sum. He immediately mounted a horse, crossed the Island, and brought away the stone. He showed it at first to a Jew, who offered him only the tenth part of its value. The circumstance soon spread, and the Captain of a merchant vessel, then in port, purchased it of the sailor; and after passing through several hands, it was finally sold in England for £2300 sterling, at the rate of 86 shillings per ounce.—*Idem.*

3. *Free Commercial School*, PARIS.—The course, which requires two years for its completion, will continue this year. It comprehends the studies which prepare young men for commercial knowledge, and the theory of commerce, in its strictest sense. The preparatory studies are, 1st. The art of commercial writing, that is to say, the art of collecting, connecting, and expressing one's ideas upon all subjects relating to commerce; 2d. commercial chronology, including the grand epochs of commerce, and details relative to the

progress of agriculture, manufactories, arts, maritime discoveries, and navigation; 3d. the geography of commercial nations, comprehending the astronomical, geological, and political considerations, which enter into the science of commerce, 4th. the historical revolutions of commercial nations from the most ancient to the present time.

The theory of commerce, properly speaking, comprehends, 1. Outlines of the commercial system in the following order: Notions of commerce and its branches, objects of exchange arising from agriculture, mines, fisheries, hunting, and the arts, means of communication by caravans, navigation, and roads. Measures of merchandise, or systems of weights and measures. Prices of merchandise or theory of money, and its paper representatives, commercial relations, and the balance or rates of exchange, effects produced by commerce, with proofs that it is the source of industry, wealth, population, and happiness. 2. The commercial state or degree of riches, power, and strength, of all commercial people, ancient and modern. 3. The legislation of commerce, or the art of establishing in any nation the basis of an extended commerce, of harmonizing its different interests, of organizing internal trade by wise regulations, and ensuring the continuance of its exterior relations, upon justice, strength, and moderation. 4. Commercial laws or analysis of the laws of commerce before Colbert, under Colbert, during the French Revolution, and the developement of a new code of commerce. 5. The moral duties of a merchant. 6. The elements of practical commerce, viz: arithmetic, geometry, exchange, and book-keeping. This plan, besides embracing the science of commeree, on a wide scale, presents a course of instruction which is connected with almost every branch of human knowledge. The school is absolutely gratuitous and open to every body, the pupils being under no formality but that of presenting their names to the professor.

H. C. Guilhe, Professor.
Louis Fabre, President.
A. Verdier, Secretary.
Rev. Encyc. Dec. 1823.

4. Geneva. *Museum.*—The donations have been neither less rich nor less abundant, than in the preceding year. They are not only the product of the generosity of our fellow-citizens, but many strangers of distinction have been disposed to give to this establishment proof of the interest they take in it. The apartments of mineralogy and ornithology, have been particularly enriched by these new gifts. The museum has acquired a new kind of importance and usefulness; its halls, laboratories, and instruments, were used during the last two winters, for gratuitous courses of chemistry and philosophy, applied to the arts, and of elementary mathematics, which the committee of industry has opened to artists. These courses given by able professors, have been eagerly attended. The municipal council of Geneva has given a new proof of its desire to encourage and favour the culture of the sciences, in granting the sum of 40,000 florins, (about $3700,) for the purchase of the collection of apparatus of Professor Pictet, ancient inspector general of public Instruction.—*Rev. Encyc. Nov.* 1824.

5. Bordeaux *Linnæan Society.*—This learned society celebrated for the seventh time, the fête of Charles Linnée, its illustrious patron. In the hall of the conservatory of arts, elegantly decorated, and ornamented with the bust of H. M. Charles X. a numerous and select company collected at an early hour. M. Dargelas, the president, opened the session by an interesting discourse, on the pleasures and utility of the natural sciences, and particularly of botany. The lectures then commenced in the following order: A report upon the labours of the society, from November 1823, to the present time, by M. Clave, secretary The history of the coffee tree, by M. Venot, M. D. Notice of the French colonies of Senegal, by M. Teulere, M. D. This notice informed the meeting that the Linnæan Society of Senegal cherished the hope of naturalizing the coffee plant in that colony, the first stalk which had been produced having ornamented the room at the time of their celebration in July. Reflections upon the sensibility of vegetables by M. Chansarel, M. D. Notice of the vine and its products, by M. Paillon, M. D. A poem, entitled *Rural Illusions*, in which was exhibited the portrait of an old man, who wished, before he expired, to enjoy for the last time, the spectacle of nature, produced in the meeting, feelings at

once tender and melancholy. Statement of the annual transactions of the society, French and foreign, by M. LATEBRADE director. In this were noticed the scientific progress of the society in almost every part of the world, and the constantly increasing number of its members. Finally, M. GUILHE, honorary member, terminated the session by a charming piece of poetry, entitled *Més adieux à la campagne à la fin des vacances.—Idem.*

6. PERIGUEUX.—*Model School of Mutual Instruction.*—The distribution of prizes took place in this school on the 22d of September last. Neither the bishop nor the curate being present, M. LAUBRESSET, first adjunct of the mayoralty of the city, took the chair. The assembly was numerous and brilliant. The chairman opened the meeting by a discourse in which he remarked that this school, founded by the commune, not only maintained itself in spite of numerous obstacles, but surpassed the hopes that it had excited. M. Gaudel, director of the school, then recommended to his pupils never to forget the sentences of the ancient sage, collected by Fenelon, the proverbs and moral sayings of poor Richard; the maxims recommended to youth by the good Rollin, and especially the divine precepts which they may learn every day from the New Testament.—*Idem.*

7. FRENCH POSTS.—The income of the post-office in France, amounted in the year 1824, to about 26,560,000 francs, being the postage of about 60,000,000 of letters. If to this is added the number of letters and packets transported free, the amount will be 110 millions, without reckoning 25,000 printed sheets which Paris forwards every day to the departments, and 25,000 others which originate in, and circulate in the departments. The service of Paris produces an annual revenue of about 4,310,000 francs. It is estimated that 40,000 letters (of which from 28 to 30,000 are taxed, and from 10 to 12,000 free,) leave Paris every day, and that there arrive daily in that city about 30,000, of which 18,000 are charged. This gives a reciprocal intercourse between Paris and other places, foreign and domestic, of 25,500,000 letters per year. The little post of Paris occasions a daily movement of about 15,000 letters.

Rev. Encyc. Dec. 1824.

8. *The Exposition of the System of the World*, by the Marquis de Laplace has reached its fifth edition, revised and augmented by the author. In the conclusion of a brief, but well written notice of this new edition, the reviewer (Francœur) observes: "After having explained those movements in the system of the world which must be regarded, not only as certain, but as affording a standard of the highest degree of certainty which the human mind can attain, M. De Laplace reproduces his ingenious hypothesis of the origin and formation of the planets. It is well known that he regards these bodies as resulting from the condensation of some parts of the solar atmosphere. This would very well account for their motions being in the same direction, and their orbits nearly circular, and but little inclined to each other, instead of moving as the comets do, in all directions, and in orbits extremely eccentric. This opinion would seem to conform to the observations of Herschell upon the nebulæ, and to all the well established principles of physical astronomy. Nevertheless De Laplace presents this theory "only with the diffidence which ought to accompany every opinio , not founded upon observation or calculation" This reserve in a philosopher of the highest order, is not sufficiently imitated by certain writers, who, less circumspect, are able to understand and explain every thing, without observation or calculation. Nothing is more easy than to connect, by a theory, facts, but imperfectly understood, and as imperfectly represented: the beginning of the present century has given birth to many conceptions of this nature; but the "system of the world," more than compensates us for such defective and flimsy productions.—*Rev. Encyc. Jan.* 1825.

9. Copenhagen.—*Public Instruction.*—In the month of October 1823, M. Oerstedt, professor of philosophy in the university of Copenhagen, and so justly celebrated in Europe for his electro-magnetical discoveries, signalized his return to his country by an invitation to his fellow-citizens to assemble together and form a society for the purpose of diffusing the knowledge of experimental philosophy in its application to all the various branches of human industry. This invitation was attended with the happiest results. The society formed in July 1824 has already named two committees, viz. a *physico-technical* committee, and a committee of commerce. The courses were about to commence, and M.

Oerstedt had also agreed to superintend them gratuitously. Prince Christian, who affords so noble a protection to the sciences, has not only contributed to the funds of the society, but condescends to preside as its patron. The king has taken it under his protection.—*Idem.*

10. SWITZERLAND.—*Canton de Vaud.*—M. Benjamin Delessert, deputy from Paris, has just given to the town of Cossonay, the cradle of his ancestors, a fresh proof of his liberality, by placing under its control 10,000 francs to aid in that district, the establishment of a school of mutual instruction.—*Rev. Encyc. Feb.* 1825.

11. *Gymnastic Science.*—The French government having resolved to encourage the Institution of M. Amoros, professor of gymnastics at Paris, the minister of the interior, appointed five commissioners to examine in all their parts the gymnastic exercises and to report thereon in detail. M. Amoros first gave the committee an idea of what he calls elementary exercises, which consist in chaunting different pieces, the rhythm of each of which corresponds with various movements of the legs, arms and body, which the pupils execute on the spot. A metrometer (metronome) regulates these motions. The pupil thus learns to measure time and space, to regulate with precision the common step, the accelerated step, and the leaps of the gymnastic course. These exercises impress upon their different movements a rhythm which befits them; they give greater developements to the voice, and more force to the lungs; they render the joints more supple, prepare the pupils for fatigue, and dispose them to exercise in the open air. The committee were too enlightened not to appreciate the advantages of chaunting in connextion with gymnastic exercises. To accustom the pupils to preserve their equilibrium, so necessary in certain cases of danger, M. Amoros made three of the professors take a ball of 6lbs. and hold it sometimes with the left hand, sometimes with the right, the superior extremity horizontally extended, and advanced in front. The same exercise was repeated with the inferior extremities, the ball being supported alternately by each foot. To sustain the effort, maintain the station, to keep all the moveable points of the body in a fixed position, to subject the extremities to the tarsus and make the different points of the latter a solid pivot which maintains the ef-

fort and re-establishes the centre of gravity; are the principal muscular actions which this exercise require. The pupils in the court and stadium, then applied the theoretic principles which they had just learned, and here the committee witnessed the utility of the gymnastic method. They saw with what precision all the various exercises were performed; as well those that required great rapidity of motion as those that depend on firmness and strength. Many among them obtained 350, 440, and 550 degrees of the free dynamometer, for it is by this instrument that Amoros calculates the progressive developements of their muscular powers.

We have seen feeble and timid men acquire in a short time, by gymnastic exercises, very considerable strength and boldness, and their moral energy rise in proportion to the increase of their physical strength. From the stadium the pupils proceeded to the enclosure where the machines were erected, and where they performed the exercises of running over inclined planes, clearing barriers, climbing masts, walking upon unstable beams, mounting ladders 36 feet high and slipping down, ascending heights by means of ropes and poles, and by men so suspended as to serve as ladders, and descending again with the greatest facility. The commissioners, surprised at the strength, suppleness, agility, and address of the pupils testified their satisfaction, and acknowledged the utility of the exercises. These were terminated by their vaulting over wooden horses and also over living ones, and by the conquerors receiving the prizes due to their superior skill.

The design of this instructor is not merely to regulate and perfect the physical powers of his pupils, but to teach and dispose them to lend assistance to the weak, and to aid their fellow-creatures when in danger. Those who first witness these exercises, are in constant fear for the safety of the pupils. But their elementary lessons accustom them gradually to measure their force and skill; they are able by proceeding from simple to compound exercises, to acquire solid instruction. If accidents occur they arise evidently from disobedience, presumption, or forgetfulness of principles so well explained and applied in this establishment. Every needful precaution is taken to secure the pupils from accident. A thick bed of sand is spread at the foot of each machine, nets are extended round the masts, and the less skilful pupils are supported by belts, while their motions are carefully watched and encouraged by the professors. The pupils in this remarkable session evinced the greatest docility.—*Idem.*

12. Meteorology. *Limits of heat and cold.*—In uniting and comparing a great number of observations made with the thermometer, M. Arago has deduced the following consequences: 1st. In no place on the land, and in no situation, will a thermometer elevated two or three metres (from 6 to 10 feet) above the surface, and sheltered from all reverberation rise to the 37th degree of Reaumur or 46th degree of the centigrade scale ($=115\frac{3}{4}$ Farenheit): 2d. In the open sea, in whatever place and season, the temperature of the air never surpasses 24° Reaumur (=86° Far.): 3d. The greatest degree of cold observed on our globe, with a thermometer suspended in the air is—40° Reaumur (=—58° Far.): 4th. The water of the sea in no latitude or season, acquires a temperature superior to 24° Reaumur, or 86° Far.—*Idem.*

13. Sweden.—Agreeably to a printed report made to the "Society for the propagation of mutual Instruction," in Stockholm at the general meeting held the 19th of May, 1824, it appears that in the twelve episcopal districts of Sweden there are 60 schools on the new system, and that the number of pupils was continually increasing. The pamphlet contains a statement of the receipts and expenses of the society, a list of the 86 members who composed it, and a discourse of M. Fryxell, Recorder, on the utility of the new method.—*M. A. J.*

Rev. Encyc. Avr. 1825.

14. The American Journal of Science and Arts *conducted by* B. Silliman, M. D. &c.—The February number of this journal is thus noticed in the *Revue Encyclopédique* for May 1825.

"This number of an excellent journal from which we have often entertained our readers, is very rich in articles of geology, mineralogy, and natural history. The mathematics also occupy a remarkable portion of it." A brief analysis is then given of the most important articles in the number under review, and the writer concludes with the following observations:—"We see that the journal of M. Silliman is among the number of those which are read with pleasure and curiosity, as soon as they appear, and which, as a component part of our libraries will be at all times consulted, and will furnish useful materials to philosophers of the present and future generations."

As a just return for the friendly opinions of this journal, expressed by our Parisian fellow-labourers, we may remark that if there are, among our readers, any individuals whose taste for general science, and acquaintance with the French language, would be gratified by the perusal of a monthly journal, published at Paris with great regularity, and forwarded, punctually, to this country by the Havre packets, they cannot do better than to become subscribers to the *Revue Encyclopédique.* We know of no work which comprehends, within the same limits, so much information, with respect to the current literature and science of Europe, and the world. Each number consists of about 300 pages 8vo., closely printed, and contains, besides original reviews of new works, in the manner of the English quarterly reviews, a notice, and brief analysis, of the principal new publications of Europe and America, which come to the knowledge of the editors; and of the most important new discoveries in science and the arts. The terms of subscription are 46 francs per annum, or 26 francs for six months. This work may be obtained on application to A. Desplaces, French bookseller, No. 105 William-street, New-York.

15. Hamburg. *Surgery.*—A physician of this town, has just invented a new surgical instrument, by which a leg may be cut off in one second, and which benumbs the pain of the patient by a pressure simultaneous with the amputation.—*Idem.*

16. Geneva. *Mare-Auguste* Pictet.—Our republic and the physical and natural sciences have just sustained an immense loss in the person of Professor Pictet, who died on the night of April 19—20. Four months has scarcely elapsed since death deprived us of his younger brother, the Counsellor of State, C. Pictet de Rochemont, one of our most distinguished magistrates; and again the tomb is open to deprive us, after an illness of three weeks, of a man whose vast knowledge, and the generous and useful employment which he made of it, rendered him dear to all his fellow-citizens.

The loss of this distinguished savant, so impressively felt in Switzerland, will be equally so in those countries in which he supported a scientific correspondence, and especially in

France, where he filled with distinction, during many years the station of Inspector General of education.—*Idem.*

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Other Extracts from Foreign Journals.

17. *Manufacture of Salt by Evaporation on Faggots.**—The salt works at Montiers in the Tarentaise, are perhaps the best conducted of any in the world. The water from which the salt is manufactured, is only about half the strength of sea water; yet by the simple and ingenious method of evaporating, the works are rendered very profitable. In the first attempt to make salt at Montiers, in 1550, the water was concentrated by trickling through pyramids of rye straw, arranged in open galleries, and afterwards evaporated in boilers by fuel. The present buildings were erected in 1739. There are four evaporating houses, called Maisons d'Epines, (literally, houses of thorns.) Nos. 1 and 2 are each 350 yards in length, about 25 feet in height, and seven feet wide. They are uncovered at top; the frame is filled with double rows of faggots of black thorn, placed loosely so as to admit the air, and supported firmly in their position by transverse pieces of wood.

The water being received from the reservoir trickles through the faggots, and falls into troughs arranged underneath; from which it is raised by pumps worked by a water-wheel, when it again takes the same course. This process is continued until the water is concentrated to about three degrees of strength, i. e. until half of the water is evaporated, (the water, as received from the springs, containing from 1.75 to 1.83 per cent. of saline matter.) The process is conducted with more nicety in Nos. 3 and 4, and these houses are covered at the top, to protect the salt-water from the rain. No. 3, is 370 yards long: in this the water is concentrated to the strength of 12 per cent. when it is passed along channels to the Maison d'Epines No. 4, a building only 70 yards in length: here the concentration is continued nearly to the point of saturation. In dry weather the concentration is

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* Analysis of a paper by R. Bakewell, Esq. in the Lond. Philos. Mag. and Journ. Vol. 63.

carried to 22 degrees ; but in rainy, moist weather, to 18 degrees only. When the water is nearly saturated, it passes to a large building, where are the pans for boiling, and the salt is crystallized in the usual method.

Thus, 8000 hogsheads of water, in passing through the Maisons d'Epines, are evaporated to about 550; and only one sixteenth part of the fuel is consumed, that would be required for evaporating the whole quantity of water by fire.

The faggots are changed at periods of from four to seven years. Those in Nos. 1 and 2, where the saline impregnation is weak, will decay sooner than in Nos. 3 and 4. In No. 3 all the twigs acquire so thick a coating of selenite, that when broken off, they resemble stems and branches of encrinites.

The Maison des Cordes was invented by an ingenious Savoyard named Buttel. The original intention of this building was to save the expense of fuel, by crystallizing the salt itself upon cords, from which it was broken off by a particular instrument for the purpose. This process is at present abandoned for crytallizing ; but the cords are still used for evaporating, and are found to answer better for the higher concentration of the water than the faggots. This method did not answer for the first evaporation, because the water rotted the cords ; but the water which is considerably concentrated, deposites a coating of selenite around the cords, completely defending them from the action of water. The cords have many of them remained in use thirty years, without being changed.

The fuel used at the pans for the last process is partly wood, and partly anthracite from the neighbouring mountains. The quantity of salt made here annually is about 2,250,000 lbs. and of sulphate of soda about 187,000 lbs. The other alkaline matter which adheres to the pans is sold to the glass makers. The annual expense of these works is about 100,000 francs, and the net annual profit, about 50,000 francs.

18. *Effects of Mercurial Vapour.*—In the Philosophical Transactions for 1823, Part II. William Burnett, M. D. gives a very interesting account of the effects of mercurial vapours on the crew of his majesty's ship Triumph in 1810.

The Triumph, of 74 guns, was lying in the harbour of Cadiz, in March, 1810, when a Spanish vessel laden with quicksilver, was wrecked under the batteries of that town. The boats of the ship were sent to her assistance, and about one hundred and thirty tons of the quicksilver were saved and carried on board the Triumph. The mercury, it appears, was confined in bladders, the bladders in small barrels, and the barrels in boxes. The heat of the weather was at this time considerable, and the bladders, having been wetted in the removal from the wreck, soon rotted, and the mercury to the amount of several tons was speedily diffused through the ship, mixing with the bread, and more or less with the other provisions. The effect of this accident was soon seen, by a great number of the ship's crew, as well as several of the officers, being severely effected with ptyalism. In the space of three weeks from the mercury's being received on board, two hundred men were afflicted with ptyalism, ulcerations of the mouth, partial paralyses in many instances, and bowel complaints. New cases occurring daily, Rear-Admiral Pickmore, on recommendation of the surgeons of the squadron, sent the Triumph to Gibraltar, to remove the provisions and purify the ship by ablution. The order was strictly attended to, by the removal of the provisions, stores, and the shingle ballast on shore, and afterwards by frequent ablution.

On restowing the hold, every man so employed, as well as those in the steward's room, were attacked with ptyalism; and during the ship's passage, and on her return to Cadiz, the fresh attacks were daily and numerous, till the 13th of June, when the Triumph sailed for England. After their departure from Cadiz, they experienced fresh breezes from the N E. and the men being kept constantly on deck, and the ventilation of the ship being particularly attended to, a sensible decrease in the number daily attacked soon become apparent; but nevertheless, many of those already affected became worse, and they were under the necessity of removing twenty seamen, and the same number of marines, with two sergeants, and two corporals, to a sloop of war, and the transports in company. On their arrival in Cawsand Bay, near Plymouth, on the 5th of July, not one remained on the list for ptyalism.

The effects of the mercurial atmosphere were not confined to the officers and ship's company; almost all the stock, consisting of sheep, pigs, goats, and poultry, died from it; mice, cats, a dog, and even a canary bird, shared the same fate, though the food of the latter was kept in a bottle closely corked. The surgeon, Mr. Plowman, saw mice come into the ward room, leap up to some height, and fall dead on the deck.

The vapour was very deletereous to those men who had any tendency to pulmonic complaints: three men died of phthisis pulmonalis, who had never before complained; and one man who had suffered pneumonia but was perfectly cured, and another who had not any pulmonic complaint before, were left behind at Gibraltar, labouring under confirmed phthisis. Many of the men had formerly been attacked with malignant ulcers, which at one time prevailed to a considerable extent in the English ships, both at home and abroad. In many who had so suffered, the ulcers, which had long been completely healed, without even an erasure of the skin, broke out again, and soon put on a gangrenous appearance.

The mercury showed its effects upon the ship itself, by the decks being covered with a black powder; but quicksilver was not at any time discovered in this powder, in a native or globular state, though the brass cocks of the boilers, and the copper-bolts of the ship, were covered with the metal, the last to some extent within the wood; a gold watch, gold and silver money kept in a drawer, and likewise some of the iron work of the ship which had been kept bright, evidently showed the influence of the prevailing atmosphere, being in some places covered with quicksilver.

The facts which are fully detailed by Dr. Burnet, seem to sufficiently authorize the opinion of Mr. Plowman, the surgeon, and of Mr. Burnet, that the systems of the sufferers were brought under the influence of the mercury, by inhaling the mercurial vapours.

91. *Cabinet of Entomology.*—Professor Thunberg, of Upsal, has proposed to sell his large and valuable collection of Insects. It is very extensive, containing at least between 25,000 and 30,000 specimens: it commenced 60 years ago, and has been continued to the present time. The new, and as yet undescribed species are many. The collection is rich in specimens from Japan, Java, Ceylon, the Cape of Good Hope, and South America. For the whole, the proprietor expects £2000 sterling.

20. *Remarkable Water-spout in France, in* 1823.—In the arrondissemens of Dreux and of Mantes, about 3 o'clock of the 26th of August 1823, a storm came on from the S. W.

accompanied with a sudden and powerful heat. A water-spout was seen not far from the village of Boncourt, having its broad base resting on the ground, and its summit lost in the clouds. It consisted of a thick and blackish vapour, *in the middle of which were often seen flames in several directions.* Advancing along with the storm, it broke or tore up by the roots, in the space of a league, seven or eight hundred trees of different sizes, and at last burst with great violence in the village of Marchepoy, one half of the houses of which were instantly destroyed. The walls, overturned to their foundations, rolled down on all sides; the roofs, when carried off, broke in pieces, and the debris were dragged to the distance of half a league by the force of this ærial torrent. Some of the inhabitants were crushed to pieces, or wounded by the fall of their houses, and those who were occupied in the labours of the field, were overthrown or blown away by the whirlwind. Hail-stones as large as the fist, and stones and other foreign bodies, carried off by the wind, injured several individuals. Carts heavily loaded were broken in pieces, and their loads dispersed. Their axletrees were broken and the wheels were found at the distance of 200 or 300 paces from the spots where they were overturned. One of these carts which had been carried off almost bodily, was pitched above a tile-kiln, which had been beaten down, and some of the materials of which had been carried to a considerable distance. A spire, several hamlets, and different insulated houses, were overthrown. Several villages were considerably injured. The lower part of the water-spout is supposed to have been about 100 toises in diameter.

A water-spout, similar in appearance and in its effects to the one above described occurred near Genoa, on the 16th of September, 1823.—*Edinb. Phil. Journ. Vol. X.*

21. *Kite for communicating with vessels stranded on a lee-shore.*—Capt. Dansey of the British Royal Artillery, proposes the employment of a kite to facilitate "communication with vessels stranded on a lee-shore, or under other circumstances, where badness of weather renders the ordinary means impracticable. A sail of light canvass or holland (being cut to the shape and adapted for the application of the principles of the flying kite) is launched from the vessel, or other point, to windward of the space over which a communication is required; and as soon as it appears to be at

a sufficient distance, a very simple and efficacious mechanical apparatus is used to destroy its poise, causing it to fall immediately, but remaining still attached by the line and moored by a small anchor, with which it is equipped." One end of the rope being thus conveyed to the shore. and fixed by this small anchor, some one of the hands is enabled to get on shore and render assistance to others. The importance of the object is sufficient to recommend every expedient for its accomplishment. Capt. D. is particular to recommend certain proportions for the construction of the kite. The canvass or holland is extended upon two spars whose lengths are to each other as 2 to 3, the cross-piece intersecting the standard so that the upper section of the standard shall be to the lower section as 1 to 2. At two points on the standard, about $\frac{1}{7}$ of its length from the head and the same from the bottom, two lines are attached, the upper about $\frac{1}{6}$ of the length of the kite, and the lower $\frac{2}{3}$ of its length, which combined form the belly-band ; and to their point of junction is attached the line which is to retain the kite. The tail may be 5 or 6 times the length of the kite, and its weight must be proportionate to the wind.

To effect the descent of the kite, the end of the line retained in the vessel is slipped through an apparatus, called the *messenger*, which, having a sail attached to it, is immediately taken up by the wind along the line towards the kite. This messenger by driving out a wedge which is essential for the proper poise of the kite, so transfers the centre of suspension, that a rapid descent of the kite and apparatus attached is a necessary consequence. Some experiments made with this instrument have given Capt. D. much confidence in the success of his invention.—*Trans. Soc. Arts, Man. & Com.*

22. *Chronometers.*—Mr. Harvey, F. R. S. E. has lately discovered that *the density of the medium in which a chronometer is placed has a sensible influence on its rate*, in most cases producing an acceleration when the density is diminished or a retardation when the density is increased. In a few timekeepers he has found the reverse to take place, viz. a decrease of rate from diminished density, and an increase from increased density ; but the former appears to be the most general effect. Mr. Harvey has proved this to be the case by an extensive course of experiments, in which he has

subjected many chronometers to pressures, from half an inch of mercury to 75 inches; and in all cases has found, that in all instances if a time-keeper *gained* by *increasing* the density, it *lost* by *diminishing* it, and *vice versa*. A difference of density denoted by an inch of quicksilver, is sufficient to produce in many chronometers, a visible alteration of rate.

Mr. H. has drawn from it several important conclusions: for instance, that a chronometer constructed in London, nearly on the level of the sea, would undergo an alteration of rate, from difference of atmospheric pressure alone, if transported to Geneva, to Madrid, to Mexico, or any other place, situated much above the level of the place where it is constructed.

The whole of the results are about to be laid before the Royal Society. *Lond. Phil. Mag. Vol.* 63, *p.* 311.

23. *Sordawalite, a new mineral.*—This name has been given by M. G. Nordenskiold, Esq. to a mineral from Sordawala in Finland.

The mineral is somewhat like coal in appearance. It occurs massive and without any traces of cleavage. The colour is greenish, or grayish black It is as hard as glass. It occurs in a thin bed, and breaks readily in a direction at right angles to the direction of the bed. The fracture is conchoidal; and the lustre vitreous, inclining to semi-metallic Opaque. Brittle. Spec. grav. 2,530. It becomes reddish on long exposure to the atmosphere.

Its chemical composition is found to be as follows:

Silica,	49.40	Magnesia,	10.67
Alumine,	13.80	Phosphoric acid,	2.68
Peroxide of Iron,	18.17	Water,	4.38
			99.10

24. *Influence of sounds on the Elephant and Lion.*—In the human ear the fibres of the circular tympanum radiate from its centre to its circumference, and are of equal length, but Sir E. Home has found that in the elephant where the tympanum is oval they are of different lengths, like the radii from the focus of an ellipse. He considers that the human ear is adapted for musical sounds by the equality of the radii, and he is of opinion that the long fibres in the tympanum of the el-

ephant enable it to hear very minute sounds, which it is known to do. A piano-forte having been sent on purpose to Exeter Change, the higher notes hardly attracted the elephant's notice, but the low ones aroused his attention. The effect of the higher notes of the piano-forte upon the great lion in Exeter Change was only to excite his attention, which was very great. He remained silent and motionless. But no sooner were the flat notes sounded than he sprang up, attempted to break loose, lashed his tail, and seemed so furious and enraged as to frighten the female spectators. This was attended with the deepest yells, which ceased with the music. Sir E. Home has found this inequality of the fibres in neat cattle, the horse, deer, the hare, and the cat. *Phil. Trans.* 1823.

25. *Aurora Borealis.*—Dr. L. Thienemann, who spent the winter of 1820 and 1821, in Ice and, made numerous observations on the polar lights. He states the following as some of the general results of his observations:

1st. The polar lights are situated in the lightest and highest clouds of our atmosphere. 2d. They are not confined to the winter season or to the night, but are present, in favourable circumstances at all times, but are distinctly visble only during the absence of the solar rays. 3d. The polar lights have no determinate connexion with the earth. 4th. He never heard any noise proceed from them. 5th. Their common form, in Iceland, is the arched, and in a direction from N. E. to W. S. W. 6th. Their motions are various, but always within the limits of the clouds containing them. —*Edinb. Phil. Jour. Vol.* X.

26. *Curious Lunar Refraction.*—Dr. Forster, in a paper read before the Meteorological Society of London, and published in the Lond. Phil. Mag. Vol. LXIII. mentions a curious lunar refraction, which he observed some years ago. About seven o'clock in the evening, the *moon* being five days old, he noticed a double refraction of her image of the following form and relative position ☽ ☽, that is, two distinct crescents instead of one, and so pr cisely similar that it could not be distinguished which was the moon and which the paraselene. Dr. F. thinks this phenomenon analogous to the double refraction in certain laminated spars; and that it may indicate that there existed atmospherical laminæ at that time—which

laminated condition of the atmosphere may possibly be connected with the various contrary currents of air, which exist contemporaneously in successive altitudes in the atmosphere.

27. *Vibration producing the primitive Colours.*—Dr. Forster has also made a curious observation in looking at the stars through a telescope, by giving the telescope a gyratory motion, so as to cause the stars viewed at the time to describe a circle, giving a luminous ring in the field of view of the telescope, instead of a luminous point. It is remarkable that the ring of light thus produced is not uniform in colour, but is *separated into the prismatic colours*, each colour seeming to occupy a certain portion of the circular ring of light. In rapid gyrations of the telescope dark lines are produced, which intervene between the several colours, giving the circle a broken appearance. All of the fixed stars produced this diversity of colours, though the colours were very different in different stars. Thus the blue was the most conspicuous in *Lyra:* for though the successive portions of the ring were red, yellow, green and indigo; yet all these colours were weak compared with the blue. *α Cygni* showed a preponderance of indigo, less yellow and blue. *Beltageus* produced yellow, and intense red and green. *Sirius* showed much indigo, violet and portions of bright white light. *Capella* much orange, red, green, and less of the more refrangible colour. *Aldebaran* principally red, with some green and very faint orange. *Arcturus* produced a much less coloured ring than the others; indeed its portions seemed to be orange and red running into each other. The planets *Jupiter* and *Mars* showed no colours at all; the rings produced by viewing them with a gyrating telescope, being only circles of light of the ordinary and uniform colour of those planets respectively. When any identical star was observed, the same colours were produced in whatever direction the telescope was vibrated.

Dr. F. hints that the different distances of the stars may be one cause of this curious disposition of the light; and that the fact that *Arcturus* resembles the planets, in not affording the colours in any great degree, may afford grounds for considering him as the nearest of the fixed stars.

28. *Declinations of stars proportioned to their Refrangibility.*—Dr. Forster has lately compared the declinations of

thirteen stars, as given by seven different observers ; and finds that, generally speaking, the greatest differences of results have occurred in those stars whose proportionate refrangibility, is the greatest and the least ; and that the differences of results have been the least in *Capella* and those stars whose refrangibility is nearest to the mean. From numerous experiments Dr. F. concludes that the refractions of *Capella* appear to equal the mean refraction, and those of *Lyra* and *Aldebaran* the two extremes.

29. *On the effect of animal charcoal in preventing the putrefaction of stagnant water.*—M. A. Chevalier, of Paris, having been consulted by a gentleman respecting the best method of preventing a pond in his garden from putrefying, recommended the employment of animal charcoal. The experiment was tried with perfect success. The small pond or basin was about 9 feet in diameter and 3 deep. The water proceeded from a spring; but towards autumn it became putrid, and exhaled a mephitic odour. On the 10th of August, 1823, 45lbs of animal charcoal in powder were thrown into it, care being taken to spread it equally on the surface, where it at first floated ; but afterwards fell to the bottom. The effect of this was to remove all offensive smell from the water; and M. Chevalier upon examining a bottle of it, found that it had neither an offensive smell nor taste, though it had been out of the pond for 8 days. M. Chevalier observes that the animal charcoal which has been thus used in a pond might when taken out be used as a manure, as it gives out by slow degrees to vegetable bodies, the substances which it has absorbed. See the Journal de Pharmacie for 1824, p. 73.—*Dr. Brewster's Journal.*

30. *On the phosphorescence of several sub-resins.*—M. Bonastre who has made some interesting experiments on this subject, has given the name of sub-resins, to those which are entirey deprived of essential oil, which are deprived of acid, and which are soluble only in boiling alcohol, ether, or the volatile oils. The property of phosphorescence, when they were pounded in a porcelain mortar with a glass pestle, he found in gum Elemi, gum Alonchi, and the gum Arbol-a-brea from Manilla. In gum Elemi the light was pale and feeble, and less than is shown in pounding sugar. In gum Alonchi well-

dried and heated the light was much more vivid and the colour a little reddish. It gave out slight scintillations. The gum Arbol-a-brea was more luminous than sugar, and even emitted light by friction in water. When these three gums were treated with dilute Sulphuric acid, they were phosphorescent in the same degree. See the Journal de Pharmacie, April 1824, p. 193.—*Ibid.*

31. *Minerals produced by heat.*—It has been very often observed, that the analyses of minerals are of comparatively little value, as long as we are not capable of reproducing by composition what had been dissolved. Professor Mistcherlich has accomplished this important object. We have been gratified by the sight of beautiful and well defined crystals of grayish-white pyroxene, which had been obtained by mixing the constituent parts indicated by analysis in the necessary proportion, and exposing this mixture to the high degree of heat of the porcelain furnaces of Seires. By this means Professor Mistcherlich has succeeded in obtaining several species that occur in nature. He has likewise observed among the different kinds of slags more than forty species in a crystallized state, particularly of such minerals as are found in primitive rocks, but likewise a good many others which have not been hitherto observed. We propose giving in our next number a full statement of the further details of these most important experiments.—*Ibid.*

32. *Ammonia disengaged from plants during vegetation.*—M. Chevalier has determined the very curious fact, that the Chenopodium vulvaria spontaneously disengages ammonia in a very free state during the act of vegetation; and he has also found in conjunction with M. Boullay, that a great number of flowers, even among those that have a very agreeable odour spontaneously disengage ammonia during vegetation. M. Chevalier likewise obtained ammonia from the Chenopodium vulvaria by distillation. (See the Journal de Pharmacie, Feb. 1824, p. 100.)—*Ibid.*

33. *Influence of prussic acid upon vegetation.*—M. C. J. H. Becker in his "dissertatio de Acidi Hydrocyanici vi perniciosa in plantas", which appeared at Jena in 1823, in 4to. has per-

formed a number of experiments, from which it follows that the prussic acid prepared according to Vauquelin's method, destroys vegetable life in nearly the same manner as it acts upon animals. Grains immersed in this acid die or loose their germinating faculty. The more delicate vegetables yield to it more readily than the robust ones. *Ibid.*

34. *Composition of fulminic acid*—M. Libeg has found that the fulminating silver of Howard owes its detonating property to an acid capable of combining in different proportions with different bases, and of thus forming as many detonating salts. MM. Gay Lussac and Libeg having examined this *fulminic acid* have found that this substance which cannot be obtained in an insulated state, is composed of one atom of cyanogen, and one atom of oxygen, forming probably together the *cyanic acid*. Hence the neutral fulminates will be cyanites, and the different fulminic acids bi-cyanites. Journ. de Pharm. Mai 1824, p. 257. *Ibid.*

35. *Sulphuric and hydro-chloric acids found in the Rio Vinagro.*—M. Humboldt has recently communicated to the academy of Sciences, that MM. Boussingant and Rivero, who are exploring the Cordilleras of New-Grenada, have analyzed the waters of a river called Rio Vinagro, and have found in them in a free state, the sulphuric and hydro-chloric acids. *Ibid.*

36. *English locality of metallic lead.*—This substance has lately been found in situ in the neighbourhood of Alston. It occurs in small globular masses imbedded in galena and a slaggy substance, accompanied with red litharge, crystals of blende, and quartz. The vein in which it is found is in limestone, and of the thickness of an inch, widening out to two or three as it goes down. The whole mass within the vein is considerably decomposed, and the ore is found in incoherent pieces, some of which are about the size of a walnut. Many of them have a very slaggy appearance, both externally and internally, while others are pure galena, distinctly cleavable, and coated with a white sulphate of lead, produced by decomposition. A more particular notice of this mineral will soon be given.—*Ibid.*

37. *Annual return of migrating birds to the same spot.*—The late Dr. Jenner, in a curious paper on the migration of birds, published since his death in the *Phil. Trans.* for 1824, mentions the following curious experiment. "At a farm-house in the neighbourhood, I procured several swifts, and by taking off two claws from the foot of twelve, I fixed upon them an indelible mark. The year following, their nesting places were examined in an evening, when they had retired to roost, and there I found several of the marked birds. The second and third year, a similar search was made, and did not fail to produce some of those that were marked. I now ceased to make an annual search; but at the expiration of seven years, a cat was seen to bring a bird into the farmers kitchen, and this also proved to be one of those marked for the experiment.—*Ibid.*

38. *Red Snow.*—The red snow which Mr. Bauer has so admirably figured and described under the name of *Uredo nivalis*, Dr. Hooker in the Botanical appendix, which will soon appear, to Capt. Parry's second voyage, has been disposed to look upon as belonging to the genus Palmella of Lyngbig. In a letter which we have just received from Professor Agardh, of Lund, the esteemed author of so many publications on hydrophytology, that gentleman thus expresses himself:—"A very curious fact, I will mention to you. I have ascertained the singular circumstance that the red snow is an *Alga*, which I call Rotococcus nivalis, and that it is found not only upon all Alps in the Spring, but also on limestone in Sweden, during the summer. It had been observed by Linnæus, and then described as a lichen by Baron Mangel. Having had the opportunity of examining both the *lichen* and the *red snow* from the arctic expedition, I find them to be absolutely the same. My memoir on this singular subject will be published in the Act. Acad. Naturæ Curiosorum in Germany,"—*Ibid.*

39. *Portable Gas Light Companies.*—Our readers will have much satisfaction in learning, that the Portable Gas Company of London is succeeding beyond the most sanguine expectations of its projectors; and the use of the portable gas lamp, invented by our townsman, David Gordon, Esq is hourly extending, and will soon be in general use, wherever oil gas is manufactured. Companies have been formed, and extensive machinery is manufacturing for Paris, Rouen, and

Amsterdam, and companies are forming in Manchester, Dublin, Bordeaux, Lyons, and Nantz. Why was Edinburgh, where this invention was made and first exhibited, the last capital to patronize and adopt it ?—*Idem.*

40. *Changes in the contents of Brine Springs.*—Mr. Henmann, of Schonebeck, in Prussia, observes, that the relative quantity in the contents of brine springs, is subject to a variation in regard to the different species of salts which they contain. The brine from Halle was analyzed in 1786, by Gren, who did not discover in it any muriate of magnesia at all. Mr. Henmann himself obtained in 1798, muriate of lime, and muriate of magnesia, in the proportion of seven to one. Having recently analyzed the same, he found the quantity of muriate of magnesia to be almost double that of muriate of lime. According to an analysis of 1794, the brine of Schonebeck contained only 6000 cwt. of glauber salts, in the same quantity of brine, in which, supposing the contents of muriate of soda to be equal, it contained in 1823, between 37,000, and 38,000 cwt. The latter of these brines contains so much of muriate and sulphate of potash, that nearly 1000 cwt. of these salts are annually obtained for sale. *Schweigger, b.* 10, *p.* 70.

41. *Paper Making.*—A discovery has been made in France of a material capable of superseding the use of rags in paper making. It is a composition that resembles a preparation of the finest quality of rags, and is readily converted into a pulp, without the employment of any kind of machinery, and by which the best kinds of paper are made. This material can be provided at so cheap a rate, that it is estimated its whole cost, including preparation, will be less than sixpence per pound.—*Lond. Journ. Arts and Sciences.* Vol. VIII.

42. *Manufacture of Hats.*—A patent has been granted in England for a peculiar kind of fabric, to be made of a mixture of cotton and silk, for the covering of hats and bonnets, in imitation of beaver. The foundation of the hat or bonnet may be of felt, hemp, wool, or any of the usual materials, and which, when formed, is to be covered by the fabric in question. This fabric is to be woven in an ordinary loom, (by a peculiar process,) and to consist either wholly of cot-

ton, or to have cotton for its basis, and silk for its outside.—*Ibid.*

43. *English Opium.*—The cultivation of the poppy for the manufacture of opium, continues to be prosecuted with success in England. It was mentioned in Vol. VIII of this Journal, that Messrs. Cowley & Staines, of Winslow, in the year 1822, raised one hundred and forty-three pounds of opium from eleven acres and five poles of land. In the year 1823 the same gentlemen raised one hundred and ninety-six pounds of opium from a little more than twelve acres of land. The English opium continues to be generally approved by the medical profession and now sells at two shillings per pound above the best foreign. The soil on which the poppy is most advantageously raised, consists of a good loam; and a porous sub-soil is deemed a circumstance of prime importance; it being observed that however good a soil may appear, if it be situated immediately above clay, no profit can be extracted from it by the growth of poppies. A tolerably correct idea of the fitness of any particular soil for the growth of poppies may generally be formed by observing the shape in which it produces the capsules of the poppies. On suitable land they generally assume the oblate spheriod form, while in unfavourable situations they constantly degenerate into an oval shape, an accident which may usually be traced to disease of the root; and which invariably diminishes the product of opium, and, in a lesser degree, that of seed also.—*Trans. Soc. Arts, Man. and Com. Lond.* Vol. XLII.

43. *Menstruum for Biting-in on Steel Plate.*—A gold medal has been presented by the society for the encouragement of Arts, Manufactures, and Commerce, to Mr. E. Turrell, for his *Menstruum* for biting-in on steel plate. The directions for preparing this menstruum are: Take four parts, by measure, of the strongest pyroligneous acid, and one part of alcohol; mix these together and agitate them gently for about half a minute; then add one part of pure nitric acid; and when the whole are thoroughly mixed, the menstruum is fit to be poured upon the etched steel plate.—*Ibid.*

45. *General Regulations of the Linnæan Society of Paris* *—Art. I. The Linnæan Society of Paris is composed of *Resident* members; of *Auditors;* and of *Honorary* and *Corresponding* members throughout the world. It annually elects a President, and two Vice Presidents. The Secretary is perpetual.

The *Honorary* members have a special right of eligibility to all offices of the institution, and when in Paris, have a seat and vote in all meetings of the mother Society. There exist seventy-one honorary members

The Auditors are selected among those persons whose pursuits are not confined to natural sciences, and who can by their literary talents, practical skill, and liberal services, add lustre and celebrity to the object of the Institution. These, with the corresponding members, who are very numerous, have also the privilege of a seat and vote. The number is thought to be nearly seven hundred.

The 5th Class is that of the ladies, *associées libres.* They have seats at the two general and public meetings of the 24th May, and 28th of December, and once every three months. The task of ornamenting the Linnæan Hall, and the arrangements of the annual festival, are exclusively committed to their care. They are twenty-four in number.

Art. II. Seven or more *Corresponding* members, residing in any distant city, or district, are priviliged to organize themselves as a colony or branch of the Linnæan Society of Paris, and adopt such regulations as they please, not inconsistent with those of the Parent Society, who appoint their President as an Honorary member, and perpetual in his office. With him and the Secretary of the section, the official correspondence, and the scientific communications, are exchanged. The sections are allowed also to elect resident associates in their own district; and from these, by their unanimous vote, they may choose or present Honorary or Corponding members of the Paris institution, from which being elect, they are entitled to a diploma.

Art. III. All Linnæan members are obliged to contribute for the general stock of useful knowledge, of improvements

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* Forwarded, together with an account of the hail-rod, by Dr. F. Pascalis, President of the New-York Section of the Linnæan Society of Paris, for insertion in this Journal.

and discoveries in botany, horticulture, and all branches of natural philosophy, by transmitting a copy of their works, memoirs, or essays on those subjects, to be deposited in the general collection at Paris: also specimens or drawings of exotic or rare plants, seeds, and such productions as deserve the attention of the learned. 2dly, by subscribing to the Linnæan Transactions or Annals, which are yearly published. This injunction is obligatory on all national members, but as the foreign members have a right to all materials of instruction, it is expected they will in general secure it by subscription.

Art. IV. The Linnæan Society of Paris annually present for the use of each section, the yearly reports of the perpetual Secretary, and a copy of all internal transactions or the annals, and other scientific works as are distributed by the authors, with the printed narrative of the general meetings and festivals. In proper season also, a distribution is made to all sections or colonies, of their share of new or rare seeds, slips, roots or plants, or forests trees, and the same offerings are expected from them as far as circumstances can permit.

Art. V. To each additional printed catalogue of new members, the names of those are added who, by neglect or omission of the regulations, cease to belong to the institution.

46. *Hail-Rod.*—This instrument which was first put in in practice by M. Lapostolle, professor of physic and chemistry at Amiens, has been thought very useful in protecting from hail, vineyards, and other cultivated grounds in Europe. Dr. Pascalis, in an address delivered at a meeting of the New-York Section of the Linnæan Society of Paris, on the 13th of June last, after adverting to the discovery of this instrument, proceeded with the following remarks.

" After these attempts, a member of our Linnæan Society took up the experiment on an extensive scale, and with the view of obtaining a greater mass of testimonial evidence, he experimented on a broad range of inhabited and cultivated farms in the department of the Pyrenees, protecting by the rod, those spaces which had been the most devastated by hail; and during the three seasons for the trial, of 1821, '22, '23, the result was again highly corroborative. This being made public, the use of hail-rods (*paragreles*) became popular in the environs of Munich. Trieste, Milan, and a great part of

Lombardy, in many places along the Pô, and has now reached even Bavaria and Switzerland. I here omit a long catalogue of other certified facts and experiments, mentioning only that these hail-rods are said to possess an additional property, that of dispelling, in a great degree, the fogs which infect the northern districts of Italy. The Linnæan Society of Paris considers the efficacy of this new process sufficiently authenticated; but it being still in opposition to the theories of the learned, it is left to the concurrence of philanthropists and great land-proprietors to establish it finally by trial and irrefragable evidence: on their testimony it ultimately depends. The Society solicits well substantiated accounts of localities, times, seasons, and other fundamental circumstances of our experiments, for which premiums and other encouragements will be devised and distributed at the winter session of 1825."

Dr. Pascalis remarks that "though a sufficient number of metallic rods would effectuatly arrest the danger, [of hail,] they are things of the last resort, being a remedy too expensive to be applied."

Description of the Hail-Rod (Paragrele) *as recommended by the Linnæan Society of Paris.*—Select a pole of any wood whatever, and about seven metres (say twenty-five feet) in length, of a thickness sufficient to ensure its supporting itself, and strip it entirely of the bark by which it would be likely to damage soon. There must then be applied along this pole, a rope of ripe rye or wheat straw, composed in the following manner. The straw, well soaked in spring water, is to be plaited four stranded; each of the strands to be composed of three smaller plaits, making in all a stout rope or cable of thirty-four millimetres (from two inches to two and a half) in diameter. The tighter this rope the better. It must be tied at top and bottom to the pole with red copper or brass wire, and bound to it with strips of the same wire at every fifty centimetres. (twenty inches.) Through the middle of this rope from end to end, and drawn perfectly straight, there must run a thin twine of raw flax, (by no means of tow; hemp is too imperfect a conductor,) of ten or twelve twist; this twine must be fastened at the top of the pole, to a rod fixed there of *yellow brass* latten. This rod is to be one fifth of an inch in diameter, and twelve inches long. This pole may be solidly fixed on houses, trees, or oaken posts, six or seven feet long, and buried in the ground for half their length. Such hail-rods are estimated to cost not more than fifty cents a piece, and to last from twelve to fifteen years. They must be raised, however, after harvest, put under cover with the other rural implements, and only replaced at the vernal equinox. By these rods the lightning is diverted from houses and barns, and the fields preserved from hail-storms. Their effects appear to extend on a radius of fifty for each rod, and they should be placed within one hundred or one hundred and thirty feet of each other.

N. B. Any communication on the above subject, post paid) will be thankfully received by Dr. Felix Pascalis, President of the Linnæan Section, No. 486 Pearl-street, N. Y. or by Dr. Elijah Mead, Secretary of the same, Beekman-street, near Pearl.

II. Domestic.

1. *Proceedings of the New-York Lyceum of Natural History.*

[Continued from Vol. IX. p. 91.]

March 1, 1824.—Dr. Madianna read his "Observations and experiments on the seeds of the Cerbera Thevetia." Inserted p. 86 of the Annals of the Lyceum. The President, Dr. Torrey, read an account of the Columbite of Haddam, (Conn.) with notices of several other North American minerals, inserted p. 89.

March 8.—Dr. Mitchill communicated a paper "On the two-headed Serpents of North America," which was referred to the Committee of Publication. Dr. Dekay read an account of the Phoca cristata recently taken in the vicinity of New-York. Inserted p. 94.

March 15.—Mr. J. Cozzens reported on a poisonous fish of the Antilles, presented at a former meeting. It is the *Tetrodon testudineus* of authors, and is highly deleterious. A paper, by Messrs. King & Ludlow, entitled "Appearances on dissection of the Phoca cristata," was then read to the Society. It was accompanied by several beautiful and interesting preparations made from this animal. Baron G. Cuvier, of Paris, was elected an *Honorary Member* in the place of the Abbé Correa de Serra, deceased. P. R. Ricard Madianna, of Paris, and J. I. Bigsby, of the British Medical Staff were chosen Correspondents.

March 22.—Captain Le Conte read "Observations on the North American species of the Genus GRATIOLA." Inserted p. 114. A specimen of earth called "*Matari*" was presented by Dr. Madianna, used by the negroes of the Antilles as an article of food. It is a soft steatitic earth, with a small proportion of iron. It resembles a similar earth which is frequently eaten in Africa, with little injury to the system. The use of the *Matari*, however, generally proves fatal, inducing inflammation of the stomach or dropsy.

March 29.—Dr. Van Rensselaer read a paper by Dr. J. I. Bigsby, entitled "An Account of Minerals and Organic Remains occurring in the Canadas." Vide American Journal of Science and Arts, Vol. VIII. p. 60. Dr. Madianna read his "Researches and Experiments on some species of the genus Passiflora." Inserted p. 127 of the Annals.

April 5.—Mr. Barnes communicated "Observations on Cyprea," &c. with descriptions of some apparently new species.

April 19. Mr. Cooper communicated a paper "On the Megatherium, recently discovered in Georgia." This paper was accompanied by a collection of the bones themselves of this huge extinct quadruped. Inserted p. 114 of the Annals. Mr. Halsey read a paper entitled "Remarks on certain Eutozoical Fungi." Inserted p. 125 of the Annals. Prof. J. G. Christian Lehman, of Hamburgh, was elected Honorary Member in the room of the Abbé Haüy, deceased.

April 26.—Dr. Van Rensselaer read an analysis of Humboldt's work entitled "Essai Geognostique sur le gissement des Roches dans les deux hemispheres," referred to him at a former meeting. Col. Totten read a paper entitled "*Notes on some new Supports for Minerals subjected to the action of the Blowpipe.*" Inserted p. 109. Dr. Madianna communicated a paper on the poison of the *Hipomana mancinella*, of the Antilles.

May 2.—Captain Le Conte read a paper on the Genus Ruellia. Inserted p. 140 of the Annals.

May 10.—A paper by Mr. Ralph Granger, of Ohio, was read, announcing a variety of *Corydalis formosa*, accompanied by specimens. Dr. Hancock of Demarara, and Drs. Wm. R. Wainy, and I. C. Habersham, of Savannah, Geo.

were chosen correspondents. H. Juman, Esq. was unanimously elected Draughtsman to the Lyceum. A report was received from Messrs. Cooper, Dekay, and Van Rensselaer, relative to a fossil Mastodon, from Monmouth co. New-Jersey.

May 17.—Mr. Frederick Cozzens read an account of a new locality of Cyanite, in the vicinity of the city, with an analysis of the mineral. A voluminous communication from Mr. Rafinesque, detailing his discoveries in zoology and botany, was referred to the Committee of Publication. The President, Dr. Torrey, read a continuation of his descriptions of some rare grasses from the Rocky Mountains. Inserted p. 148 of the Annals.

May 24.—Professor Hall announced the discovery of a green marble, at Rochester, Vermont, and that steel of an excellent quality was manufactured not only at Andover, but also at the Franconia works.

June 15.—Dr. Van Rensselaer communicated to the Lyceum, a notice of a new locality of the noble serpentine from Newbury, Mass., and green feldspar from Beverly, accompanied with specimens. Professor Drapiez and Van Breda of Antwerp, and Mr. Wm. Van Winthem of Hamburg, were chosen correspondents.

May 21.—Mr. J. Cozzens presented to the Cabinet of the Lyceum, a new species of fish from the Hudson, accompanied by a description. Mr. Cozzens arranges it under the Genus *Encyclus*, and proposes the specific name of *eolus*, referred to the Committee of Publication. The President read a descriptive catalogue of minerals, presented by Dr. Emmons of Chester, Mass., to the Lyceum. Mr. Jessup communicated verbally, a notice of several new localities in Massachusetts, of the following minerals. Fluate of lime, at Southampton; actynolite rock, and massive red oxide of titanium, at Westfield. B. Dearborne, Esq. of Boston, was chosen correspondent. The Lyceum then adjourned to the first Monday in August.

August 2.—A communication by Dr. Dekay, was read "On the popular belief respecting animals said to have been found in solid rocks, and showers of animals." The paper was referred to the Committee of Publication.

August 9.—The Recording Secretary read a paper from De Witt Clinton, Esq. on the "*Hirundo fulva* of Veillott, a species of swallow rapidly extending over the United

States." A specimen of the bird and its nest accompainied the description. Louis Woodbury, M. D. of Mexico, was chosen a correspondent of the Lyceum.

August 16.—The President presented a specimen of Spodumene from Sterling, the first locality hitherto known of this mineral in America. Also, Nuttallite from the same place, together with carbonate of iron and macle, from Bolton, Mass. Mr. J. J. Anderson read a paper on the permanent residence of the swallow in the United States. Inserted p. 166.

August 23.—The Corresponding Secretary, Dr. Van Rensselaer, read an analysis of Mr. Eaton's work, entitled "Geological and Agricultural survey of the district adjoining the Erie canal," which had been referred to him at a former meeting.

2. *American Geological Society.*—The annual meeting was held at the usual time and place, and the following persons were elected officers of the Society for the ensuing year.

Officers of the American Geological Society, chosen Sept. 1825, at the annnual meeting.

William Maclure, *President.*

George Gibbs,
Benjamin Silliman,
Parker Cleaveland,
Denison Olmsted,
John W. Webster,
Robert Gilmour,
Robert Hare,
Edward Hitchcock, } *Vice Presidents.*

Alfred S. Monson, *Recording Secretary.*

J. W. Webster,
Charles Hooker,
John Griscom, } *Corresponding Secretaries.*

D. Olmsted, *Curator.*

Chauncey A. Goodrich, *Treasurer.*

B. Silliman,
G. Gibbs,
P. Cleaveland,
R. Hare,
Eli Ives, } *Committee of Nomination.*

G. Gibbs,
J. W. Webster,
James Pierce,
B. Silliman,
} *Committee of Publication.*

Contributions to the American Geological Society, since our last report.

By the President, William Maclure, thirty-three volumes quarto, full bound, of the *Journal de Physique*, from Vol. LIV to LXXXVI inclusive, besides parts of some other volumes. Mr. Maclure's intention was to present the work complete; including preliminary and supplementary volumes: it extends to about one hundred volumes, and the Society, through the bounty of Mr. Maclure, are now in possession of the whole of this grand magazine of modern science, except Vols. LII and LIII which are still wanting, as are also two or three volumes or parts of volumes at the end of the series. With the exception above named, it is complete to Vol. XCIV inclusive, which comes down from 1771 to 1822, and there are some numbers in 1823 and 1824. The work we understand is now discontinued, but the Society will take care that the few deficiencies in their copy, shall, if possible, be supplied.

The Revue Encyclopédique.—From the same gentleman there have been received all the numbers from XLIX to LXIX inclusive, and as the Society had before received all the numbers before XLIX; they have now received from Mr. Maclure XXIII volumes of this work down to Sept. 1824.

Michaux's North American Sylva, with one hundred and fifty-six coloured engravings. This magnificent work in two large volumes, in Mr. Hillhouse's translation, has been also presented by Mr. Maclure. It has been already stated in the present number, that Mr. Maclure lately bought at Paris the balance of the edition of this celebrated work, and brought it out to this country for the benefit of American Science.

French Romances, Tales, Poems, &c.—Between forty and fifty volumes, 12mo. of these, most of them elegantly bound, besides pamphlets, were contained in the same box with the Journal de Physique; they were put in to fill the box, and although most of them bear no relation to science, they will be acceptable to the lovers of French literature.

The Westminster Review.—Several of the early numbers of this new work have been received from Mr. Maclure.

Dr. Van Rensselaer's Geology.—A copy of this work has been presented by the author.

3. *Correction communicated by A. B. Quinby.*

PROF. SILLIMAN,

SIR,

Since my solution of the *crank problem* was published in your Journal, it has been stated to me by several individuals, that "the London Journal of Arts and Sciences contains a solution of this problem, in which the writer finds the same result as that which I have established in my demonstration." As this statement has recently been much reiterated, and as I wish not to rest under the charge of having copied the demonstration of another writer, I beg the liberty to state, publicly, in your Journal, that the solution published in the London Journal is *not* the same as that which I have given in your Journal. The solution contained in the London Journal, (Vol. 3. p. 252.) besides being different from mine, is erroneous; and does not embrace the principles of the *crank problem.* The author makes precisely the same error as was committed by Mr. Ward in your Journal; by assuming that "the effects produced at the several points of division of the quadrant, are as the perpendiculars respectively from those points to the line of force." This error is shown in my demonstration at page 318, line 2; and page 321, line 8, Vol. VII.

A. B. QUINBY.

New-York, Aug. 24, 1825.

N. B. There is a second paper in the London Journal on the *crank;* but it is less scientific than the first, and embraces the same error.

A. B. Q.

4. *Correction communicated by G. W. Carpenter.*—In the communication on Cinchona Bark, p. 365, Vol. IX, the following passage, i. e. "Experiments which I made upon the Carthagena bark, of rather better quality than the market generally produces, yielded about one twelfth less quinine

than the Calisaya," should read thus, as it stands in my original manuscript, (the error having been made in transcribing,) "Experiments which I made upon the Carthagena bark, of rather better quality than the market generally produces, yielded one twelfth the quantity of quinine produced by the Calisaya arrolenda."

5. *Quere—Indian Summer.*

To the Editor,

Will you please to insert in the next number of your Journal, the probable causes of the peculiar aspect of the sky during that portion of the month of November, commonly called "Indian Summer?" The only object sought for by this question is information; by publishing an answer to which you would oblige,

Sir,

A CONSTANT READER.

Fishkill, May 21, 1825.

The above inquiry suggests a fair topic of discussion, upon which we should be willing to receive a communication.

Editor.

6. ***Recipe for driving Insects from trees***—communicated.—Bore a hole into the trunk of the tree, as far as, or into, the heart, fill this hole with sulphur, and place in it a well fitted plug. A tree of from four to eight inches in diameter requires a hole large enough to admit the little finger, and in the same proportion for other and larger or smaller trees. This will usually drive the insects away in the course of forty-eight hours, but uniformly succeeds, perhaps sometimes after a longer time. These facts were mentioned to me by the Rev. Dr. Woodhull. He stated that a fine large shade tree in Albany, was so infested with worms and caterpillars that passers by were obliged to make a circuit to avoid it; it became so much of a nuisance that they were on the point of cutting it down, when the application of this experiment in forty-eight hours entirely cleared it of the insects. Col. Rutgers, of New-York, has tried this experiment with (I think) uniform success; and in several instances, fruit-trees which were almost lifeless were restored.

B. D. S.

7. *Notice of the Anthracite Region of Pennsylvania*, in a late letter to the Editor from William Maclure, Esq.—We made an interesting tour through the anthracite region of this state, and found an immense mass of combustible matter, more favourably situated for being extracted from the earth, and with less labour than any coal I have yet seen. The coal beds are situated in hills from three hundred to six hundred feet above the level of the rivers and canals. The beds or strata of coal, being inclined at a pretty high angle from the horizon, may all be wrought by subterranean canals, going from the rivers made navigable by dams. The hills which at present, by the carriage on the surface, are the cause of much expense, may, by canals following the beds, be worked every where above the water level, at little or no expense, and at the same time the whole field will be effectually drained; an advantage that few or no coal fields in Europe enjoy, and from which the Duke of Bridgewater has derived great profits. This immense formation of anthracite will render this state the most productive in the union; for as soon as they can contrive a good mode of smelting iron ore with the anthracite, this will become one of the greatest iron countries on the globe, because having so much fine magnetic iron ore, and the natural state of the combustible rendering it capable of producing a very strong heat, without any preparation of coaking or adulterated with any mixture injurious to the making of iron; these circumstances constitute so many advantages as are scarcely to be met with in any one locality as yet known. The benefit that will arise to the nation from a proper method of smelting iron with anthracite, is such an object as to interest the ingenuity of all classes. For the purpose of experiment, it is necessary to procure a furnace on a small scale, as the high furnace is too expensive. The fault complained of being that the mass freezes, or does not retain its fluidity sufficiently, perhaps from the blast being too weak or too cold, or not sufficiently disseminated through the mass, owing perhaps to the want of the proper proportions of ore, coal, and flux; the form of the furnace used for charcoal may not be fit for a much greater heat, &c. &c. In short, it may be necessary to try all proportions of blast, fuel, ore, and flux, with all forms and dimensions of furnace.

8. *New Locality of Rubellite, Beryl, Tourmaline, &c.*

Extract of a letter from Mr. Stephen C. Wiliams to the Editor, dated MIDDLETOWN, Oct. 8th, 1825.

DEAR SIR,

I have taken the liberty of sending you with this letter specimens of some minerals, no localities of which have been before noticed in this place.

The light green crystals were found imbedded in the granite rocks near the lead mines, two miles below the city. Their form, most of them being six sided prisms, their colour, and their hardness, which is greater than that of quartz, induce me to think that they are *beryls*. Some have been obtained five or six inches in diameter, and eight or nine in length.

The pink coloured specimens were discovered in a detached mass of the granite in the same vicinity, and from the information which I have been able to gather by referring to Cleaveland, I flatter myself you will pronounce them *rubellite*. In the larger of the two, you will observe a green substance which I concluded must be *tourmaline;* in the same piece there is also a small crystal in which the tourmaline, if it be so, is *enclosed* in the *rubellite*. A small specimen of rose coloured mica accompanying it was found at the same place. These particulars, corresponding so nearly with the description of the Chesterfield locality, seem to afford strong ground of probability that the minerals discovered here are of the same species.

Remarks by the Editor.

We have the satisfaction of agreeing with Mr. Williams in all the opinions he has expressed, and of adding, that the spemens are so well characterized as to justify further research, and there can be little doubt that these interesting minerals will soon be found *in place*, unless indeed they were years ago thrown out from the pits and galleries of the old abandoned lead mines which are now filled with water. Mineralogists will learn with interest, that the place mentioned by

Mr. Williams, is the gorge where the Connecticut river, leaving the secondary, breaks through the primitive ridges, which are from this spot uninterruptedly continued to the famous locality of crysoberyl, beryl, &c. at Haddam, which is only a few miles below, and belongs to the same geological formation. This region is famous for large beryls. One of those transmitted by Mr. Williams, is two and a half inches in the diagonal diameter, and is a well formed crystal.

Some of the rubellites are half an inch in diameter, the crystals are distinct, and the colour lively and delicate. A group forwarded me by another gentleman for inspection, and to be returned, is singularly rich. It is situated in a mass of granite, and covers a space of about four inches on each side. This space is filled with crystals of rubellite, laterally aggregated like columns of basalt, or like the columnar argillaceous iron ore; there appear to be forty or fifty of them, and they are as distinct as crystals so closely compressed usually are. In the midst of them there lies a large crystal of the size of a thumb, of a dark leek green which much resembles sahlite, but as there is in another part of the stone a large crystal of rubellite, containing a distinct crystal of the green substance, perfectly threaded, longitudinally through it, in the manner of the Chesterfield tourmaline, although in the reverse order, it appears probable that the green crystals are tourmaline.

We trust that every attention will be given to this new and interesting locality.

P. S. October 15, 1825. The following information has just been received from Mr. Williams, in a letter dated

MIDDLETOWN, Oct. 12th, 1825.

I am happy to inform you that I have discovered rubellite, beryl, &c. in place. The rock in which they are situated is two and a half miles south-east from the city, and forms part of the primitive region, which crosses the Connecticut river at the narrows. The rubellite is found in a bed of granite, where it is associated with green tourmaline in a vein of quartz and feldspar traversing the granite. The green tourmaline is frequently inclosed in the red, the sides and angles of both prisms corresponding: a crystal of this kind, which I saw, but was unable to detach from the rock, measured three quarters of an inch in diameter. The same granite contains rose coloured mica, garnet, and beryls, similar to those in your possession. With the assistance of a competent person, I blasted the rock yesterday, and obtained some fine specimens of the green tourmaline and very good sized beryls, one four inches in diameter, and six inches in length. The rubellite and rose coloured mica were not as abundant as I could have wished. I procured, however, all that was visible in the two veins, which I discovered, and from the great abundance of granite in the vicinity, which is frequently traversed by veins of quartz and feldspar, exhibiting the green tourmaline and beryls, I am confident more will be found.

9. *Small-Pox.*—Dr. F. Pascalis, in an essay read before the County Medical Society of New-York, April 11, 1825, maintains that the virus of small-pox "is a compound and morbid formation from human effluvia"—that it "is an animal poison, exclusively proceeding from human beings, and that when prevailing as an epidemic, it is of a recent and fresh formation"—and that it "may be often renewed in camps, jails, ships, hospitals, and burying-places, as well as in all dense assemblages of human beings." "This specific matter, it appears, is formed or aggravated by an animal or deleterious effluvium, which passing from man to man, from breath to breath, gradually acquires its elementary intensity, by which a single particle or atom of it, similar to leaven, excites a general ferment of the whole lymph of the human fabric." The variolus fomes can exist, Dr. P. thinks, under different and modified forms, such as *chicken-pox*, *swine-pox*, &c. which have been designated by the generic name of *varicella*. Dr. P. discards the commonly received opinion, "that the small-pox is specifically *unique and sui generis;*" and holds that there is an important distinction between *epidemic* small-pox, and *artificial* or *inoculated* small-pox. Vaccination, he thinks is a complete preservative against *artificial* small-pox; but neither the vaccine disease, nor the inoculated small-pox is a complete preservative against the *epidemic* disease.

Note.—Some Meteorological notices, and other items of domestic intelligence, are unavoidably deferred.

THE

AMERICAN

JOURNAL OF SCIENCE, &c.

GEOLOGY, MINERALOGY, &c.

Art. I.—*Memoir on the New or Variegated Sandstone of the United States.* By J. Finch, F. B. S. M. C. S. &c.

To advance the study of Geology, it is requisite that rocks or formations, possessing similar characters, should be called by the same name, in whatever part of the surface of the earth they may be found.

In the geological map of the United States of America, a formation, coloured blue, extending from New-York to Virginia, has hitherto been called old red Sandstone. Some members of it appear to me to belong to a very different formation—to one much higher in the series—to the new or variegated Sandstone.*

I have examined this rock in a great variety of positions, but it is best displayed at the quarries, one mile North West of the town of Newark, in New-Jersey, where there are extensive excavations, which have been worked more than a century, and from whence New-York has been, and still is, supplied with large quantities of building stone. These quarries exhibit a nearly perpendicular section, which shows the following varieties.

* In New-England, the old red Sandstone, so ably described by Mr. Maclure, is the basis of the formation but some of the upper strata appear to correspond with the views of Mr. Finch.—Ed.

25 ft.	Marley sand, containing detached rolled masses of Sandstone.
9 ft.	Fine grained Sandstone.
10 ft.	Sandstone and slaty Sandstone.
3 ft.	Do.
1 ft. 6 in.	Slaty marl.
2 ft.	Sandstone.
6 in.	Slaty marl.
7 ft.	Coarse grained Sandstone.
6 ft.	Thin strata of Sandstone and slaty marl.
8 ft.	Sandstone, very fine grain.

The working of the quarry below this is interrupted by water.

The following are some of the varieties which occur at these mines:

1. Grayish white fine grained Sandstone.
2. Brown red do. do.
3. Vermillion red do. do.
4. Sandstone containing nodules of indurated marl, sometimes called clay galls.
5. Conglomerate with pebbles.
6. Sandstone with greenish specks, and containing decomposing feldspar.
7. Sandstone divided into thin plates by shining laminæ of marl.
8. Sandstone, grayish white with red spots.
9. Sandstone, dark gray, brownish yellow, and various shades of red.

In some parts of the quarry are found grayish white micaceous sandstones, containing vegetable impressions, with the bark converted into coal.

Some of the Sandstones contain small crystals and plates of green carbonate of copper, others have on their surface illinitions of manganese.

Copper mines are now opened in this formation, at Belleville, Somerset, and Bridgewater, New-Jersey. The lead mine at Perkiomen, Pennsylvania, belonging to Samuel Wetherill, Esq. is situated in a Sandstone of the same age.

In the vicinity of Princeton the rocks possess a similar character, and are composed of parallel strata of compact and slaty Sandstone, and indurated marl.

At the rocks, near the Delaware, ten miles South of Easton, Pa., the second Sandstone forms abrupt precipices, in many places, much decomposed, and presenting the appearance of massy columns.

The formation upon which the trap rocks (the newest flœtz trap of European geologists) repose at Patterson, is second or variegated Sandstone.

I accompanied Professor Renwick, on a visit to Passaic Falls, and that gentleman coincided in this opinion. Professor Akerly, of New-York, has, I believe, expressed a similar idea in one of his publications.

Beneath the Palisadoes, or trap rocks, on the shores of the river Hudson, is a sandstone which belongs to this class.

The soil produced by this formation is peculiarly adapted to fruit trees, and yields excellent pasture land; it is not so well adapted for winter grain; the farmers complain that the seed freezes out of the ground.

The surface of the country is waved, or undulating; the hills are distinguished by their gentle slope.

At Belleville and Newark, New-Jersey, the bones of extinct animals have been found in this formation.

The inclination of the strata seldom exceed 12° to 15°.

I have not yet seen the sandstone of Connecticut river in situ; but from the descriptions which have been published in the American Journal of Science, and specimens which I have seen at Boston, Massachusetts, where it is conveyed for architectural purposes; I am disposed to consider it as belonging to the variegated sandstone. It is also superior to the bituminous shale, containing fossil impressions of fish.* In Germany, the second sandstone has the same position.

Finally: The rocks, which I have hitherto mentioned in this memoir, may be classed with the second or variegated sandstone of Europe, on account of their mineralogical character—the variety of their colours—their alternation with strata of marl—the agricultural qualities of the soil—their geological position—the slight inclination of the strata—by containing the fossil bones of animals, and mines of lead, copper, and manganese.

Those who would wish to view the transition, or old red sandstone, may see it in the mountains which bound the coal formation of the Lackawannock, and the valley of Wilkesbarre; in the blue mountains of Pennsylvania; at the water-gaps of the Lehigh and Delaware; and at the gallery forming by the Lehigh Coal Company at the Mauch Chunk mines.

126 Broadway, New-York.

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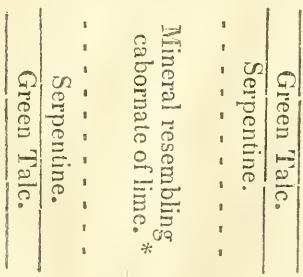
* According to Mr. Hitchcock, these are found only under the Sandstone of the coal formation, and not under the old red Sandstone.—Ed.

Art. II.—*Notice of Rocks and Minerals in Westfield, Mass.* By Emerson Davis.

Professor Silliman,

Having examined the rocks in this place, I am prepared to mention a few facts relative to their position, and to the minerals they contain.

On the mountain, 5 miles west of Westfield Academy, are two beds of serpentine; one of which, has never been mentioned in the geological accounts of this region, that have been published. It is imbedded in mica slate, and associated with primitive carbonate of lime. The limestone is at the south end of the bed, and they pass into each other, forming a stratified rock, with strata nearly perpendicular to the horizon. These strata, for the most part, seem to be alternations of Serpentine, and an unknown mineral resembling lime, about one inch in thickness. Sometimes they are found blended together, forming a compound similar in appearance to the *Verd Antique*. Here are found also veins of the same unknown mineral, serpentine, and green talc, associated as represented in the following profile.



* This mineral has a specific gravity, between 2.3 and 2.5—readily scratches glass—fine foliated in structure, like primitive limestone—with difficulty melts into an enamel before the blowpipe—does not effervesce with acids.

In some places colour rose red or purple. The mineral is suspected to be an interesting one, and is now under consideration.

This vein abounds in crystals of

1. *Schorl*, 1 inch in length, and varying from ½ to 1 inch in diameter, terminated by 3 faces, having the terminal edges truncated.

2. *Actynolite*, of several varieties is found connected with this bed. It is found in carbonate of lime, and massive, or associated with green talc. The most beautiful variety is the

3. *Fibrous Actynolite.*—It is composed of small fibres, which easily separate by pressure between the fingers, and resembles asbestus.

Another bed of serpentine occurs on the opposite side of the river, 1 mile north of this. It is the one mentioned by Professor Eaton, in his index, as found in granite, and so quoted by the Rev. E. Hitchcock, in Vol. VI. p. 227, of this Journal, and also in Cleaveland's Mineralogy, p. 435. It is manifestly in a mica slate region, for this rock appears at the surface in all directions, from the serpentine. There are bowlders of granite scattered about, and perhaps a bed. But I can hardly persuade myself, that this serpentine is contained in granite; for then we shall have, in mica slate, a bed of granite containing a bed of serpentine.

This serpentine is black in the mass; thin edges transmit a greenish light. It is of a foliated structure, the surfaces of the laminæ having nearly the lustre of hornblende. The cross fracture is dull and uneven. Sp. Grav. 2.6. When pulverized, it may be taken up by a magnet, like iron filings. I have serpentine, in my cabinet, from several localities; none of the specimens are affected by the magnet. It seems to me, that serpentine of this structure, and having magnetical properties, should form a new variety, and be called *magnetic serpentine*. There is a yellowish green mineral associated with this serpentine, its structure is somewhat foliated, diverging, and variously grouped, probably *sahlite*, and so called by some good mineralogists.

On the banks of the river, between these two localities, are several rocks of tons weight, that to the eye of the beholder, seem to be composed of a grayish white talc, containing pieces of black serpentine, from 2 to 4 inches in length, and 1 in width. On breaking the rocks, and cutting away the talc, I found, irregularly 4 sided prisms, of a hair brown colour, hard enough to scratch glass feebly; are they anthophyllite?

In West-Springfield, 6 miles east of Westfield Academy, I find veins of

4. *Coal*, in rocks called the coal formation in Hitchcock's geology of Connecticut river. The veins are numerous, and generally contain either imperfect rhombic crystals of lime, diagonals ¼ inch, or satin spar.

5. *Sulphate of Lime* (gypsum) is found between the layers of slate. It resembles fish scales, ½ inch in diameter; easily detached from the slate. It immediately turns white before the blow-pipe, does not effervesce with acids, and affords small rhombic crystals by cleavage.

6. *Bituminous Marlite* is found near this place. It has a slaty structure, though not easily split. It has a conchoidal fracture, and a glimmering lustre. When pulverized effervesces strongly with acids, and by pounding yields a bituminous odour. It contains

7. *Pyritous Copper* in irregular concretions. The globules, when broken are often beautifully pavonine.

North of this locality, 4 miles, is a bed of

8. *Bituminous Carbonate of Lime*. It yields a strong bituminous odour. Sp. grav. 2.62. It was formerly burnt for lime.

I have seen one specimen of an icthyolite, found in the vicinity of the bituminous marlite.

Westfield, Sept. 16th, 1825.

APPENDIX TO THE ABOVE PAPER.

REMARK BY THE EDITOR.

Mr. Chilton has been so obliging, as to perform the following experiments upon the unknown mineral, mentioned in Mr. Davis's account, and which has been suspected by him, to be Petalite. In the want of a fuller analysis, which we are allowed to look for, these notices may be useful.

Twenty-five grains were fused with half their weight of potash; after solution in muriatic acid, evaporation, &c., the dry mass was covered with alcohol, Sp. gr. 8.25, repeatedly shaken in a vial, and suffered to stand till the next day. The clear solution was decanted off, and paper dipped in it, inflamed without perceptible redness.

Supposing the quantity taken, too small, the experiment was repeated with fifty grains of the mineral, and more than its weight of potash. The dry mass obtained, as in the last, was treated with alcohol in a similar way. Papers dipped in the solution and inflamed, presented nothing different from what was observed in the last experiments.

Part of the alcohol was distilled off and the remainder evaporated to dryness, and re-dissolved in the alcohol that had been separated by distillation, shaken, and suffered to stand twenty-four hours. Papers were prepared, some of which were dipped in the solution, and others in alcohol; they both burned alike when inflamed. To discover what the alcohol had taken up, the alcoholic solution was evaporated to dryness and left exposed to the air. In a few hours it was damp; a little distilled water was then added, and tests applied, with the following results.

The carbonated alcalies, pure ammonia, and oxalate of ammonia threw down precipitates.

The portion to which carbonate of ammonia had been added, was filtered, and phosphate of soda applied; the result was a copious precipitate.

These trials of course, indicate both lime and magnesia.

Recollecting that Black mentions the circumstance of muriate of lime, dissolved in alcohol, burning with a red flame, I formed some of that salt, and put alcohol over it; shook it and set it on fire. The flame was distinctly *red*. The salts of strontia, dissolved in alcohol, and inflamed, exhibiting the same appearance, inclines me to regard this test of lithia, as somewhat ambiguous.

It is easy to see that the lime obtained from the mineral, according to the trials with tests, must have escaped detection, by burning the alcoholic solution of its muriate. This may possibly have arisen from using too large a proportion of alcohol; and in this way lithia may have escaped detection also

The silex from the 50 grains weighed, after ignition, 36 grains—not far from the proportion in which it exists in the Petalite.

By the continued heat of the blow-pipe, I was able to fuse a small portion of the mineral held by platina pliers.

Berzelius mentions the action of lithia, on platina foil, as characteristic, but I have not yet made this trial. As our mineralogists have pronounced it petalite, I feel inclined to submit it to a regular analysis.

Art. III.—*Remarks on Bowlders.* By Peter Dobson.

TO PROFESSOR SILLIMAN.

Sir,

I have had occasion to dig up a great number of bowlders, of red sandstone, and of the conglomerate kind, in erecting a cotton manufactory; and it was not uncommon to find them worn smooth on the under side, as if done by their having been dragged over rocks and gravelly earth, in one steady position. On examination, they exhibit scratches and furrows on the abraded part; and if among the minerals composing the rock, there happened to be pebbles of feldspar, or quartz, (which was not uncommon,) they usually appeared not to be worn so much as the rest of the stone, preserving their more tender parts in a ridge, extending some inches. When several of these pebbles happen to be in one block, the preserved ridges were on the same side of the pebbles, so that it is easy to determine which part of the stone moved forward, in the act of wearing.

I have caused blocks, with the above appearances, and weighing 15 tons, to be split up; and there are now a number of good specimens about the place, that will weigh from 10 to 50 cwt., dug out of the earth, 200 feet above the stream of water in the vicinity.

These bowlders are found, not only on the surface, but I have discovered them a number of feet deep, in the earth, in the hard compound of clay, sand, and gravel.

One block of more than 30 cwt., marked and worn as above described, was dug out of a well, at the depth of 24 feet; a part of which is still to be seen.

Bowlders, with these marks upon them, I have observed, not only in this town, but in Manchester, Ellington, and Wilbraham.

I think we cannot account for these appearances, unless we call in the aid of ice along with water, and that they have been worn by being suspended and carried in ice, over rocks and earth, under water.

It is stated in the Edinburgh Encyclopedia, Vol. XIII. p. 426, that "fields of ice sometimes rise from the bottom, and bring with them masses of rock, of several hundred tons weight. These masses of stone are imbedded in the ice, they are carried along with the ice, and deposited on shores at a great distance from their original situation."

Similar ideas are expressed in the same work, Vol. XI. p. 70.

I mention these appearances on Bowlders of sandstone in this vicinity, in order that in other places, if similar appearances exist, they may be noticed. Such observations may lead to probable conclusions respecting the transportation of Bowlders, and the formation of banks of earth.

Vernon, (Con.) Nov. 21st, 1825.

Art. IV.—*Miscellaneous Localities of Minerals.*

1. *By Messrs. Carpenter and Spackman, with an Introductory Letter.*

Philadelphia, Nov. 16, 1825.

TO THE EDITOR.

Dear Sir,

In travelling through Chester county, Pa. and part of the state of Delaware, on a late mineralogical tour we met with a number of interesting localities of Minerals, which have not as yet been published. For a part of the localities, we are indebted to Mr. Joel Baily, a zealous and industrious mineralogist, of East Marlborough, who has considerably promoted the advancement of this science, in Chester county. We hope to be excused for introducing in this catalogue, several minerals which we believe have been before noticed; as they have been heretofore described in such an indefinite manner, (as to location,) that the description is, in a great measure, useless to the travelling mineralogist. In several instances, the area of a whole township is given for the locality of a small crystal, which would, either not attract notice, or elude the scrutiny of the best observers. We have therefore, been particular, in every case where circumstances would permit, to refer the locality of each mineral to some permanent and conspicuous object, by which it may be readily found by the inquiring traveller.

Yours, very respectfully,

G. W. CARPENTER,
GEO. SPACKMAN.

On the Minerals of Chester county, West Goshen Township.

1. Chalcedony, of an extremely fine texture, and of various shades of colour, which appear in stripes and circles, beautifully arranged, forming veins from ½ an inch to 3 inches thick in serpentine. On the ridge, 1½ miles north of West Chester.

2. Jasper, yellow and red, of fine and beautiful texture. On the serpentine ridge, 1½ miles north of West Chester.

3. Brown Hematite, in stalactical and mammillary masses. Serpentine ridge, at the locality of the Jasper.

4. White Indurated Talc. Same locality.

5. Amianthus, forming veins in serpentine; in Joseph Taylor's quarry, 1 mile north of West Chester.

6. Zircon in sienite: in Bath Woods, half a mile north of West Chester, near a spring.

7. Carbonate of Magnesia, in fine acicular crystals, forming a thin vein in serpentine, in Joseph Taylor's quarry, 1 mile north of West Chester.

8. Cereolite, in the serpentine quarry of Joseph Taylor.

7. Drusy Quartz, abundant on the serpentine ridge, near the locality of Chalcedony, 1½ miles north of West Chester.

10. Magnetic oxyde of Iron, in octoedral crystals; in Joseph Taylor's quarry.

East Bradford Township.

11. Cyanite, green, white, and blue, in fascicular groups of compressed crystals; near the Black Horse, two miles west of West Chester.

12. Indurated Talc, of a green colour, in the banks of the road, near the Black Horse.

13. Andalusite? A mineral, very much resembling andalusite, occurs in 4-sided prisms, in mica slate; on the Strandsburgh road, near the Brandywine bridge.

14. Graphite, of good quality, near the Strandsburgh road, 1 mile south of the Brandywine.

15. Silico-calcareous oxyde of Titanium, in sienite; near the Black Horse tavern.

16. Zircon, in granular masses, in bluish quartz; near Jeffries's ford, half a mile west of West Chester. At the same locality occurs the crystallized Zircon, as noticed by I. Lea.

17. Hornblende, in acicular crystals. Same locality.

18. Scapolite, ¼ mile west of Jeffries's ford.

Pennsborough Township.

19. Diopside, in granular and compact masses, on the banks of the Brandywine, 1 mile below Painter's bridge.

20. Silico-calc. oxyde of Titanium, in Diopside. Same locality.

21. Tremolite, in fascicular groups of diverging fibres and crystals; at Mendenhall's lime quarries.

22. Saussurite, in carbonate of lime. Same locality.

23. Calcareous Spar, crystallized and lamellar, very beautiful; in Mendenhall's lime quarries.

24. Feldspar, of a flesh colour, in laminated masses, near Twaddle's tavern.

25. Amethyst, of the usual violet colour, in fine transparent crystals. Same locality.

Newlin Township.

26. Feldspar, in large crystals, weighing from 4 to 6 lbs. On the serpentine ridge.

27. Prehnite. Same locality.

28. Brown Hematite, in mammillary concretions, surface clove-brown and velvet-black, of a beautiful iridescent lustre; on the serpentine ridge.

29. Chalcedony, coating drusy quartz, and in botryoidal and mammillary masses, of several colours; on the serpentine ridge.

30. Jasper, of various colours, in cellular quartz; on the serpentine ridge.

31. Black Tourmaline, in large cylindrical crystals, terminated by three sided pyramids, truncated on the edges. Same locality.

32. Mica, crystallized in hexaedral flat prisms, or tables; on the serpentine ridge.

33. Drusy Quartz, of beautiful varieties, colour yellow and white; abundant on the serpentine ridge.

34. Ligniform Asbestus. Same locality.

35. Fine Amianthus, forming veins in the serpentine. Same locality.

36. Fibrous Talc, in ligniform masses, of a white and greenish colour; on the serpentine ridge.

37. Fluate of Lime, amorphous; in Edwards's lime quarry.

38. Sulphuret of Iron, in large cubic crystals, truncated on all the edges, one and a half miles north-west of Unionville.

39. Brown Spar, in curved laminated masses. Same locality.

40. Red Garnets, in beautiful dodecaedral crystals, in mica slate abundant. Same locality.

East Marlborough Township.

41. Zircon, in beautiful tetraedral prisms, terminated by pyramids, with additional faces on their angles, of a brownish red colour; occurring, detached, in the gravel and sand, on the sides of the mill race of David Pusey, ¾ of a mile south of Marlborough-street road. We believe its matrix has been gneiss, which is now decomposed and disintegrated, as several crystals were found imbedded in friable and decomposed gneiss.

42. Red oxyde of Titanium and Egeran, finely crystallized —detached. Same locality with the zircon.

43. Scapolite, in regular tetraedral prisms, (primitive form,) in a lime quarry, near the zircon locality.

44. Tourmaline, brown, green, and yellow, finely crystallized in carbonate of lime; on the farm of Mr. John Baily, on the street road.

45. Necronite, well characterized; in the lime quarry, on the farm of Mr. John Baily.

46. Fetid Quartz, the external characters like the common mineral, but emits a very fetid odour, when struck with a hammer; occurs on the farm of Mr. John Baily.

47. Carbonate of Lime, in beautiful hexaedral prisms; on the farm of Mr. John Baily.

48. Dog-tooth and rhomb Spars, of beautiful varieties; on the farm of Mr. John Baily.

49. Phosphate of Lime, in hexaedral prisms; on a farm adjoining John Baily's, south.

50. Limpid Quartz, crystallized, in several forms, and of various sizes, one (now in the cabinet of Joel Baily) a hexaedral prism, measured 14 inches in circumference. Same locality.

51. Chlorite, on the farm adjoining John Baily's, south.

52. Tremolite, of beautiful varieties; in the lime quarries adjoining John Baily's, west.

53. Sulphuret of Iron, in beautiful cubic crystals, truncated on the angles, with several modifications; on a farm adjoining Mr. John Baily's.

54. Feldspar, in laminated, detached masses, on Thomas Woodward's farm, adjoining John Baily's.

55. Cyanite, green and blue, on Thomas Woodward's farm.

56. Quartz, coloured by chlorite; on Thomas Woodward's farm.

57. Beryl, of a rich green colour, in small six-sided prisms, from $\frac{1}{8}$ to $\frac{1}{4}$ inch in diameter, in quartz; near Thomas Webb's mill, 1 mile north of John Baily's farm.

58. Fine Hornblende, in very fine acicular crystals, or fibres, curved and interlacing. Same locality.

59. Talc, white and green; on W. A. Cloud's farm.

60. Lithomarge, accompanying dog-tooth spar, on John Baily's farm.

61. Schorl, in black cylindrical crystals, in mica slate: on John Baily's farm.

West Marlborough Township.

62. Tremolite, of a beautiful variety, in diverging acicular crystals, at Bernard's Lime quarries, on the Doe-run creek, 2 miles west of Unionville.

63. Nitrate of lime, in acicular crystals; in a cave, in McNeal's lime quarry, 1 mile south-west of Bernard's quarry.

64. Scapolite, in regular hexaedral prisms, in granular limestone. Bernard's quarry.

65. Limpid Quartz, in beautiful hexaedral prisms, with pyramidal terminations, in Bernard's quarry.

66. Pseudomorphous Quartz. Same locality.

67. Sulphuret of Iron, in large cubic crystals, truncated on the angles; at Bernard's quarry.

68. Egeran, in four-sided prisms, of a reddish brown colour; at Bernard's quarry.

69. Brown Tourmaline, in granular limestone. Same locality.

New-Garden Township.

70. Stalactite, in mammillary and globular masses, of a foliated structure; in Phillips's lime quarries, on the Kennet-square road, 1 mile west of Kennet-square.

71. Brown Tourmaline, in translucent crystals, in granular limestone; Phillips's lime quarries.

72. Laminated Mica, in large plates; near Phillips's lime quarries.

73. Phosphate of Lime, massive, in primitive limestone; on Thomas Brown's farm, near White clay creek.

74. Magnetic Pyrites, traversing a vein of gneiss rock; in William Jackson's lime quarries.

75. Augite, massive and crystallized, in gneiss; in W. Jackson's quarry.

New-Castle County, Delaware.

76. Chalcedony, in compact and drusy masses, of beautiful varieties; on Chestnut-hill.

77. Brown Hematite, of various forms; on Chestnut-hill.

78. Hornblende, of a lamellar structure, and metallic lustre, resembling the Hypersthene; on Chestnut-hill.

79. Asbestus and Amianthus; in Jane's lime quarry, adjoining Isburne's.

80. Mountain cork and Rock paper, occur in granular limestone, at Isburne's lime quarry, near Newark.

81. Dog-tooth Spar, in beautiful crystals; in Jane's lime quarry.

82. Stalactical carbonate of Lime, of various formations; Jane's lime quarry.

83. Limpid Quartz, in hexaedral prisms, terminated by pyramids; in Jane's lime quarry.

84. Red oxyde of Titanium, in compressed small prisms; in Jane's lime quarry.

85. Tremolite, of a beautiful variety; in Jane's and Isburne's quarries.

86. Fibrolite, abundant on the Kennet turnpike, between Centreville and Blue-ball. As this is not in place, it is no doubt from the locality on the Brandywine, described by Mr. Thomas Nuttall, in Dr. Robinson's catalogue, as it possesses all the characters given in his description.

87. Chalcedony, a very interesting and extensive locality of this mineral, of various forms, colours, and varieties, occurs near rock springs, Little Britain township, Lancaster county. This mineral has been noticed in Cleaveland's Mineralogy, as occurring at Little Britain, but as we experienced a very considerable difficulty in finding this locality, after we had arrived in Little Britain township, we have thought proper to notice its particular situation, by which it may be readily found. This locality commences about 100 yards from Rock Springs, on the sides of a small rivulet, and continues a considerable distance towards its source. Rock Springs are situated on the property of Mr. Joel Jackson, and are well known through all the neighbouring townships, for their curious formation, and for the salubrity of their waters, which issue out of a serpentine rock, on the ridge formation.

GEO. W. CARPENTER,
GEO. SPACKMAN.

Philadelphia, Nov. 24, 1825.

N. B.—Geo. W. Carpenter, No. 294 Market-street, will exchange the above minerals, of Chester and Delaware, for those of other districts.

2. *By Dr. Samuel Robinson, with Remarks on Spurious Localities.*

TO THE EDITOR.

Dear Sir,

In compiling the "Catalogue of American Minerals," of which there was a notice in the last number of your valuable Journal, the author omitted the locality of no mineral which had been published within his knowledge, (except a few instances which he personally knew did not exist.) In so doing, he is perfectly aware that he may have *copied* many localities, from which only a single, or perhaps a doubtful specimen, was obtained, with no prospect of more being found. Such localities are generally published, without defining the spot, but merely naming the township. The author had but few opportunities of detecting such instances, which are the more unfortunate, as they tend to deceive the public, and to mislead the mineralogist who is travelling for the purpose of collecting specimens.* The author had two objects in view, in republishing all localities: to induce mineralogists to forward to the American Journal, or some other periodical work, a list of all such localities as have been exhausted, and of such as never existed, which may come within their knowledge and to notice any errors they may discover in this catalogue—and also to avoid the accusation of overlooking or omitting localities which were published. A writer in the North American Review has justly remarked, that "it has unfortunately happened in this country, that in the ardour with which mineralogy has been entered upon by our students, instances are not unfrequent, where a desire of being distinguished by the title of mineralogist, has been more conspicuous than that of being an accurate observer; hence lists of minerals have been published which cannot be perfectly relied on."†

* The author is not aware that any locality of any new mineral, in New-England, has yet been found to be incorrect, with one exception; the idocrase, of Salisbury, has been found to be a variety of garnet. See Catalogue, p. 291.

† See catalogue, p. 38, "Common Serpentine," &c.

In looking, a few months since, over the minerals which he had previously collected, the writer recognised the following:

1. *Nacrite*, on quartz and carbonate of lime, Smithfield, from the seams of the Dexter lime rock, (mentioned in his catalogue as talc.) He has since obtained some beautiful specimens, in small globular masses, on crystallized quartz and calcareous spar, and on brown spar, composed of brilliant pearly laminæ, radiating from the centre.

2. *Brown Spar*, at the same place. The planes of the crystals, which are brown and opaque, are curved, and the edges bent up, like those of a hat. Sometimes these crystals are covered promiscuously with minute transparent crystals of calcareous spar, their length being about six times their diameter.

3. *Green earth*. On the banks of a creek, between Southbury and Woodbury, Con. the writer collected a green substance, which on examination was found to be green earth; it is abundant.

4. *Amethyst*. A considerable quantity of detached, imperfect crystals, of a pale colour, and seldom transparent, has been found in Voluntown, Con., in the alluvial bank of a creek, which was excavated for the wheel of a mill, belonging to Capt. Robbins, about $\frac{3}{4}$ of a mile from his tavern, on the road leading from Chestnut-hill to Stonington.

5. *Actynolite*. Very beautiful actynolite was discovered last autumn, in Cranston, R. I. about half a mile north of the iron ore bed, in the woods, on Mr. Nicholas's farm. It is found in fragments mostly covered with earth, which appears to have been thrown out, and the rock blasted, many years since, in making an excavation. Some masses consist of distinct brilliant crystals in *talc;* other masses consist of pure fine crystals, of glassy actynolite, radiating from centres, of a deep green colour. This locality was kept very secret, until it became known this summer, when the proprietor, finding so many anxious to obtain specimens, concluded it must be very valuable, and the replies of some, that good returns had been received for what had been sent to New-York, confirmed him in his belief, and determined him to secure a part of the profits to himself, by charging most extravagantly. This circumstance shows the impolicy, as well as the impropriety of de-

luding the country people, on whose lands minerals are frequently found, by giving vague and equivocal answers, to their numerous questions, prompted by curiosity, or suspicion of the views of the collector. If the real value of the mineral, and the design for which it was obtained, were plainly and candidly told them, by all visiters and collectors, they would soon believe they had not been designedly deceived, and that the minerals were not obtained for the purpose of extracting *silver* or *gold* from them, and the disposition to endeavour to extract either silver or gold from the collectors would give place to that generosity and hospitality, which would not only be a credit to themselves, but to the community in which they live.

Providence, Oct. 11, 1825.

P. S. The writer finds, in preparing his duplicates for exchange, that he has now upwards of 4000 fair specimens, labelled, wrapped in papers, and boxed, in divisions ready for exchange, consisting mostly of New-England minerals, including all those lately discovered, mentioned in his catalogue, which he would be glad to exchange for foreign minerals particularly; also for those of the middle and south-western states.

S. ROBINSON.

Art. V.—*On the Tertiary Formations on the borders of the Hudson river.* By John Finch, F. B. S., &c.

During an excursion up the North river, a few months since, I observed some formations which may probably be classed with the tertiary strata of Europe. They may be traced, on one or both sides of the river, from near West Point, to the city of Troy, and probably extend much further to the North; in width they vary from one to fifteen miles.

The accompanying sketch represents their appearance at Hyde Park, near Poughkeepsie. The basin in which they are deposited, is formed by

Transition Clay Slate, with strata inclined at an angle of 35 to 45 degrees; the laminæ of the slate form an angle of

60° with the strata; colour bluish green, sometimes red: some of the varieties are made use of for roofing, others compact slate, pencil slate; frequently contains veins of quartz, and rarely thin beds of coal; sometimes passes into jasper slate, and alternates with transition limestone, containing the usual fossils.

Immediately super-imposed upon the transition clay slate, are the tertiary strata, consisting of an extensive deposition of

Clay Marl, containing from 12 to 15 per cent. of carbonate of lime, colour blackish blue, bluish gray; sometimes contains iron pyrites and fossil wood, varies in thickness from 10 to 60 or 80 feet; the original deposition was probably of a uniform thickness, and the irregularities of its surface may have been produced by diluvian torrents.

Adhesive Slate forms large beds in the preceding stratum, colour yellowish gray, grayish white; particles of it adhere to the fingers; it occurs in laminæ, varying in thickness from half an inch to six inches; fracture earthy; when dry, conchoidal. Used extensively in the manufacture of bricks.

Clay sometimes occurs in large beds, in the clay marl, or occupies its place, colour various.

Diluvial is the highest of these formations, and is distinguished, as in every part of the earth's surface, by sand and gravel, containing detached pebbles of the older rocks.

At Newburgh, the diluvial strata form numerous rounded eminences which may be traced to some distance in the country. South of the town, the clay appears at the surface. One mile north, on the shore of the river, is adhesive slate.

At Fishkill Landing, on the opposite shore, the adhesive slate forms a continuous stratum, extending near two miles.

Near Marlborough the clay marl predominates.

At Hyde Park, near the residence of Dr. Allen, the clay marl makes its appearance, about half way down the declivity of the hill, but it may be seen to more advantage on the estate of Wm. Bard, Esq. immediately on the shore of the river, and adjoining the property of the Hon. Judge Pendleton. When exposed to the action of small torrents of water, the marl assumes various singular forms, and becomes indurated by exposure to the air. These figured marls occur in various other places, near the North river, and have been described in the Americal Journal of Science. The diluvial strata at Hyde Park, are distinguished as forming a level plain of some extent, on which the village and several gentlemen's country seats are situated. I believe a plain of similar elevation, may be traced in many other parts, bordering on the Hudson.

Between Hyde Park and Rhinebeck, are extensive depositions of clay.

Albany is built on the clay marl formation, and in this respect resembles London. The ground is traversed by numerous ravines. In the vicinity, the cascades of Arno and Tivoli, and the rapids of Norman Kill, which every one who sees will admire, are caused by the torrents wearing away the higher strata, until they arrive at the solid strata of the transition slate.

At Greenbush is an extensive formation of the adhesive slate. Dr. T. Romeyn Beck has deposited specimens in the Cabinet of the Lyceum of Natural History, in Albany.

At Troy, the clay marl is abundant, and contains fossil wood. The plain above the city, from whence there is a fine distant view of the falls of the Mohawk, is composed of diluvial debris. The height of the formation at this place is probably the same as at Hyde Park and Marlborough. The strata, in this vicinity, have been described by Mr. Eaton in his Index to the Geology of the Northern States.

At Schenectady the same formations are visible; they also form the whole tract of country, between that city and Albany.

These strata may undoubtedly be classed with the tertiary clays of Europe, but they vary in some particulars. The London clay contains numerous fossil shells, and the bones of extinct animals, but none have hitherto been found, in the clay marl on the North river.

From the large depositions of adhesive slate, they agree more precisely with the formations at Mont Martre, near Paris, where there are alternating strata of this mineral, and clay marl transition.

The menilite has not yet been found on the shores of the Hudson, although this is a position where we may expect it to be discovered.

126 Broadway, New-York.

Art. VI.—*Sketch of the Geology of Sicily.* By Charles Daubeny, M. D. F. R. S. Professor of Chemistry in the University of Oxford.* Read at the Bristol Philosophical Institution, April 14, 1825. With a Map.

In submitting the following brief outline of the geology of Sicily, I wish it to be understood that my principal objects are, 1st, To afford an explanation of the suit of specimens from that country, which I lately presented to the institution; and, 2dly, To supply such hints, with regard to the general bearings of the strata, as may facilitate the inquiries of other travellers, who, with similar views to my own, may chance hereafter to visit that island.

To fulfil the above objects, it seemed to me more advisable that the information I had collected should appear at once, even in its present imperfect form, than that it should be kept back until opportunities occurred of verifying and extending it; for, although, on a country already minutely explored, there might be no excuse for publishing hasty or imperfect statements, yet, when the ground we are upon, is, in a manner, new and untrodden, the most general and superficial observations may often be worth recording.

Such, at least, was my own feeling when I set out on my tour round the island; and this feeling was confirmed after having completed it, when, on reviewing what I had done, I reflected on the time that would have been saved, or applied to more effectual purpose, had I been previously directed to those points in the physical structure of the country, best deserving of investigation.

In the hope, then, that as the field of geological inquiry nearer home becomes exhausted, the scientific traveller will extend his views to this interesting Island, I submit to the Society the following remarks, persuaded that they will furnish the best corrective for any errors they may contain, by affording to others the means of detecting them.

* From the Edinburgh Philosophical Journal.

The geology of Sicily may, for convenience sake, be divided into three parts, corresponding nearly with the three sides of the triangle which represents the figure of the island.

The first division will comprehend the rocks from Messina, (or rather from Taormina,) to Trepani, thus taking in the whole of the northern coast, and a small portion of the eastern.

They will be found to consist chiefly of the primitive, transition, and older secondary strata; the most recent formation, in this part of the island, being the limestone of Palermo and Trepani, which perhaps corresponds with the magnesian limestone of this country.

The second division embraces the rocks that occur near the western coast, from Trepani to Cape Passero, the most southern point of the island, and consists chiefly of a series of formations which I am inclined to refer to the most recent epoch in the history of our planet, namely, that posterior to the formation of the chalk.

The third division, which takes in the line of coast on the east, from Cape Passero to Taormina, exhibits indications of volcanic action, occurring at very different epochs, from the lavas which flowed during the period at which the tertiary beds were in the act of being deposited, to the comparatively recent eruptions that have taken place from Mount Etna.

The physical structure of the more central portions of the island need not be entered into at present, as it will be described in the course of this paper, and may be collected sufficiently for our present purpose, by an inspection of the accompanying map.

The plan, then, according to which I propose to consider the subject, whilst it corresponds with one of the usual routes adopted by travellers, has the advantage of following the natural order of succession in which the rocks should be considered.

Let us commence, then, with the neighbourhood of Messina, the only part of the island in which rocks of a granitic character occur.

Ferrara, indeed, in his Account of Sicily, lays them down as consisting of true granite; and my observations here were far too cursory to justify my contradicting him.

I may however remark, that, in the places which I examined, the rock seemed to have the characters of Gneiss; and this is the formation which probably extends on the Italian side of the Straits, if I may judge from the specimens I brought from the celebrated rock of Scylla, where the slaty character prevails. In this rock, the mica is sometimes silvery, sometimes dark coloured; the quartz and felspar have the ordinary characters. These three ingredients are disposed in laminæ, and the aggregate is penetrated by veins, consisting of quartz and mica, in large and distinct concretions.

The rock also contains imbedded masses, consisting chiefly of a mixture of quartz and hornblende.

The same formation, I believe, extends uninterruptedly along the northern coast, as far as Melazzo, where the little neck of land projecting into the sea, on which the castle and town have been built, is composed of well marked gneiss.

Near the extremity, however, of the peninsula, on the summit of the cliff, and at an elevation of several hundred feet above the level of the sea, there is seen resting upon the gneiss a compact grayish limestone, containing numerous shells, such as Terebratulæ, Turbinites, and a profusion of Madreporites, principally of the turbinated kind. I have also specimens which seem to contain those madrepores, with finely striated branches, known under the name of *Junci lapidei;* and Mr. Coneybeare (to whom, as well as to our curator, Mr. Miller, I feel indebted for naming many of the shells which I had collected from this and other localities,) has pointed out to me small cylindrical stems, which he conceives to be the trunks of the *Isis Gorgonia.* This discovery is interesting, as Scilla, in his work "De Corporibus marinis lapidescentibus," states his having met with this fossil among the hills in the neighbourhood of Messina, in a mineralized state, mixed with echini, shells, &c. He found the coral in beautiful branches, as well as fragments, the whole surface deprived of its colour, although in the thicker fragments, a purplish hue might still be found internally.

It seems that he at first took this fossil for the leg-bones of some animal, but afterwards discovered it to consist of the fragments of some jointed coral, bearing a strong resemblance to the knotted coral described by Imperatus, as found in the sea near the island of Majorca.*

The limestone of Melazzo contains imbedded fragments of gneiss; and, at the line of junction with that rock, there is an

* See Parkinson's Organic Remains, Vol. II. p. 72.

appearance of intermixture, caused probably by a disintegration of the older rock having taken place on its surface, previously to the deposition of the more recent one.

I have no data on which to rest any well grounded opinion with respect to the age of this limestone, having seen none precisely resembling it in other parts of the island. It would appear, however, from the account given by Scilla, that a due examination of the mountains round Messina, would lead to the discovery of more of the same rock, and thus afford us the means of ascertaining its relations. For the present, I am rather disposed to refer to it a recent origin.

East of Melazzo, the gneiss is succeeded by a schistose rock, which here possesses the characters of mica-slate. This formation, consisting sometimes of this variety of rock, and sometimes of clay-slate, constitutes a considerable chain of hills, extending in a south-west direction from thence to the coast, of which Noara is the most elevated peak. I crossed this range of mountains, in my first journey at Taormina, on the road leading from Catania to Messina, and in my second, after I had skirted the western base of Etna, in striking across from Randazzo to the northern coast.

This wild and little explored district, which Brydone describes as the haunt of banditti, may be traversed at present in the most perfect security, and would deserve to be visited by every traveller, were it only for the striking views it presents of Mount Etna on the one hand, and the Lipari Islands on the other. The prevailing rocks appear to be either some of the intermediate gradations between mica-slate and clay-slate, a loose rubbly variety of the latter kind of rock, or a conglomerate made up of fragments of quartz, mica, and clay-slate, which may be fairly considered a gray-wacke. Ferrara, in his Campi Flegrei, notices the occurrence of a porphyry "composed of felspar, schorl, mica, red or greenish grains of quartz, and greenish-red chrysolite," (*Qu.* olivine ?) I have myself found, in the gravel near Taormina, rolled masses of a hard porphyry, consisting chiefly of felspar, with some mica.

The clay-slate also contains occasional beds of anthracite, as near Messina. The prevailing character of the slaty rocks is earthy and friable; but to this there are many exceptions, especially near Taormina, where we meet with a compact mica-slate,* in which quartz sometimes abounds. At Rocca-Lumera, and Ali, some miles to the north of the latter place, we meet with a quartzose variety of slate, containing various metallic sulphurets, such as galena, sulphuret of antimony, together with iron and copper pyrites. The decomposition of these have probably given rise to the formation of alum, for which Rocca-Lumera was once celebrated: but the works at present seem quite neglected. The same remark applies to the lead mines formerly worked in that neighbourhood.

The slate near its southern termination, alternates with beds of red sandstone, and is covered by a compact limestone, many varieties of which are much prized as marbles. It is more frequently of an ash colour, sometimes brecciated with irregular patches of red and gray, or diversified by undulating veins of a whitish and more crystalline variety of calcareous matter, which penetrate the substance of the bed. The junction between the limestone and the subjacent mica-slate, is well seen near the road, at the foot of the hill on which the ruins of Taormina are situated. This hill, and probably most of those contiguous, consist of this limestone which stretches far into the interior, constituting a sort of boundary line between the Volcanic and Neptunian districts, a barrier beyond which the lavas of Etna have never yet penetrated.

To this same formation seems to belong the series of rocks which I before mentioned, as occurring on the northern coast, after we have passed Melazzo, on our way to Palermo. They are best seen at Cape Minjivio,† where the Greek colony of Tyndaris formerly stood. They there consist of beds of mica-slate, alternating with a bluish crystalline lime stone, without shells, of a granular rock, consisting principally of quartz and mica, which I shall denominate Quartzy Rock, and a sandstone made up of minute fragments of the above two ingredients. The strata are here inclined at a considerable angle; and, if my observations are correct, to the north-west; but this does not accord with the dip which I have noted down as belonging to the slate of Taormina,

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* Few of the rocks in this district, excepting those near Taormina, exhibit the characters of primitive mica slate.

† Minjivio is a corruption of Mons Joris, a temple in honour of Jupiter having formerly stood there.

which appears to be to the south-west. However this may be, the whole series of beds seen at Cape Minjivio rests finally on mica-slate, which itself appears to repose on the gneiss of Melazzo. After leaving the former place, however, the quartzy rock appears for some time to predominate, until we arrive at a village called Giojusa, some miles west of the town of Patti, where it is seen at first curiously interlaced in thin strata, with a gray compact limestone, and afterwards giving place to that rock. This limestone contains several caverns, one of which was entered a few years ago, and found to contain bones of some large animals, which, unfortunately, were not preserved. I explored another which had recently been discovered, but found no animal remains; the floor was covered with stalagmites, and a black mould had been dug from it to render the access more easy. It would be interesting to ascertain whether this limestone be continuous with that of the mountains near Taormina to which it seems to be parallel.

Between Guisa and Cape Orlando, we may observe a repetition of the same slate formation as before, which is here of very limited extent, speedily giving place to a red sandstone, not micaceous like the former, and containing red ironshot grains of sand, instead of angular fragments of quartz. This red sandstone continues all along the coast to Cefalu, uninterrupted, except by a bed or two of compact grayish limestone, used as a marble, and without petrifactions.

This sandstone sometimes alternates with thin beds of shale, like that belonging to the coal formation.

The promontory of Cefalu consists of an isolated rock, which announces at a distance, by its bold and abrupt figure, that it is constituted of different materials from those of the preceding country. It consists, in fact, of a bluish fetid limestone, which, as I am informed, is termed by lapidaries a Lumachella marble, being hard enough to receive a polish, and having portions of sparry crystalline matter distributed over it, which appear to be derived from the presence of organic bodies, although these are rarely distinct, except on the weathered surface of the stone. I found them best exhibited among the remains of the Cyclopean Temple, on the hill of Cefalu, the stones of which indicate, by their gigantic size, the extreme antiquity of the fabric.

On the weathered surfaces, acted upon during so many ages, the petrifactions, as being the hardest portions, stand out in relief, but having been unable to detach any of them, it is impossible for me at present to attempt enumerating their species.

I do not know whether any stratification can be discovered in the rock of Cefalu; there is indeed a kind of separation into three distinct masses, but these look rather like the result of cleavage, which may take place in every rock, even down to granite, than the effect of a deposition at distinct periods.

Indeed, the rock itself seems to split irregularly, in a direction just opposite to that of the nearly horizontal seams above noticed.

The whole of this calcareous formation rests upon the sandstone just described, and may be referred to the chain of hills, which, under the name of the Madonia Range,* are seen in the back ground, running nearly parallel to the north coast, between Cefalu and Termini, and from thence extending to Palermo, and perhaps to Trepani.

It should seem, however, that this is the only spot within the limits of this formation, in which organic remains have been discovered. I myself, examined attentively the compact limestone of Termini and Palermo, without finding any, and all the localities to which Professor Scena, in his *Topography of Palermo*,† refers, in proof of their occurrence, seem to belong, not to the compact limestone, but to the recent breccia, which I shall afterwards describe as overlying it. This circumstance makes me adopt, with some degree of hesitation, the idea of the identity of the Cefalu with the Palermo limestone.

Let us now consider the characters of this limestone, as seen at Palermo and Termini.

It is generally of a bluish colour, and is then often found to emit, when struck, a fetid odour like sulphur; sometimes, however, it is white, and of a compactness not much exceeding that of the hardest kind of chalk, or of the beds which are occasionally met with in the Jura limestone.

* The Madonia Mountains were the Nebrodes of the ancients; the highest of them, according to Ferrara, attain the elevation of 610 toises, or 3660 feet.

† Vide "*Topografia di Palermo, abbozzota*, da Dominico Scena Professore di Fisica nel 'Universitá di Palermo, 1818."

It is probable that the latter constitutes the softest variety of the Palermo limestone, and that the hardest may be seen in the marble of Castronuovo, employed in the columns of the Palace at Caserta, near Naples, and in the great staircase of the Convent of San Martino near Palermo.

The formation in general is, however, best marked by the beds of chert, with which it is accompanied; these occur at Monti Giuliano near Trepani;* at Termini, and in some of the hills near Palermo,—others, as the Monte Pelegrino, being entirely destitute of them.

The chert presents several beautiful varieties, as will be understood, when I remark that the Sicilian jaspers and agates are derived either directly from thence, or indirectly from the rolled masses in the valleys, or on the sea-shore, which this rock appears to have exclusively furnished.

These beds have sometimes a brecciated or a conglomerated structure, whilst at others, the siliceous matter combined with a portion of alumine, and just enough of lime to cause a feeble action with an acid, forms stripes diverging in all directions, the interstices of which are filled up with a somewhat lighter coloured and softer variety of the same material.

The jaspideous beds are either red or yellow, the two varieties often occur together, and are penetrated by veins of pure crystalline quartz, thus constituting those beautiful agates for which Sicily has so long been celebrated.†

This formation is also marked by the occurrence in it of a pulverulent white earth, which, by analysis, is found to contain half its weight of magnesia. In this, and in the character of phosphorescing vividly on live coals, it resembles the pulverulent beds which I observed in the magnesian limestone near Buda, and which Beudant has already noticed. In Hungary, this powdery substance is accompanied with, and perhaps derived from, beds of a magnesian limestone, with a harsh gritty feel, which, when exposed to the weather,

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* Formerly Mount Eryre, famous for the Temple of Venus. It is one of the loftiest mountains of *Neptunian origin.* Its height is stated by Ferrara at about 590 toises, 3540 feet above the sea.

† The agates of Sicily were much prized, even among the ancients; indeed, it is well known that this stone acquired its name from Achates, a river in Sicily.

decompose into rhomboidal fragments. Near Palermo there are beds of a siliceous limestone, containing a good deal of magnesia, which decompose much in the same manner. The pulverulent Palermo limestone was in great request formerly, as a remedy for various disorders, and large quantities of it, under the name of the Earth of Biada, used to be exported or sold for domestic consumption: at present it is rarely to be met with in the shops, although it may have been useful as an antacid, for the same purpose fors which we employ magnesia, and, therefore, perhaps has better pretensions to repute than many substances that still maintain their place in pharmacy.

Before I quit the subject of the Palermo limestone, I must not omit a circumstance relative to the rock of Mount Pelegrino, near that city, which seems to deserve notice. Notwithstanding the uniform compactness of this stone, wherever it has been recently quarried, we find it in those parts which have been exposed to the weather, honeycombed in an extraordinary degree, by holes of considerable size, which penetrate several inches below the surface, but indicate, from the gradual decrease of their dimensions, that the cavities were formed by the action of the weather, sinking gradually into the substance of the stone.

These cavities, in their size and appearance, reminded me of those which occur near the surface of a hard siliceous limestone, belonging to the Oolite formation, found near Cirencester in Gloucestershire, which has obtained the local name of the Dagham alum-stone.

This irregular disintegration of the surface is common, in a greater or less degree, to most limestones exposed to the weather; but it would be interesting to discover, whether the greater size of the cavities formed in these two instances, be derived from any peculiarity in the nature of the rock itself or in the circumstance under which it has been placed.

With regard to the age of the Palermo limestone, I cannot speak with confidence, but I conceive, that the facts already stated, warrant me in considering it, for the present, as corresponding to the Zechstein of the Germans, and the Magnesian limestone of England; in corroboration of which, I may perhaps add, that most of the specimens contain magnesia, although not generally in very large proportion.

All the high ground near Palermo is occupied by this ancient calcareous formation, but the valleys and coast are covered with a very different kind of material, which would appear to have been at one time of considerable thickness, as it constitutes hills, which, though they offer no comparison in point of elevation with those consisting of the compact limestone, are yet some hundred feet in height.

The line of demarcation between this and the preceding rock, is very distinctly marked by the character of the vegetation. The compact limestone, like that of the Appenines, or of Nismes in the south of France, is chiefly adapted for the olive, and affords but a scanty pasturage, vegetation being obstructed by the fragments of chert, which cover the surface here, as in many portions of the limestone district in Derbyshire; whereas, the formation now about to be described, affords the finest crops of corn, and is distinguished, even where uncultivated, by the luxuriance of the plants that grow every where upon it.

This formation consists either of a coarse puddingstone, containing rolled and angular fragments of quartz, and of the compact limestone on which it rests, or of a calcareous breccia, in which sand is also present, though limestone be the predominating ingredient.

Wherever the latter variety is found, shells are very abundant, so that we may be led to attribute the presence of calcareous matter in this instance, principally to the accumulation of decayed organic bodies.

The genera of shells commonly most frequent in this rock, are the Pecten, Ostrea, and Venus; but in that variety of it which occurs at the foot of Mount Pelegrino, and is only distinguished from the former by its greater freedom from sandy matter, and the consequent whiteness of the rock, Serpulæ, Dentalia, and Venericardiæ, may be distinguished along with those already mentioned.

I may remark once for all, that a breccia of this kind, replete with shells, not far, if at all, removed from existing species, seems to fill up the hollows in most of the older rocks of Sicily. Thus, a formation of this kind exists, as I am informed, at Messina, though, being at that time occupied on other subjects, I did not observe it. The same formation occurs at Syracuse, and along the coast upwards towards Catonia, where it must not be confounded with the calcareous rock afterwards to be described, which alternates with volcanic tuff.* Between Taormina and Giarre, at the foot of Etna, is a limestone, with shells similar to the above, which alternates with a yellow sandstone; these beds seem to repose upon the older lavas.

The same recent formation occurs in various situations along the northern coast, as near Melazzo and Termini, between Alcanio and the sea, and at the foot of Mount Guilliano near Trepani.

In following the line of coast from the latter place to Girgenti, we observe a white calcareous breccia, which appears to be of the same date and origin.†

It is well seen near Marçola, where it contains numerous shells, especially Trochi, Pectens, Tellinæ, Cardia, Arcæ, Dentalia, Neritæ and Murices.

A similar breccia, but one of a more arenaceous character, constitutes the whole of the coast between Selinus and Sciacca, and is in many places ascertained to extend several miles into the interior, for I found it at Castelvetrano, which, in this part of the island, was the farthest point from the coast to which I deviated.

The shells in these places are mostly the same as those before enumerated, but they here form an aggregate sufficiently compact for a building stone. Of this material were built the temples at Selinus, the stupendous ruins of which are known by the names of the Pillars of the Giants, (Pileri dei Gigante;) and though the uneven surface of the stone would have been ill adapted for finished sculpture,‡ yet, from

* If a statement of Ferrara's be correct, the breccia above mentioned must be formed by causes now in action, like the indurated sand of the coast of Cornwall; for this author states, that remains of the utensils of mariners have been found in it. This, however, cannot be the case with respect to the breccia which covers the blue clay, for in this we have abundant evidence of diluvial action.

† Humboldt's Personal Narrative, Vol III. p. 10., English Translation, describes a calcareous sandstone or breccia of the same kind, as occurring near Cumana. It rests on beds of clay containing selenite and gypsum.

‡ It is to be hoped that the public will soon be presented with a detailed account of the recent discovery made in 1823, by some of our own countrymen among these ruins,—a discovery not less interesting in itself, as making us acquainted with an æra in Grecian sculpture, anterior to any of which we possess documents, than for the enterprise and self-devotion displayed by the individuals who accomplish it; one of whom fell a victim to a fever, brought on by his zeal in prosecuting his laborious task during a most unwholesome season.

the comparative ease with which it might be worked, it was probably preferred for buildings in which the bulk of the materials, and the solidity of the structure, were the points chiefly considered.

Near Marçola and Sciacca, I observed in the rock certain spherical concretions, arising from the clusters of irregular tubiform bodies, diverging from a common centre. I know not whether they are organic.

This recent breccia is seen to rest upon a formation of quite a different nature. The superposition I first observed near the road between Mazzara and Castelvetrano, where the former rock is seen resting on a calcareous marl, devoid of shells, but replete with selenites. As we proceed southwards, the gradual rise of this stratum brings more frequently to view the subjacent rock, which at Sciacca is seen at the level of the sea, whilst the breccia appears on the heights above, where the town itself is situate. The same thing occurs at Girgenti, where the breccia contains very fine turritellæ, trochi, and lunulites; and in the interior of the country, where all the most elevated spots are crowned with a similar loose shelly stratum, partly calcareous, partly arenaceous, always resting upon blue clay, and always full of petrifactions.

Thus the heights of Castrogiovanni, (according to Ferrara, 480 toises, or 2880 feet above the sea,) which overlook the valley of Enna, so celebrated in the mythology of the ancients, and the fabled resort of their gods, are composed of this rock, resting upon a white calcareous stratum without shells, alternating with beds of marl, and this upon the blue clay which constitutes the bulk of the subjacent rock. Here, in addition to the preceding genera of shells, the sandstone contains specimens of the conus, buccinum, trochus, turbo, and mya.

I must own, that some farther examination may be required to establish the identity of the breccia found upon the hills in the interior of the island, with that on the coast between Trepani and Selinus; but as I have seen the latter resting near Mazzara, on a rock decidedly the same with that on which the former is incumbent, and as the character of the rock, as well as its imbedded fossils, appear to coincide, I think myself warranted, for the present, in setting down the one as a continuation of the other.

Let us now consider the characters of the subjacent stratum, which, in point of extent, is by far the most considerable in Sicily. Indeed, it might be safely said, that nearly half the surface of the island is constituted of this and the subordinate beds, as it extends from the neighbourhood of Palermo and Termini on the north, to Terra Nuovo on the south, occupies nearly the whole of the centre, and extends on the east to the skirts of Etna. The predominating rock in this formation is a bluish plastic clay, with which are associated beds of gypsum, of blue limestone, of a dark-brown slaty marl, of a white argillaceous limestone frequently alternating with marl, and of a brecciated calcareous rock, with oval masses of a white compact limestone, like that which occurs in the Palermo rock.

The blue clay rarely contains shells, and the only ones I discovered in a state sufficiently distinct to be made out, were a mytilus and a cardium. I never recollect to have seen it resting on any of the other beds which I have mentioned as being associated with it; in every instance it appeared to be the fundamental rock.

The beds of gypsum found incumbent upon it rank among the most striking features in the geology of Sicily. They are composed sometimes of gypsum, sometimes of entire masses of selenite, which exhibit a confused crystallization. Plates may sometimes be detached nearly a foot in length, and six or eight inches in breadth.*

The sulphate of lime occurs also dispersed in crystals through a white clay, and in cavities of the blue clay, accompanied with those crystallizations of sulphate of strontian and of native sulphur, for which Sicily has long been celebrated.

It would appear that beds of sulphur are found everywhere disseminated through the substance of this blue clay formation,† for though Sicily has long supplied all Europe with that mineral, its stores are as yet very far from being exhausted.

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* The arrow-headed variety of crystals seemed the most common.

† As for instance, in that of Radebaoy, near Crapina, in Croatia, where the sulphur is met with in balls disseminated through clay, and covered with marl, containing impressions of fishes, &c. the whole resting on the plastic clay.

The sulphur occurs either massive or crystallized in octahedrons, but is always of that bright yellow which Brocchi considers as proof that the mineral has been sublimed, and never of the liver-hue, which belongs to it in some districts.

The blue clay likewise contains beds of rock salt, of which the most considerable are at Alimina, NE. of Castrogiovanni, where this substance is found both massive and crystallized in cubes. The springs that issue from this formation have always more or less of a brackish taste; and I found, on the application of proper tests, that they contain much muriate of soda, some sulphate of magnesia, and sulphate of soda. These latter salts were found also incrusting the sides of ravines, and in other situations exposed to the contact of streams of water. The other minerals found in this formation are not numerous; iron and copper pyrites are sometimes met with, and, I believe, sulphate of barytes, and alum. In a country, in short, so replete with sulphur, all the combinations of that mineral, or of the sulphuric acid with the different bases, are to be looked for; and most of them accordingly are found.

It is, indeed, probable, that the formation of these sulphuric salts, and the sublimation of the sulphur, are taking place in many parts of this formation, even at the present moment, for there are abundance of facts which show that a chemical action is going on among the inflammable materials which it contains, giving rise to the production of heat, and to the disengagement of elastic vapours; to phenomena, in short, which present some analogy to those of volcanoes, although exhibited on a much smaller scale.

It is not long since the proprietor of some land in the interior congratulated himself on his good fortune, in being able to collect a large supply of sulphur already purified, by merely placing vessels to receive a stream of that substance, which was constantly issuing from the side of a hill. This was occasioned by a bed of sulphur in the interior of the mountain having caught fire, and the heat generated by the combustion of one portion serving to melt the remainder; Nature having, in this instance, adopted the wasteful process employed from time immemorial by the Sicilians, for getting rid of the intermixed clay, which consists simply in collecting the materials in large heaps, and setting fire to them on the surface, thus causing the liquefaction of one portion by the combustion of another.

At Macaluba, a hill near Girgenti, consisting of blue clay, there is a continual disengagement of gas, (which I found to consist of carbonic acid and carburetted hydrogen,) from small cavities, shaped like craters, which are filled with muddy water, mixed with petroleum. When I visited the spot the action was rather feeble; but there are times when the quantity of gas emitted is so great, as to throw up the mud to the height of 200 feet, so as almost to justify the name of an Air-Volcano, which has been applied to it.

I shall mention only one other proof of the same fact, which is exhibited near the town of Sciacca, the ancient baths of Selinus. On the slope of Mount Calogero, the ancient Mons Cronius, at the back of the above town, are baths of which the temperature is no less than 120° of Fahrenheit, and which, from their sensible qualities, seem to contain sulphate of magnesia and sulphuretted hydrogen gas. Like the Harrowgate waters, they are much used for cutaneous disorders. At a higher level we lose the rocks belonging to the blue clay formation, and find ourselves upon a white saccharoid limestone, of a compact nature, containing kidney-shaped masses of flint, like those seen in the chalk-strata, which continues to the summit of the mountain. The age of this limestone I must leave for other travellers to ascertain; for though I should be disposed, from its general characters, to refer it to the same formation as that of Monte Giuliano, near Trepani, yet the presence in it of nummulites would lead one to suspect a more recent origin.

I allude to it however, in this place, only on account of the vapour which is continually issuing from the clefts of the mountain at its summit, as an evidence, in common with the hot sulphur-baths at its foot, of the chemical action going on at present among the constituents of the blue clay-formation. The discovery of this vapour, or rather perhaps its application to medicinal purposes, is attributed to Dædalus, who is said to have hollowed out the cavern in which patients are exposed to the hot exhalations. At present, the name of Dædalus is superseded by that of Saint Calogero, to whom a chapel is dedicated close to the spot from whence the vapour issues.

The most southern point at which I recognised the blue clay was in the neighbourhood of Terranuova, where it gives place to a shelly limestone, alternating with a calcareous breccia, which at the time I was disposed to identify with the breccia seen everywhere associated with the preceding rock.

At present, among the various omissions of which I accuse myself, but which the scantiness of accommodation, as well as the distraction of various objects, sometimes rendered unavoidable, there is none I regret more than my not having fully made out the relations of the blue clay formation to the limestone which succeeds it between Terranuova and Cape Passero.

I am, upon the whole, inclined to view it as resting upon the latter; but, on looking back to my notes, I must confess that I do not find myself authorized to state this, on any certain grounds.

I may however, express with more confidence, my belief, that the blue clay formation is of very recent date, belonging probably, to the Tertiary Epoch; and is not, as might be supposed, from the presence of salt and gypsum, related to the new Red or Muriatiferous Sandstone of the north of Europe.

There is nothing in the nature of its imbedded minerals to contradict such an opinion; for gypsum and selenite, sulphur and sulphate of Strontian, are quite as characteristic of the Paris beds as of the secondary sandstone; and common salt is said, by Steffens, to accompany the same rocks at the Segeberg in Holstein; and, by Humboldt, in New Andalusia.*

My reasons for assigning to it this date are, its containing beds of blue limestone with shells, some of which (as Turritellæ) seem to bespeak a tertiary origin; its being accompanied, throughout its whole extent, by the recent breccia above noticed; and the probability that the amber of Sicily has been derived from this stratum,—a circumstance directly affirmed by Ferrara,† and favoured by the situations in which this mineral is chiefly met with; namely, at the mouths of rivers which have flowed through this rock.

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* See Humboldt's Personal Narrative, Vol. I. p. 262, English Translation, and Steffen's Geogn. Aufsatze, p. 142. The description of the muriatiferous clay of New Andalusia corresponds exactly with what we know of the blue clay of Sicily.

† Vide Ferrara Campi Flegrei, p. 29.

Should my inference appear hardly warranted by the above considerations, it will be borne out, at least, by the fact of the identity of this formation with the marl of Italy, described by Brocchi,* which that able geologist seems to to have good grounds for referring to the same recent period. The greater part of the country, at the foot of the Appenines, consists, it would appear, of a calcareous sandstone, and of a brown or bluish marl. The recent origin of the latter is evinced by the trunks of trees buried in it, and preserved nearly fresh, by the leaves of vegetables, and skeletons of fish, in which the dried muscular part may be recognised, and by the immense number of shells retaining all but their animal matters and colour, and sometimes even these.

It contains, like the blue clay of Sicily, beds of sulphur, which is here of a liver colour, and which, according to our author, has been sublimed; thus giving rise to the production of the yellow variety, also seen in the marl of Italy, distributed through the cavities of the rock. Like the blue clay of Girgenti, it gives rise to disengagements of inflammable gas, as near Modena.† It contains mineral pitch, amber, sulphate of lime, both massive and crystallized, sulphate of strontian, and sulphate of barytes. Common salt abounds in the marl of Italy, as in that of Sicily, which is proved by the salt springs, so common in the vicinity of Cesena, Sienna, and Volterra.

The description given by Brocchi, of the calcareo-arenaceous breccia, which accompanies the marl of Italy, corresponds equally with what I have observed respecting that of Sicily, and strengthens the probability that the two formations are identical.

I have now to describe a series of rocks, which occupy the southern portion of the island, extending from Cape Passero, (formerly Cape Pachynus,) to the Lake Lentini, where they are interrupted by a diluvial tract, termed the Piano di Catania, but are seen again northward of that district, near

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* Vide Brocchi Conchologia Subappenina.

† These phenomena are called Salses, or Air-Volcanoes. Is it possible that the inflammable gas of the Pietra Mala, between Florence and Bologna, may have originated from the same stratum, and have found its way through clefts in the older rocks, to the summit of the mountain, whence it escapes?

Catania, and in a few other places, where the rock has escaped being covered by the lavas of Mount Etna.

I traced these beds uninterruptedly, from Terranuova to Cape Passero, and found them to consist either of a soft earthy looking limestone, generally of a straw colour, which, in some of its varieties, resembled the beds occurring in the oolite of this country, or of a breccia, in which nodules of a more compact limestone were imbedded in the earthy looking basis, before described.

In the south of the island, near the town of Ragusa, this formation contains beds of limestone of a black colour, owing to the presence of bituminous matter,* with which it is so strongly impregnated, that thin pieces of it will burn in a candle, leaving an earthy residuum; and it is even said, that the inhabitants use it as fuel. Near Palagenia, west of Lentini, is a lake called Lago Naftia, which is constantly giving out petroleum; it is situated in the same formation.† In many places natural caverns are found, in which a large quantity of nitre is collected, the constituents being probably furnished, in a great measure, by the dung of bats, which resort there in vast numbers.

It is curious to observe, that the natural caverns are frequently incrusted with stalactite, though the artificial excavations, found in great numbers on the same spot, the antiquity of which cannot be questioned, seem altogether free from them.‡

In the country between Terranuova and Cape Passero, the only shells I observed, were near the little town of Scicli, where they consisted chiefly of pectens and ostreæ. I have

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* I find that the Ragusa limestone contains near 14 per cent. of bituminous matter.

† See Ferrara's Pamphlet on the Lago Naftia.

‡ These artificial excavations are extremely curious, in an antiquarian point of view, and do not seem to have been sufficiently noticed. In some places, as at Pantalica, and in the valley of Ipsica, the rock is completely honeycombed with them; and it is difficult to tell, whether they are designed for sepulchres or habitations; at all events, they belong to a people anterior to the period of Greek colonization. The general size of the excavations was about six feet square; and at Pantalica, they were so regularly disposed along the abrupt face of the rock that they resemble the ranges of windows, belonging the several stories of a long building. They seem to be confined to the south of the island, where the stone is soft, and easily hollowed out.

also, from this locality, the cast of a shell which resembles an arca.

At Cape Passero, however, the fundamental rock is not of Neptunian, but of Volcanic origin. At the level of the sea, and rising to a considerable height on the cliff above, is a tuff, the basis of which is a species of dark indurated clay, allied to wacke, and the imbedded portions are composed partly of compact, and partly of cellular lava.

This tuff, as the aggregate may be called, is often amygdaloidal, little spherical concretions of calcareous spar being disseminated through it, and in these cases I have observed, intermixed with the wacke, numerous crystals of a mineral of the hornblende family, which I believe to be schiller spar. In other cases the calcareous matter has penetrated uniformly into the interstices of the rock, and cemented together its parts.

This volcanic tuff is covered towards the summit of the cliff by a bed of limestone, which extends to a little island opposite, on which the Castle of Cape Passero is erected. The limestone is very different in its external characters from that which I had followed from Terranuova. It is of a more crystalline and compact structure, bearing a much nearer resemblance to the limestones of the older strata, than the preceding beds.*

Its usual colour is white, but is sometimes veined with blue, forming, in appearance at least, a kind of breccia.

The shells it contains are numerous, numulites are abundant, as are also madreporites and melanites. But the most remarkable petrifaction is the hippurite, first discovered I believe by Thompson, and noticed in an early volume of the *Geological Transactions*. The entire mass of the rock seems to be charged with this shell, which it is difficult, however, to detach.

The best specimens I succeeded in procuring are already in the museum, and may, I hope, enable Mr. Miller to throw some light on the structure of this rare and curious fossil.

The bed of limestone already noticed is covered by another volcanic rock similar to the preceding one, and two or

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* My friend Mr. Delabeche, who is just returned from Jamaica, showed me some specimens of tertiary rocks from that island, which, in point of compactness, quite equal those of Cape Passero.

three of such alternations occur within a few miles of the Cape. After this a pause seems to have taken place in the volcanic operations, for the calcareous rocks continue without interruption for a distance of almost thirty miles northward of the Cape, to a line nearly parallel with the town of Palazzolo, when indications of igneous action appear to recommence.

The most numerous alternations, however, of these two classes of deposits occur between the town of Lentini and the Mountain of Santa Vennera, to which, as illustrating the general structure of this district, I shall chiefly confine myself.

Santa Vennera, the loftiest mountain in the south of the Island, is capped with lava, full of cells, having that oval or elongated figure common in rocks from which elastic vapours have been disengaged, whilst they were flowing in a current.

Underneath it is a bed of compact limestone, full of minute and hardly distinguishable shells. At a still lower level on our descent towards Lentini, we meet with a second bed of volcanic matter similar to the first, and before we reach the town two other such alternations take place.

At length, as we descend the last hill, which brings us thither, we find ourselves on a calcareous stratum singularly contorted, and dipping in a direction just the reverse of the preceding strata, which seem to be inclined towards the south-west.

The volcanic nature of the beds which separate the calcareous deposits in this part of the island, being unquestionable, it becomes an interesting point to ascertain to what class of formations the latter must be referred.

In this inquiry the order of superposition will assist us little; for, as the whole of these beds rest, as we have seen, on the Volcanic tuff of Cape Passero, so are they covered, in the rare instances in which any other kind of rock is seen above them, by the modern lavas of Mount Etna. The character, therefore, of the shells they contain, seems the only method that remains to us for determining the date of the rocks, and here, fortunately, the information afforded, if not absolutely conclusive, leads, at least, to a probable conjecture.

In the south of the island, indeed, between Cape Passero and Palazzolo, few fossils occur, and these not of a decisive character, unless the rock of Cape Passero itself be considered an exception, where, together with the hippurite, a fossil common, as it would appear, both to the chalk and the first tertiary limestone,* nummulites and melanites are also frequent.

It is, however, to the country intervening between Sortino and Lentini, that I would refer for the most satisfactory proofs of the real age of this formation, as we there see beds abounding in shells, which, if not confined to the most recent class of rocks, seem, nevertheless, in this instance, by their concurrence as well as frequency, to indicate the recent date of the beds which contain them. Among these, the cerithium, turritella, venus, and venericardia may be mentioned as frequent; and near Lentini, dentalia, strombi, pectines, casts of trochi, and neritæ, also occur.

I may add, that fossil fish have been found near Syracuse, as in the rocks of a similar epoch at Monte Bolca near Vicenza.

With regard to the volcanic rocks with which these beds are associated, I may observe, that, whilst the cellular and semivitreous aspect of many of them is such as to preclude any class of geologists from entertaining doubts with respect to the manner of their formation;† the characters of other portions present strong analogies to rocks of the trap family, which, whatever may be their origin, must have a much older date assigned to them.

In some of the beds, for instance, there is a uniform compactness, and a lithoide fracture, which seems to indicate the presence of a certain degree of pressure; in others we may observe the presence of olivine, either disseminate in minute crystals through the mass, as in basalt, or assembled in nests.

The cavities are also frequently filled up with calcareous spar or with zeolites, just like the amygdaloids of more ancient strata; and in some of the beds a tendency to a columnar arrangement is discernible.

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* According to Dr. Boué's arrangement of Fossil Organic Remains, published in the number of the Edinburgh Philosophical Journal for January and April 1825, it appears that the *Hippuritis rotula* and *H. elongatus* of Schlottheim belong to the chalk; the *H. areolatus*, *H. turbinolatus var. α*, and *H. renovatus*, to the first tertiary or salt-water limestone.

† At Palagonia, west of Lentini, the volcanic rock has a superficial covering of obsidian, while it has internally a lithoide basaltic aspect, reminding one of the vein in the island of Lamlash, close to Arran, the sides of which are of pitchstone, whilst the centre is basalt.

The explanation of these phenomena must be reserved for another occasion; at present I have only time to advert to the facts themselves.

The volcanic rocks just considered may, in conformity with my friend Professor Buckland's nomenclature, be termed Antediluvian,* as they have been all subjected to the operation of the same general cause to which the formation of the valleys must be referred.

It is therefore plain, that no craters are to be expected to exist in rocks so circumstanced, although it has been erroneously stated that there is one on Monte Vennera, and others on some of the contiguous hills. The whole of this class, in short, though probably not formed under the pressure of the entire ocean, must have been produced, partially at least, under water, and that at a period antecedent to the existing order of things.

This, indeed appears to be likewise the case with some of the lavas that occur in the neighbourhood of Etna, in the greenstone of the Cyclopean Islands, near Catania, which, though now severed apart from the mainland, and from each other, once constituted a continued stratum, that seems antecedent to the mountain, at the foot of which it is now placed.

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* In adopting this term, I mean to express no opinion with respect to the much agitated question, as to the identity of the particular deluge recorded in the Mosaic History, with the cause to which the excavation of the valleys and the formation of beds of gravel are to be referred.

That no cause, or combination of causes, now in operation, could be adequate to produce these effects, and that the best mode of accounting for them is to suppose the eruption and subsequent retreat of a vast body of water acting simultaneously over the whole surface of the globe, I am myself fully of opinion; but that this event was the same with that deluge which we see alluded to in Holy Writ, is obviously a distinct question, and one which I forbear entering upon, as it belongs rather to the province of Theological than of Scientific discussion. I make these remarks lest I should be accused of adopting a classification founded on hypothetical principles, whereas the expression of *antediluvian* and *postdiluvian*, here used, is merely meant to imply, that the rocks so named were formed before or after the period at which the valleys were excavated, and may, therefore, be received by every one who agrees with Professor Buckland so far as to admit, that the latter effects were brought about by the simultaneous operation of one general cause, and not by a succession of partial ones.

Amongst the other rocks on the same coast, that of Castello d'Aci would appear to be submarine, or at least, of subaqueous origin. It consists of a volcanic breccia, the cementing substance of a sandy nature; the nodules a cellular kind of lava. The nodules, however, are not rounded masses, but result from a sort of irregular cystallization, most of them possessing a radiated structure, so that they resemble a clusture of prisms meeting in a common centre. The above stellular arrangement is the most common, but in other cases the prisms have more of a fan-shaped structure; and in both instances, the point towards which they converge, as well as the interstices between them, consists of tuff.

It seems probable, indeed, from many circumstances, that the eruptions of mount Etna commenced at an era not only antecedent to the time of Homer, but even perhaps to the commencement of the present order of things. If the existence of pebbles and other rolled masses, establish the operation of a deluge, we have, in the gravel at the foot of Etna, abundant evidence of antediluvian eruptions, for both cellular and compact lavas are found among these deposits. Nor would it be difficult to point out, on the slope of Etna, especially on its north-east side, valleys which, from their size and figure, seem referable rather to diluvial action, than to the effect of torrents.

Perhaps the beds of lava at Aci Reale, to which Mr. Brydone refers in his entertaining Travels in Sicily,* where he

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* The following is the passage to which I refer.

"Near to a vault, which is now thirty feet below ground, and has probably been a burial place, there is a draw-well, where there are several strata of lavas, with earth to a considerable thickness over the surface of each stratum. Recupero has made use of this as an argument to prove the great antiquity of the eruptions of this mountain. For if it requires two thousand years, or upwards, to form but a scanty soil on the surface of a lava, there must have been more than that space of time betwixt each of the eruptions which have formed these strata. But what shall we say of a pit they sunk, near to Jaci, of a great depth. They pierced through seven distinct lavas, one under the other, the surfaces of which were parallel, and most of them covered with a thick bed of rich earth. Now, says he, the eruption which formed the lowest of these lavas, if we may be allowed to reasou from analogy, must have flowed from the mountain at least 14,000 years ago. Recupero tells me he is exceedingly embarrassed, by these discoveries, in writing the history of the mountain; that Moses hangs like a dead weight upon him, and blunts all his zeal for inquiry, for he really has not quotes an observation made him by the Abbé Recupero, which seems to him to impugn the faith of our received chronologies, are, in reality, of a date antecedent to the last general eruption of the waters, for I have perceived nothing analogous to these beds among the lavas which the mountain sends forth at present.

At all events Brydone has been grossly deceived, in imagining that the seven beds of lava seen lying, one above the other, near this spot, have been successively decomposed into vegetable mould; the substance which really intervenes between the beds being nothing more than a sort of ferruginous tuff, just similar to what would be produced by a shower of volcanic ashes, such as usually precedes or follows an eruption of lava, mixed up with mud, or consolidated by rain.

Of course, his inference with respect to the antiquity of the globe falls to the ground, as being founded on the fact of the decomposition of so many beds of lava, which turns out to be altogether a mistake.

With regard to the mere modern lavas of Mount Etna, those, I mean, of manifestly postdiluvian origin, I have only to remark, that they exhibit much less variety, both in the nature of their component parts, and in that of their accidental ingredients, than do those of Vesuvius. The older lavas belonging to this class sometimes possess the characters of porphyry slate, and even of trachyte, from which there would seem to be a gradation, dependent on the relative antiquity of the beds, down to the lavas of the present period, which have the usual cellular and vitreous aspect of such products.

Having made this observation, whilst in Sicily, I was pleased on my return, to find, on perusing some papers of the celebrated Prussian geologist Von Buch, (in the Transactions of the Berlin Academy,) that a similar observation is there recorded, on lavas in general, which are conceived by him to

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the conscience to make his mountain so young as that prophet makes the world. The Bishop, who is strenuously orthodox,—for it is an excellent See,—has already warned him to be upon his guard, and not pretend to be a better historian than Moses; nor to presume to urge any thing that may in the smallest degree be deemed contradictory to his sacred authority."—*Brydone's Tour through Sicily*, Vol. I. p. 140.

owe their peculiar characters to an admixture of trachyte with titaniferous iron.

It would be inconsistent, however, with the limits of this communication, to pursue the subject farther, as all general inferences, with regard to this class of substances, would find a more natural place in an essay on the Phenomena of Volcanoes in general.

To conclude then, it would appear that the Island of Sicily contains rocks of the primitive, transition, secondary, and tertiary classes.

The primitive are only found at the north-east corner of the island, near Messina, where the prevailing rock appears to be gneiss.

The transition constitute a chain of hills, extending obliquely from Mellazzo on the north coast, to Taormina on the west. They consist chiefly of mica-slate and clay-slate, quartz-rock, gray-wacke, sandstone, and limestone.

The secondary rocks are found chiefly in a line parallel with the north coast. They consist, 1st, Of red sandstone, with beds of shale, extending from Cape Orlando to Cape Cefalu. 2dly, Of a compact limestone, with beds of chert, jasper, and agate, which constitutes the Madonia Mountains, and extends from Cefalu to Palermo, and from thence to Trepani. It perhaps, corresponds with the magnesian limestone of England. The tertiary rocks consist either of beds of blue clay and marl, containing much gypsum and selenite, sulphur, sulphate of strontian, alum, and common salt. 3dly, Of a calcareous breccia, replete with shells of a recent date, which is seen extensively on the western coast, at the level of the sea; and as we trace it south, is found to rest on the blue clay; or 4thly, Of beds of shelly limestone, which occupy all the south of the island, and alternate repeatedly with beds of volcanic matter.

The volcanic rocks of Sicily are, at least, of two epochs; namely, Antediluvian, which alternate with calcareous rocks, in the Val di Noto, in the southern part of the island. 5thly, Postdiluvian, which comprise the greater part of the lavas that have flowed, at different times, from Mount Etna. It is probable that this mountain was burning, at a period antecedent to the time of Homer; and there are volcanic rocks at its foot, which seem to have been produced anteriorly to the commencement of the present order of things.

APPENDIX.

In order to fulfil my promise of furnishing to others the means of correcting the errors into which I may have fallen, I subjoin the following sketch of the route which the geological traveller should take, in order to obtain as complete a view as possible, in a short time, of the physical structure of the island.

1st day. Messina to Melazzo. Promontory to be examined.
2. —— To Giojusa. Antiquities of Tyndaris.
3. —— Santa Agata.
4. —— Cefalu. Cyclopean ruins.
5. —— Termini. Baths. Madonia. Mountains near.
6. —— Palermo. Recent Breccia of Bagaria lies on the road.

1st day. Palermo to Alcamo.
2. —— To Trepani. Temple of Segeste on the road.
3. —— Marsala. At Trepani Monte Giuliano, formerly Mount Eryx. About Marsala, recent Breccia well seen.
4. —— Castelvetrano. Quarries of Campo Bello.
5. —— Sciacca. Ruins of Selinus on the way. Near Sciacca, Mount Calogero (Baths of Dædalus).
6. —— Monte Allegro. Beds of selenite.
7. —— Girgenti. Before leaving Monte Allegro visit the sulphur mines of Cattolica.

From Girgenti travellers proceed, in general, along the coast to Alicata and Terranuova. I should recommend the following deviation, in order to obtain a knowledge of the structure of the interior of the island.

1st day. Girgenti to Caltanisetta, by Macaluba (air Volcano) Aragano. (Sulphur mines,) &c.
2. —— To Castrogiovanni, where the salt mines of Alimena are seen. Vale of Enna.
3. —— Caltagirone. Bridge thrown over a chasm.
4. —— Terranuova. Look for the junction of the blue-clay and tertiary limestone.

Having regained the coast at Terranuova, proceed:

1st day. To Ragusa. (Bituminous rock.)
2. —— Bachyno, near Cape Passero, seeing on the the road, if possible, the Valley of Ipsica, curious for its artificial caverns.

3d day. From Bachyno visit the rocks of Cape Passero, and then proceed to Noto.
4. ——Palazzolo. Antiquities of Acra.

From thence the usual route is to Syracuse; but I should recommend the following deviation, in order to obtain a full view of the volcanic rocks of the Val di Noto.

5th day. To Vizzini.
6. —— To Palagonia. Lago Naftia.
7. —— Lentini; sleeping at Carlentini to avoid the exhalations from the lake.
8. —— Sortino. Grottos of Pantalica.
9. —— Syracuse.
10. —— Katania.
11. —— Giardini. Ruins of Tauromenium.
12. —— Messina.

If it be wished to make the tour of Mount Etna, the route would be,

1st day. Aderno.
2. —— Randazzo.
3. —— Giardini.
4. —— Catania.

With respect to the inns, those at Messina, Palermo, Catania, and Syracuse, may be considered pretty good. At Cefalu, Termini, Girgenti, Terranuova, Giardini, tolerable. Nearly all the rest execrable, affording scarcely any thing else than a shelter from the elements.

BOTANY.

Art. VII.—*Contributions towards the Botany of the States of Illinois and Missouri.* By Lewis C. Beck, M. D. Professor of Botany, Mineralogy, &c. in the Rensselaer School.

TO PROFESSOR SILLIMAN.

Dear Sir,

During my residence in Missouri, in the years 1820, 21, and 22, a portion of my time was occupied in the investigation of the vegetable productions of that and the adjoining state. Upon my return, I was so fortunate as to receive, uninjured, the collections which I had made. Until the present season, however, I have not had leisure to examine them with the necessary attention, and to revise my notes upon the recent plants. This work I have now commenced, and submit to you the first part, for publication in your valuable journal. Those species which are presented as new, are minutely described; and in all cases where the western specimens of known plants differ from the eastern, this difference is stated. By this means we shall become acquainted with, at least, some of the peculiarities in the vegetation of that interesting section of the United States. Concerning the more common plants, the habitats and times of flowering only are mentioned. The catalogue, it is hoped, will contribute somewhat to increase our stock of knowledge, and will be particularly interesting to geographical botanists, and to future writers upon the botany of the United States.

With sentiments of respect,

Yours, &c.

Albany, Nov. 1, 1825. LEWIS C. BECK.

DIANDRIA. MONOGYNIA.

Ligustrum vulgare *Lin.*

Obs. This shrub attains the height of seven or eight feet, on the prairies, near St. Louis. It is doubtful whether it is a native. Dr. Torrey, in his Flora of the Northern and Middle States, says that it is introduced from Europe; but its situation near St. Louis, appears to be such as to lead to a contrary opinion. It flowers early in May.

Veronica peregrina *Lin.* †

Hab. On the banks of creeks, near St. Louis—common. It flowers in May.

Leptandra virginica *Nutt.*

Hab. Prairies near St. Louis—rare. June.

Gratiola missouriana.*

Root fibrous, perennial. *Stem* erect, simple or sparingly branched, terete, from 4 to 6 inches high. *Leaves* narrow-lanceolate, connate at base, toothed near the apex, opposite. *Peduncles* alternate, rarely opposite, longer than the leaves. *Bracts* longer than the calyx. Segments of the *calyx* linear-lanceolate, unequal, more than half the length of the tube of the corolla. *Corolla* yellow; tube slightly curved. *Filaments* two, of the length of the tube. *Capsule* ovate, acute, shorter than the calyx. Whole plant viscid-pubescent.

Obs. This plant differs from G. *virginica L.* in the following particulars—viz. Its habit is more slender—leaves narrower, and but sparingly toothed at the summit—calyx leaves and peduncles longer—capsule smaller and more acute.

Hab. On the alluvion of the Mississippi river, near St. Louis. June.

Lindernia dilatata *Muhl.*

Hab. Inundated banks of the Mississippi, at St Louis and elsewhere. July.

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† I have, with few exceptions, omitted synonyms, as these may be found in the works of Pursh, Torrey, and others.

Catalpa syringœfolia *Pursh.*

Obs. It is a subject of much dispute, whether this tree is a native of the United States. Judging from the localities which I have visited at St. Louis, and elsewhere on the Mississippi and Ohio rivers, I am inclined to believe that it has been introduced. The existence of this tree, in the western sections of the United States, was one of the arguments advanced by Jefferson and Volney, to prove that the climate there is much warmer, under similar parallels of latitude, than on the Atlantic coast. If, however, this tree is not a native, as is the opinion of Nuttall and other botanists, the argument is unfounded; for it will bear cultivation at Albany, and other places on the coast, far north of where it is found in the west.† The few trees which I observed in the vicinity of St. Louis, were from 15 to 20 feet high, and when in flower were extremely ornamental. It flowers late in June.

Justicia pedunculosa *Mich.*

Hab. This plant, although rare, is found in the extreme parts of the United States. Elliott notices it in his Sketch of the Botany of South Carolina and Georgia. It is found also in creeks in the western parts of the state of New-York. In Missouri, I have observed it only on the inundated banks of the Merrimack river, 16 miles south of St. Louis. It is from 2 to 2½ feet high, and flowers in June.

Cunila glabella *Mich.*

Hab. On the rocky banks of the Mississippi, at St. Louis. —In similar situations on the St. Lawrence, Ohio, and Tennessee.—August.

Obs. Nuttall and some other botanists follow Persoon, in placing this plant under the genus Hedeoma; but it differs from this last in its calyx, which is oblong-cylindric, 10-striate, not gibbous at the base, indistinctly 2-lipped, with the teeth nearly equal and subulate. Dr. Torrey's description of this species is minutely accurate, so far as relates to the western specimens which I possess.

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† For further remarks on this subject, see a paper, by the author of these contributions, published in the New York Medical and Physical Journal, Vol. II. p. 273.

Hedeoma hirta *Nutt.*

Root annual. *Stem* 4 to 6 inches high, branching at the base, pubescent. *Leaves* linear, sub-lanceolate, acutish at both extremities, entire, and veined. *Bracts* ciliate. *Calyx* strigose. *Flowers* in whorls, minute, shorter than the calyx.

Hab. On the rocky banks of the Mississippi, in company with the last. According to Mr. Nuttall, it is also found on the open alluvions of the Missouri. July.

Monarda Bradburiana.*

Root perennial. *Stem* about three feet high, simple, quadrangular, solid, smooth, except at the joints, and on the angles towards the top. *Leaves* opposite, sessile, or on very short ciliate petioles, hairy on both sides, oblong-lanceolate, dentate, rounded at the base. Outer *bracts* broad-lanceolate, ciliate, coloured. *Calyx* hairy, very densely bearded at the throat, terminating in five subulate, divaricate teeth, which are more than an eighth of an inch long; teeth and upper part of the calyx coloured. *Heads* of flowers large, terminal. *Corolla* large, deeply divided into two lips; upper one narrow, curved, enclosing the stamens, and about the same length, very villose at the end, pale purple; lower lip broad, with darker spots. *Sessile-leaved Monarda.*

Hab. Barrens north of St. Louis. July.

Obs. I have named this beautiful and very distinct species, in honour of the late John Bradbury, F. L. S., as a tribute to the memory of a highly valued friend, and distinguished botanist.

Monarda scabra.*

Root perennial. *Stem* obtuse-angled, smoothish, three feet high, branching. *Leaves* from 2 to $2\frac{1}{2}$ inches long, ovate-lanceolate, sub-cordate, serrate, revolute on the margin, scabrous, thick, punctate, opposite, on short hairy petioles, somewhat hairy. *Bracts* ovate-lanceolate. *Flowers* in large simple terminal heads, which are somewhat in threes. *Calyx* half an inch in length, hirsute, very densely bearded at the throat, terminating in short acute teeth, nearly straight. *Corolla* hirsute, pale purple; upper lip straight, about the length of the stamens. *Rough-leaved Monarda.*

Hab. Woods on the banks of the Mississippi river, one mile north of St. Louis. July—August.

Obs. This species can be distinguished by the surfaces and texture of its leaves; and by the shortness of the teeth of the calyx, which are almost obscured by the dense hairs at the throat.

Monarda ciliata *Pursh & Willd.*

Hab. Banks of Riviere des Peres, five miles west of St. Louis. July. Some of the specimens have lanceolate leaves, on petioles of from half an inch to three-fourths of an inch in length. They should, perhaps, constitute a new species.

Circæa canadensis *Muhl. Cat.*

Hab. Woods on the banks of the Mississippi—common. June.

TRIANDRIA. MONOGYNIA.

Fedia radiata *Mich.*

Hab. On the banks of the Mississippi. April—May.

Iris versicolor *Lin.*, *Var.* sulcata *Torrey.*

Hab. Swamps a mile west of St. Louis—abundant. May.

Sisyrinchium bermudianum ?

Obs. There appears to be some confusion among botanists, with regard to S. bermudianum, and I am still doubtful whether my specimens belong to this species. They are from four to six inches high, with numerous flowers;—valves of the *spathe* unequal, coloured; *petals* broad, nerved, with a central cusp.

Hab. On the rocky banks of the Mississippi, nearly opposite to the mouth of the Missouri river—Illinois. April.

Scirpus pendulus *Muhl. Gram.?*

Hab. Borders of ponds, west of St. Louis. June.

Scirpus acicularis *Lin.*

Hab. In similar situations with the last. June.

Dulichium spithaceum *Pers.*

Hab. Banks of the Merrimack river, sixteen miles south of St. Louis. June.

Cyperus inflexus *Muhl. Gram.*
HAB. Near St. Louis. July.

Cyperus strigosus *Muhl. Gram.*
HAB. Margins of ponds, St. Louis. July.

TRIANDRIA. DIGYNIA.

The following grasses were found on the prairies near St. Louis, viz.

Leersia oryzoides *Swartz & Muhl.* July.
Agrostis alba *Lin.* June.
Alopecurus geniculatus *Lin.* June.
Poa reptans *Mich.*
Poa reptans, *Var.* cœspitosa *Torrey.* June.
Poa compressa *Lin.* May—June.
Poa annua *Lin.* March—April.
Elymus glaucifolius *Muhl.* July
Panicum latifolium *Lin.* May.
Andropogon furcatum *Muhl. Gram.*

TRIANDRIA. TRIGYNIA.

Mollugo verticillata *Lin.*
HAB. On the prairies in Illinois and Missouri—common. July.

Lechea major *Lin.*
HAB. Prairies near St. Louis. June.

TETRANDRIA. MONOGYNIA.

Cephalanthus occidentalis *Lin.*
HAB. Banks of the Mississippi at St. Louis. June.

Galium circæzans *Mich.* } Wet grounds, near
Galium bermudianum *Lin.* } St. Louis. May.

Houstonia minima.*
Root annual? *Stem* 1 to 1½ inches high, erect, simple, square, a little scabrous. *Leaves* opposite, spathulate-ovate,

subacuminate, ciliate, scabrous on both sides. *Flowers* solitary, terminal, crowning a peduncle, which is of about half an inch in length. *Calyx* inferior? segments large, ovate, subacuminate, erect, persistent, as long as the tube of the corol. *Corolla* blue; border expanding.

HAB. *Fields* about half a mile west of St. Louis. March.

OBS. When I first observed this plant, I supposed it to be *H. patens* of Elliott; but upon a closer examination, I find it to be quite distinct. The stem of *H. minima* is simple: in a few specimens, however, I observe a small shoot protruded from near the root; the leaves and the segments of the calyx are of a different shade, the latter being much larger. The peduncle of *H. patens* is armed in the middle with two scales, which is not the case with *H. minima.* Mr. Elliott observes, moreover, that it is not easy to point out a mark of specific distinction between his *H. patens*, and *H. cærulea*, of Linneus. This remark cannot apply to *H. minima.* I have seen whole fields covered with this beautiful little plant, and it is uniform in its height, and the other specific characters above detailed. The segments of the calyx alone, would sufficiently distinguish it from *H. cærulea Lin.*; and indeed from all the other species of this genus.

Houstonia cœrulea *Lin.*

HAB. Prairies in Illinois and Missouri—common. May. My specimens have mostly dichotomous stems.

Houstonia longifolia *Willd.*

HAB. Prairies, west of St. Louis.—May.

Houstonia purpurea *Willd.*

HAB. In similar situations with the last. May. My specimens all have lanceolate leaves, differing, however, in breadth. Hence the reason why Linnæus and some of his correspondents confounded it with *H. longifolia.*

Houstonia ciliolata *Torrey Fl.*

HAB. Woods three miles west of St. Louis. May.

OBS. My Missouri specimens of this plant agree remarkably with those which I received from Professor Hadley, of the Western Medical College, and which he gathered at Niagara Falls. Previous to my having seen Dr. Torrey's description, I had labelled my specimens *H. purpurea* with a mark of doubt. I am now convinced that they do not belong to that species.

Cornus florida *Lin.*

Hab. On the banks of the Illinois river, 50 miles above its mouth—not common. March—April.

Cornus circinata *Willd.*

Hab. On the American bottom opposite to St. Louis. April.

Cornus sericea *Willd.*

Hab. With the last.

Plantago virginica *Lin.*

Hab. Near St. Louis and elsewhere—common.

It varies considerably in height and in the size of its leaves.

Plantago pusilla *Nutt.*

Hab. On the mounds about one mile north of St. Louis. April. The specimens which I observed were about three inches high; and were not armed with the subulate bracts belonging to *P. aristata* of Michaux, with which this species has been confounded.

Ptelea trifoliata *Lin.*

Hab. Timbered alluvions of the Mississippi, at St. Louis and elsewhere. May. In my specimens the leaves are generally pubescent on the under surface, and have a whitish colour.

TETRANDRIA. TETRAGYNIA.

Potamogeton gramineum *Mich.*

Potamogeton lucens *Lin.*

Both these species are found in ponds west of St. Louis. July.

(*To be continued.*)

Art. VIII.—*Caricography.* By Prof. Dewey.

(Continued from Vol. X. p. 48.)

[Communicated to the Lyceum of Natural History of the Berkshire Medical Institution.]

66. Carex *acuta.* L.
Muh., Pursh, Eaton, Pers. no. 197.
Ell. no. 21. Schw.
Wahl. no. 136. Rees' Cyc. no. 156.
Schk. tab. Ee and Ff fig. 92.

Spicis staminiferis pluribus vel una oblongis erectis, suprema pedunculata, cæteris sessilibus et abbreviatis; spicis fructiferis *distigmaticis* subternis oblongis cylindraceis sæpe recurvis sessilibus infima pedunculata, sæpe apice staminiferis, laxifloris vel subdensifloris; fructibus ellipticis compressis acutiusculis ore integro et protruso glabris, squama oblongo-lanceolata paulo brevioribus.

β. erecta, (mihi,) Spica staminifera solitaria brevi; spicis fructiferis binis erectis sessilibus strictis subdensifloris brevicylindraceis. C. *virginiana?* Rees' Cyc. no. 100.

γ. sparsiflora, (mihi,) Spicis staminiferis binis brevibus, inferiore parvula; spicis fructiferis oblongis subsessilibus laxis subsparsifloris.

Culm 1—2 feet high, acutely triquetrous, very sharp and rough on the edges; leaves linear, often longer than the culm, very rough on the edges, carinate, sheathing the base; sheaths striate, sometimes filamentous; bracts long, leafy, rough, surpassing the culm, slightly auriculate at the base; staminate spikes one to three, cylindric, sessile except the highest, variable in length; staminate scale oblong, obtuse, often rather acute, brown on the border; stigmas two; pistillate spikes about three, cylindric, from half an inch to two inches in length, often staminate at the apex, sessile except the lowest, and recurved, sometimes all sessile and closely erect, sometimes rather densely flowered, often very loosely flowered and fruit decurrent; fruit elliptic, varying to ovate and obovate, smooth, with an entire protruded mouth; pistillate scale oblong-lanceolate, dark brown on the margin, green on the keel, a little longer than the fruit. Colour of the plant bright green, of the spikes dark.

Flowers in May and June—grows in marshes; common.

This is a variable species, and was named C. *mutabilis* by Willd. in Prodr. Berol. In Schk. there are eight figures in its different states exhibiting two varieties. It is generally recognised without difficulty from its form and the roughness of its culm and leaves. It often grows in large, elevated, dense bogs.

67. C. *cespitosa*. L.
Muh., Pursh, Eaton, Pers. no. 195. Schw.
Wahl. no. 139, Rees' Cyc. no. 132.
Schk. tab. Aa and Bb fig. 85.

Spica staminifera solitaria, sæpe binis, erecta oblonga, infima sessile; spicis fructiferis *distigmaticis* ternis oblongo-cylindraceis subdensifloris sessilibus, sæpe apice staminiferis; fructibus ovalibus et obovatis utrinque convexis obtusis ore integro et protruso glabris, squama oblonga obtusa paulo longioribus.

Culm 12—20 inches high, triquetrous, slightly scabrous above, leafy; leaves linear-lanceolate, shorter than the culm, abbreviated below, sheathing towards the base; bracts leafy, linear-lanceolate, rather shorter than the culm and without sheaths; staminate spikes one or two, oblong, lowest sessile; staminate scale oblong, obtuse, purplish brown on the margin, whitish on the keel; stigmas two; pistillate spikes three, sometimes staminate at the apex, cylindric, rarely two inches long and often less than one, sessile, nearly erect, lowest slightly pedunculate, rather densely flowered; fruit oval or obovate, obtuse, with an entire and protruded mouth, glabrous; pistillate scale oblong, obtuse, rarely lanceolate and obtuse, nearly black on the margin, green on the keel, and a little shorter than the mature fruit. The whole plant is of a light green colour or yellowish green, and is rather soft to the touch.

Flowers in May—grows in dense patches along the banks of streams, and is often overflowed by the rise of waters; common, but not abundant.

Four varieties of this species are figured by Schk., but they are easily recognised. On our specimens the pistillate spikes are longer than those represented on the figures of Schk., or on my specimens received from England. This species is nearly related to the preceding; but the difference in the manner of growth, colour, and roughness, is great and constant; and to the eye their appearance is very diverse.

68. C. *aquatilis*. Wahl.
Pers. no. 193, Wahl. no. 135. Rees' Cyc. no. 175.
Schk. Car. II. p. 29.
Am. Journ. Vol. X. tab. E. fig. 16.

Spicis staminiferis pluribus vel unica erectis; spicis fructiferis *distigmaticis* breviter pedunculatis cylindraceis subternis superne incrassato-clavatis densifloris suberectis, sæpe apice staminiferis; fructibus ellipticis sublentiformibus glabris ore integro et protruso, squamæ ovatæ acutiusculæ subæquantibus.

Culm 20—30 inches high, erect, triquetrous, stiff, somewhat reclined at the summit, rather obtuse angled and scarcely scabrous; leaves linear-lanceolate, striate, stiff, long as the culm, spreading; bracts long, leafy, much surpassing the culm, without sheaths; staminate spikes one to four, erect, subsessile, lower one bracteate, staminate scale oblong, somewhat obtuse, tawny; stigmas two; pistillate spikes about three, shortly pedunculate, suberect, cylindric, thickened above, an inch to two inches long; densely flowered; fruit elliptic, somewhat lenticular, rather small, glabrous, entire and protruded at the orifice; pistillate scale ovate, rather acute, tawny on the edge, about equalling the fruit, and as it is narrower, giving a light appearance to the spikes. Colour of the plant bright green.

Flowers in May—grows in the form of bogs in wet situations; common.

This species has been confounded with C. *acuta*, to which it is closely related. But it differs in its larger and thicker spikes densely flowered, in its wider leaves, in its less acute and even obtuse angled culm scarcely scabrous, and in its spikes being much lighter coloured. It is described by Schkuhr, but he has given no figure of it. Our plant agrees with a specimen from Sweden.

The three preceding species with C. *stricta* and C. *crinita* form a very natural subdivision in this genus. Excepting C. *crinita*, they strongly resemble each other, and will not be distinguished without particular attention.

Note. Though the distinguishing characters of C. *cephalophora*, were given Vol. VII. p. 269 of this Journal, a more extended description is due to that species, and here follows.

C. *cephalophora*.
Muh., Pursh, Eaton, Schw., Ell.
Pers. no 26. Mon.* no. 12.
Schk. tab. Hhh fig. 133.

Spiculis androgynis superne staminiferis *distigmaticis* ovatis densè aggregatis subquinis bracteatis ; fructibus ovatis acuminatis compressis bifidis margine scabris, squamæ parvæ scabro-cuspidatæ subæqualibus.

Culm 8—20 inches high, 2—4 feet, and decumbent according to Muhlenberg, triquetrous, scabrous above ; leaves very long, often surpassing the culm, linear-lanceolate, scabrous on the margin, striate, sheathing towards the base ; spikelets three to seven, about five generally, staminate above, ovate, becoming yellow or tawny, distinct but densely aggregated, often forming a kind of head, lower ones often a little remote, with ovate bracts ending in a scabrous bristle twice or thrice as long as the spikelets ; fruit ovate, acuminate, compressed, bifid, scabrous on the margin, glabrous, and diverging ; pistillate scale ovate, small, cuspidate, and scabrous, about the length of the fruit. Colour of the plant rather light green.

Flowers in May—grows along the borders of woods ; common.

The particular difference between C. *cephalophora* and C. *squarrosa*, which were strangely confounded by Pursh, was remarked upon Vol. VII. p. 269—270.

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* See the "Monograph of the North American species of Carex ; by the Rev. Lewis D. De Schweinitz : Edited by John Torrey." This paper, which is known to be greatly indebted to its Editor for its present form and many of its excellencies, began to appear in the "Annals of the Lyceum of Nat. History of New York," Vol. I. No. 9. The reference to the Monograph will be *Mon.* or Schw. and Torrey.

69. C. *stricta*. Gooden.
Schw. Analyt. Tab. Wahl. no. 138.
Pers. no. 196. Rees' Cyc. no. 133.
Schk. tab. V fig. 73.

Spicis staminiferis subgeminis erectis oblongis subtriquetris; spicis fructiferis *distigmaticis* subternis cylindraceis erectis sæpe apice staminiferis superne acutiusculis, infima breviter pedunculata; fructibus ovatis compressis acutiusculis ore integro et protruso glabris, squama oblonga acuta paulo brevioribus.

Culm 12—20 inches high, erect and stiff, acutely triquetrous, quite scabrous above, leafy towards the base; leaves stiff, erect, linear-lanceolate, rough on the edge, shorter than the culm, *filamentose at the sheaths;* bracts leafy, rough, linear-lanceolate, about the length or longer than the culm, auriculate at the base when young; staminate spikes two, sometimes one, rarely three, long, triquetrous, highest pedunculate; staminate scale oblong, rather obtuse, reddish brown on the margin, green on the keel; stigmas two; pistillate spikes about three, erect, subcylindric, one to two inches long, densely flowered, often staminate at the apex, tapering above, nearly black from the dark colour of the scales; fruit ovate, compressed, small, rather acute above, entire and protruded at the orifice, glabrous, not persistent but falling off very early; pistillate scale oblong, acute, nearly black on the margin, white on the keel, nearly as long as the fruit. Colour of the plant, except the spikes, *glaucous* green.

Flowers in May—grows in marshes. I have found it abundant in a marsh a mile north of the College. Also Penn., Schw.

This species, found in England and Sweden, was first recognised in our country, by Mr. Schweinitz. It has probably been confounded with C. *acuta*, which it much resembles. There can be no doubt however that it is a distinct species. Though it grows in similar situations with C. *acuta*, it does not form a *bog*, but spreads over the surface of the marsh. It differs from that species too in its colour, in the appearance of its spikes, in its more stiff and erect form, and in its fruit being *caducous*. In the specimens which I have seen, the pistillate spikes are as long as, but smaller than, those of the European specimens.

This species is not the C. *stricta*, Lam., the C. *Virginiana*. Rees' Cyc. no. 100, which is probably the variety β of C. *acuta*.

70. C. *crinita*. Lam.
Muh., Pursh, Eaton, Pers. no. 192, Ell. no. 20. Rees' Cyc. no. 141. Schw.
Schk. tab. Eee fig. 125, and Ttt fig. 164.
C. *leonura*, Wahl. no. 120, Rees' Cyc. no. 138.
C. *paleacea*, Wahl. no. 131, Rees' Cyc. no. 171.

Spica staminifera solitaria vel binis laxis, sæpe sparsè fructiferis; spicis fructiferis distigmaticis, rarò tristigmaticis, subternis oblongo-cylindraceis pedunculatis nutantibus sublaxifloris inferne attenuatis, sæpe superne staminiferis; fructibus ovatis subinflatis subtriquetris breviter rostratis ore integro glabris, squama oblonga lineare longè scabro-aristata triplo brevioribus.

β. *paleacea*. C. *paleacea*, Wahl. Spicis fructiferis subquaternis longo-cylindraceis flagelliformibus densifloris distigmaticis recurvis cum pedunculo longo reclinato; squamis cuspide longa serrata terminatis, fructu plus quam triplo longioribus.

γ. *gynan ra*. C. *gynandra*, Schw. Analyt. Tab. Spicis fructiferis pendulis; squamis fructu subduplo longioribus.

Culm 15—30 inches high, acutely triquetrous, subscabrous above: leaves linear-lanceolate, scabrous on the edge, striate, shorter than the culm with striate sheaths; bracts leafy, surpassing the culm, without sheaths, somewhat embracing the stem; staminate spike single, sometimes two, long, lax, often with a few fruit scattered above, or below, or along the middle of the spike; staminate scale linear, acute, rough on the edge, brown on the margin, sometimes oblong and mucronate; stigmas two, rarely three; pistillate spikes two to four, usually three or four, oblong-cylindric, often larger in the middle and attenuated at the base, pedunculate, nodding, sometimes suberect, often staminate above, rather densely flowered; fruit ovate, subtriquetrous, subinflated, short-rostrate, glabrous. entire at the orifice; pistillate scale linear, broad at the base, short-oblong, with a long scabrous awn, brown on the margin, about thrice the length of the fruit.

The first is the variety described by Lamarck. It flowers in May—grows in wet situations; colour a light green. It is described under the name of C. *leonura* by Wahlenberg, and as having three stigmas, which is sometimes the fact, it corresponds to tab. Eee fig. 125. Schk.

The second variety is the C. *paleacea*, Wahl., described as having two stigmas, and corresponds to tab. Ttt fig. 164, Schk. It flowers in May—grows in light, alluvial soil, or along streams, colour yellowish green, often three feet high, long, cylindric, recurved, pistillate spikes, densely flowered, and supported on rather long reclined peduncles, and with a pistillate scale more than three times as long as the fruit, and terminated by a long, rough, serrate curve.

The third variety is the one named C. *gynandra* by Mr. Schweinitz, and, as appears from a comparison of specimens, differs but little from the more common form of the species.

71. C. *atrata*. Lin.
Pers. no. 28. Wahl. no. 114.
Rees' Cyc. no. 74. Schw.
Schk. tab. X fig. 77.

Spicis tristigmaticis subquaternis oblongo-ovatis subcernuis, terminali androgyna inferne staminifera, superis confertis sessilibus, inferis subdistantibus pedunculatis subrotundo-ovalibus compressis glabris breviter rostratis ore bilabiato, squama oblonga acutiuscula nigra paulo brevioribus.

Culm about a foot high, triquetrous, scarcely scabrous, leafy and brownish towards the base; leaves linear-lanceolate, shorter than the culm, nearly flat, striate; bracts long and leafy; spikes three to five, with three stigmas, oblong-ovate, densely flowered, rather nodding, the highest androgynous, staminate below, the others with scattered staminate florets, three highest sessile and approximate, the lower rather distant, and pedunculate, sometimes nodding, and nearly destitute of sheaths; fruit roundish oval, sometimes slightly obovate and somewhat acute at the base, compressed, glabrous, with a short, two-lipped beak: pistillate scale oblong, somewhat acute, *black*, a little longer than the fruit. Colour of the spikes black, of the plant light green; agrees with the same species received from Silesia.

This species inhabits the Alps, the mountains of England, &c. and was discovered in our country on the Rocky mountains by Dr. E. James. This species is very different from C. *nigra*, Willd. no. 115, Pers., and also from C. *ustulata*, Wahl. no. 92.

72. C. *Washingtoniana.* (mihi.)
Am. Journ. Vol. X. tab. D fig. 14.

Spicis distinctis; spica staminifera solitaria erecta; spicis fructiferis tristigmaticis oblongis cylindraceis subsessilibus subremotis erectis subsparsifloris; fructibus ovalibus utrinque acutis compressis brevi-rostratis ore integro glabris, squamæ ovato-oblongæ acutiusculæ subæquantibus.

Culm about a foot high, triquetrous, subscabrous above; leaves linear, striate, about as long as the culm, shorter below; bracts leafy, linear, lower ones equalling the culm with scarcely any sheaths; staminate spike single, erect, short pedunculate with an oblong and obtuse black scale, white on the keel and edge: stigmas three; pistillate spikes two to four, oblong, cylindric, erect, about sessile, rather loose flowered, nearly an inch long, and separated from each other about their length; fruit oval, rather acute at both ends, compressed, glabrous, with quite a short beak and entire at the orifice; pistillate scale ovate-oblong, subacute, about equalling the fruit, nearly black, with a white edge and white line on the keel. Colour of the spikes black or dark brown: of the plant light green, becoming brown.

Flowers in June—grows in damp soil—found on the White mountains of N. H. near the summit of Mount Washington, by Dr. J. Barratt, Professor of Botany, &c. in the Mil. Acad. Middletown, Ct.

This plant differs from C. *nigra*, Willd. and Pers. no. 115, as appears from the description there and in Rees' Cyc. no. 75, in its oblong, rather remote spikes, and in its fruit and scale. C. *nigra* has ovate, clustered spikes. It may have been mistaken for C. *saxatilis*, but differs from that species Schk. tab. I and Tt fig. 40, as well as from its var. C. *Bigelowii* in the Analyt. Tab. of Mr. Schweinitz, in the shape of its spikes, fruit, and number of stigmas. Although this species resembles, it is, as well as the preceding, very different from C. *ustulata* Wahl. no. 92, the C. *atrofusca* Schk. tab. Y fig. 82, which, according to Mr. Schweinitz, has been found in Labrador.

73. C. *Michauxii.* (Mihi.)
C. *subulata.* Mx.
Pursh, Eaton, Schw.
Am. Journ. Vol. X. tab. G fig. 21.

Spicis distinctis; spica staminifera solitaria erecta; spicis fructiferis tristigmaticis subternis sessilibus vel incluse pedunculatis distantibus per-paucifloris; fructibus subulatis vel subinflato-lanceolatis longis rostratis divaricato-reflexis ore integro glabris, squama lanceolata plus quam triplo longioribus.

As Wahlenberg had published a species under the name of C. *subulata*, found in the Isle of Bourbon, and very different from that described by Michaux, it is necessary to give Michaux's plant a new name. I have chosen for it the name of that eminent botanist.

Culm a foot high or more, triquetrous, slender, smooth, lax; leaves flat, linear, striate, smooth, shorter than the culm with striate sheaths; bracts leafy, linear, flat, upper ones long as the culm; staminate spike single, short, small, with an oblong mucronate white scale; stigmas three; pistillate spikes about three, sessile or with inclosed peduncles, two to four flowered, quite distant; fruit subulate, or long lanceolate, rostrate, slightly inflated, entire at the orifice, reflexed and diverging, somewhat two-ranked; pistillate scale lanceolate, whitish, nearly one third as long as the fruit. Colour of the plant light green.

Flowers in May and June. Found in Canada, Mx.—Alleghany mountains, Schw.—Also in N. Jersey, whence I received the plant through the politeness of Dr. Torrey.

This plant is related to C. *leucoglochin*, Erh., but is a very distinct and finely characterized species.

74. C. *vesicaria.* Lin.
Muh., Pursh, Eaton, Schw., Pers. no. 203.
Wahl. no. 124, Rees's Cyc. no. 163.
Schk. tab. Ss fig. 106.

Spicis staminiferis distinctis subternis erectis, suprema pedunculata, cæteris sessilibus; spicis fructiferis tristigmaticis binis vel ternis cylindraceis alternis erectis densifloris, suprema sessile; infimis subpedunculatis; fructibus oblongo-ovatis subteretibus inflatis subulato-rostratis potentibus nervosis glabris bicuspidatis, squama ovato-cuspidata vix duplo longioribus.

Culm about two feet high, triquetrous and somewhat winged above; leaves linear-lanceolate, rough, long or longer than the culm, sheathing towards the base; bracts leafy, long, distant, much surpassing the culm, without sheaths; staminate spikes three, erect, cylindric, upper one longer and pedunculate, the others sessile and bracteate; staminate scale oblong, obtuse, white and subserrate on the edge, tawny; stigmas three; pistillate spikes two or three, cylindric, erect, in maturity somewhat nodding, alternate, sessile above, pedunculate below, rather thick; fruit oblong-ovate, tapering above, rostrate, nerved, glabrous, bicuspidate, inflated, somewhat spreading; pistillate scale ovate-cuspidate, tawny, green on the keel, more than half as long as the fruit. Colour of the plant rather light green.

Flowers in May and June—grows in marshes, or beside slow muddy brooks. Found in Penn., Muh.—Westfield, Mr. Davis, to whom I am indebted for most of my specimens. Also, in Northampton.

This species differs from its related species, C. *ampullacea*, in its spikes, and in the form and length of the fruit and scale; the latter having more distinctly ovate fruit and a scale nearly equal in length to the fruit; from C. *lacustris*, and C. *riparia*, in the appearance of its spikes, fruit, and scale; from C. *evoluta*, Hartm. particularly in the shape of the fruit.

75. C. *Hitchcockiana.* (Mihi.)

Am. Journ. Vol. X. tab. E fig. 17.

Spicis distinctis; spica staminifera solitaria erecta pedunculata; spicis fructiferis tristigmaticis subternis, erectis exserte pedunculatis paucifloris persparsifloris, infima remota; fructibus subtriquetro-ovalibus inflatis utrinque alternatis apice recurvis striatis cum rostro brevi truncato et aperto, squamæ oblongæ vel ovatæ mucronatæ subæquantibus; culmis, foliis, bracteisque scabro-pubescentibus.

Culm 16—24 inches high, erect, triquetrous, scabrous above; leaves scabrous, shorter than the culm, striate, shorter below, with striate sheaths; bracts long, leafy, much surpassing the culm, with short sheaths, and often having a large ovate stipule opposite the bract; staminate spike single, erect, from the sheath of the highest pistillate, with a lanceolate or oblong acute scale, white on the margin and green on the keel; stigmas three; pistillate spikes 2—4, generally three, erect, short pedunculate, the two higher rather near, the third rather remote, and the fourth, when present, very distant, peduncles some longer than the sheaths; fruit elliptic, somewhat triquetrous, attenuated at both ends, alternate, distant, inflated, striate, recurved at the apex, with a short beak abruptly terminated and having an open orifice; pistillate scale ovate or oblong, rough-mucronate, often equalling and sometimes exceeding the length of the fruit, whitish on the margin and green on the keel. Colour of the plant rather dark green; and the culm leaves, and bracts covered with a slight, but distinct, *scabrous pubescence*.

Flowers in May—grows on the borders of mountain woods, Williamstown.

This beautiful species is allied to C. *laxiflora*. It is readily distinguished from that species by its fruit and rough pubescence. It is named in honour of the Rev. E. Hitchcock and lady, to whom I am so greatly indebted for the figures which accompany this Caricography.

76. C. *paniculata*. L.
Muh. Pursh, Eaton, Schw., Pers. no. 77.
Wahl. no. 25. Rees' Cyc. no. 61. Mon. no. 23.
Schk. tab. D fig. 20.

Spiculis androgynis superne staminiferis, sæpe dioicis, distigmaticis fuscis ovatis in paniculam digestis; fructibus ovato-lanceolatis acuminatis gibbis nervosis bidentatis margine ciliato-serratis basi glabris, squama ovata acuta acuminata paulò brevioribus.

Culm 15—30 inches high, slender, triquetrous, scabrous above; leaves linear, pointed, about as long as the culm, narrow, striate, shorter below, with tawny sheaths at the base; spikelets staminiferous above, often diœcious, numerous, ovate, tawny, arranged along several branches, and the whole of a paniculate form; stigmas two; fruit ovate-lanceolate, acuminate, bidentate, scarcely triquetrous, somewhat concave below, gibbous at the base, with a scabrous margin and becoming dark brown in maturity; pistillate scale ovate, acuminate, tawny, a little longer than the fruit. Colour of the plant light green.

Flowers in May—grows in large tufts along the borders of ponds and about stagnant waters; common. This species is common in Europe, and the specimens received from the north of Europe agree exactly with ours, even in size, though ours is generally said to be a smaller plant. The characters which distinguish this species from C. *teretiuscula*, Gooden. were mentioned Vol. VII. p. 266 of this Journal.

β. decomposita. C. *decomposita*, Muh. Gram. no. 58. In this variety the panicle has a lighter or a green colour, the scales are white with a green keel, and the fruit is without nerves and entire. In every important character it agrees with C. *paniculata*.

77. C. *rosea*. Schk.
Muh., Pursh, Eaton, Pers. no. 61.
Schw., Ell., Mon. no. 15.
Schk. tab. Zzz fig. 179.

Spiculis androgynis superne staminiferis distigmaticis subquaternis alternis subremotis sessilibus, infima longo-bracteata ; fructibus oblongo-lanceolatis superne convexis margine scabris bidentatis perdivergentibus, squama ovata obtusa subduplo longioribus.

Culm 8—16 inches high, three or five angled, very slightly scabrous above; leaves linear lanceolate, long as the culm, shorter below, rough on the edge, with striate sheaths; spikelets three to six, five to twelve flowered, staminate above, alternate, ovate before maturity, often remote, sessile, two highest near, the lowest and often the two lower with a long, scabrous, setaceous bract; stigmas two; fruit oblong-lanceolate, or ovate subrostrate, convex above, scabrous on the margin, two-toothed, diverging or horizontal, often reflexed ; pistillate scale ovate, obtuse, white, green on the keel, about half the length of the fruit. Colour of the plant varying from light to deep green.

Flowers in May—common in moist woods and pastures; in the open fields has a rather stiff culm; in the woods is rather slender and tall, and often prostrated by the weight of the fruit.

β. radiata. C. *stellulata.* *β. radiata*, Wahl.

Spiculis distantibus subtrifloris cum bracteolis setaceis ; fructibus oblongis ; culmis spathameis flaccidis, setaceis, foliis angustissimis.

This variety is credited to our country by Wahl. It is often found about woods, four to six inches high, slender, with very narrow leaves. spikelets about three, distant, 2—4 flowered, with very long setaceous bracts; fruit rather oblong and diverging. In other respects it resembles the common C. *rosea.*

In Vol. VII. p. 271, the characters which distinguish C. *rosea* from C. *retroflexa* were mentioned; a more full description of the latter species as well as of C. *stipata*, is necessary for the student, and follows in this place.

C. *retroflexa.* Muh., Mon. no. 14.
Schk. tab. Kkk fig. 140.

Spiculis androgynis superne staminiferis distigmaticis subquaternis alternis ovatis subapproximatis sessilibus bracteatis; fructibus ovatis acutiusculis bidentatis margine glabris vel subscabris reflexo-patentibus, squamæ ovatæ acutæ subæqualibus.

Culm about a foot high, triquetrous, often somewhat six-sided by an elevation along each side, slightly scabrous above; leaves nearly as long as the culm, sheathing towards the base, linear-lanceolate; spikelets staminate above, alternate, rather near, ovate before maturity, about four, and four to nine according to Muh., becoming yellowish, sessile, lower spikelets with bristly and long bracts which often fall off before the fruit; stigmas two; fruit ovate, acutish, two-toothed, glabrous or slightly scabrous on the margin, diverging or reflexed; pistillate scale ovate, acute, or ovate-lanceolate, white, green on the keel, very nearly as long as the fruit. Colour of the plant rather a pale green.

Flowers in May—grows in woods and pastures; not very abundant.

The constant and plain difference between the fruit and scale of this plant, and those of C. *rosea*, entitle it to be considered a distinct species.

C. *stipata.* Muh.
Muh., Pursh, Eaton, Schw., Pers. no. 53.
Ell. no. 7. Mon. no. 18.
Schk. tab. Hhh fig. 132.
C. *vulpinoidea*, Mx.

Spica decomposita; spiculis androgynis superne staminiferis distigmaticis numerosis oblongis aggregatis bracteatis; fructibus ovato-lanceolatis basin teretibus plano-convexis margine subscabris nervosis bifidis, divergentibus, squama ovato-lanceolata subduplo longioribus.

Culm 1—3 feet high, acutely triquetrous, quite scabrous above, hollowed on the sides; leaves lanceolate, rather broad, nerved, rough on the edges, often long as the culm, with striate sheaths; spike decompound, from one to three inches long, composed of several oblong spikelets formed of many small ones closely aggregated; spikelets staminate above, numerous, aggregated, bracteate, becoming yellow, with a large and long bract often supporting the lower spikelet; staminate scale lanceolate; stigmas two; fruit ovate-lanceolate, convex and gibbous at the base, tapering and plano-convex above and subscabrous, nerved, bidentate, glabrous; pistillate scale ovate, acuminate, or ovate lanceolate, yellowish, little more than half the length of the fruit. Colour of the plant varies from deep to yellowish green.

Flowers in May—grows in wet soil and about marshes; common.

This plant greatly resembles C. *vulpina*, L.; but differs in its fruit, and scale, and spike.

78. C. *siccata*. (Mihi.)

Am. Journ. Vol. X. tab. F. fig. 18.

Spica composita distigmatica; spicula terminali androgyna superne staminifera obtusa; spiculis inferis subquaternis staminiferis ovatis acutiusculis, infime sæpa inferne fructifera cum bractea squamosa oblongo-lanceolata, omnibus ovatis acutiusculis approximatis; fructibus ovato-lanceolatis acuminatis compressis margine scabris bifidis nervosis, squamam ovato-lanceolatam subæquantibus.

Culm 12—18 inches high, triquetrous, small, stiff, scabrous above; leaves linear, narrow, triquetrous at the end, shorter than the culm, scabrous, sheathing towards the base; spike compound, stigmas two, spikelets three to seven, ovate, somewhat acute except the highest, sessile, approximate, tawny; the highest androgynous, staminate above; the lower smaller, staminate; the lowest sometimes pistillate below, and supported by an ovate-lanceolate, tawny scale or bract, and sometimes rather remote; fruit ovate-lanceolate, compressed, bifid, nerved, acuminate, glabrous, with a scabrous margin; staminate scale ovate, lanceolate, tawny; pistillate scale like the staminate, about equal to the length of the fruit, with a greenish keel. Colour of the plant light green and of a *dried* appearance.

Flowers in June—grows on the sandy plains in Westfield, Mass., where it was found by Mr. E. Davis, principal of the academy.

This is a singular and beautiful species. It considerably resembles C. *intermedia*, Gooden. and Schk. tab. B fig. 7 especially in the situation of the staminate flowers and spikes. Like this too, C. *siccata*, may be found to be quite variable in the number of spikes producing fruit. On the specimens of C. *intermedia*, received from the north of Europe, the fruit and scale are *ovate;* the spikes larger and more numerous, and the lowest has a foliaceous, bristly, long bract; the leaves are much broader and longer:—the plant grows too in wet situations. In these characters it is easily distinguished from C *siccata.* The figure of our plant does not show the usual number of spikelets.

79. C. *Davisii.* (Mihi.)

Spicis distinctis; spica staminifera solitaria sessili brevi; spicis fructiferis tristigmaticis, binis vel ternis staminiferæ ap-approximatis ovatis sessilibus paucifloris, sæpe una radicali longo-pedunculata; fructibus globoso-triquetris basin attenuatis rostratis pubescentibus ore obliquo, squamæ ovatæ subæqualibus; culmo decumbente.

Culm 6—10 inches high, very slender, triquetrous, scabrous above, decumbent; leaves subradical, linear, rough on the edge, narrow, nearly flat, carinate, as long or longer than the culm, with purple sheaths at the base; bracts ovate at the base, lanceolate, the lower one leafy and surpassing the culm; staminate spike single, short, small, sessile, from the bract of the highest pistillate spike, with an oblong-acute or lanceolate scale, tawny, white on the edge and green on the keel; pistillate spikes two or three near the staminate, sessile, ovate, about four-flowered, sometimes a radical one long-pedunculate; stigmas three; fruit globose, subtriquetrous, tapering at the base, rostrate, pubescent, with an oblique orifice sometimes slightly bifid; pistillate scale ovate, acute, tawny, white on the edge, green on the keel, and nearly equal in length to the fruit. Colour of the plant light green.

Flowers in May—grows in tufts in open woods on dry hills. Williamstown. Named in honour of Mr. E. Davis, Principal of the academy in Westfield, Mass.

This is the plant considered in Vol. VII. p. 268, to be the C. *alpestris*, Allion. Although it had been compared with this species and pronounced the same, the examination of perfect specimens of C. *alpestris* lately received from Germany shows that the botanist was mistaken, much as our plant resembles that. C. *alpestris* is a larger plant; has larger spikes and fruit; its staminate scale is oblong, obtuse; its fruit *obovate* or pyriform, distinctly triquetrous, with a shorter beak in proportion to its magnitude; its pistillate scale is oblong and longer. These characters clearly distinguish it from our plant.

Note. C. *alba*, Hænke, which was announced in Vol. VII. p. 266, and which I have since found in abundance upon *Goat Island* near the Falls, differs from the specimens received from Germany in the *setaceous* form of the leaves. The fruit and its scale is rather smaller than those of the European specimens, but exactly like them, the fruit on both being *black* in maturity. Some of the leaves on those from Europe are narrow and resemble those upon our plant.

80. C. *oligocarpa*. Schk.
Muh., Pursh, Eaton, Pers. no. 148, Schw.
Schk. tab. Vvv fig. 170.

Spicis distinctis; spica staminifera solitaria ebracteata; spicis fructiferis tristigmaticis ternis subquinquifloris oblongis distantibus longo exserte pedunculatis et laxis; fructibus ovatis triquetris alternis glabris nervosis apice excurvis et brevi-rostratis ore integris, squama ovata paulo longioribus.

Culm 6—16 inches high, triquetrous, slender, slightly winged, striate, scabrous above, decumbent; leaves linear-lanceolate, flat, carinate, striate, rather soft, rough on the edge, subradical, with white or tawny sheaths at the base; bracts like the leaves, upper ones surpassing the culm, leafy, with *short* sheaths; staminate spike single, oblong, triquetrous, rather short, from the bract of the upper pistillate, and pedunculate; staminate scale tawny with a green keel, at length nearly white, ovate-lanceolate, lower one large; pistillate spikes two to four, generally three, alternate, oblong, three to nine flowered, usually about five-flowered, distant, the lowest subradical; with long, slender, exsert and lax peduncles; the highest peduncle often not surpassing the sheath; fruit ovate, sometimes nearly obovate, triquetrous, nerved, glabrous, alternate, short-rostrate and a little recurved at the apex, entire at the orifice; pistillate scale ovate, acute, often slightly awned, tawny, green on the keel, and a little shorter than the fruit, though variable in its length. Colour of the plant rather light glaucous green.

Flowers in May—grows in woods upon hills; common, but not abundant.

By Willd. the fruit of this species is called *obovate*, and it is so figured by Schk. I have not seen it obovate, although it approaches that form occasionally; generally it is clearly, as described by Muh., *ovate, triquetrous.* In our woods it often attains a greater height than is mentioned by Muh., and the spikes are rather more remote. Pursh considered this plant the same as C. *paupercula*, Mx., which is probably not the case.

β. *Van Vleckii.* Am. Journ. Vol. X. tab. F fig. 20. C. *Van Vleckii*, Schw.

Spikes longer, fruit more remote, peduncles shorter, fruit smaller, and its scale about half its length.

The specimens of this variety, received from Mr. Schweinitz, are exactly like those found here, which seem to be only a shorter and smaller variety of C. *oligocarpa.*

31. C. *Muskingumensis.* Schw. An. Tab.
—— *arida*, Schw. and Torrey no. 31.

Spica composita; spiculis androgynis inferne staminiferis distigmaticis ovali-oblongis utrinque acutiusculis suboctonis approximatis; fructibus lanceolatis compressis nervosis alatis glabris acuminatis bidentatis, squama ovato-lanceolata plusquam duplo longioribus.

Culm 20—36 inches high, large, triquetrous, hollow, striate, scabrous above; leaves linear-lanceolate, striate, scabrous on the edge, about the length of the culm, shorter below, with striate sheaths ending in a membranous tawny border pointed downwards; spike compound, composed of seven to ten spikelets, which are large, oval-oblong, somewhat acute at both ends, staminate below, approximate, about half an inch long, dry and chaff-like, whitish tawny; the lowest with a setaceous bract ovate at the base; stigmas two; fruit lanceolate, three eighths of an inch long, compressed, narrow, very thin, distinctly winged, bidentate, scarcely scabrous on the edge even under the lens, nerved, acuminate;

pistillate scale ovate-lanceolate, slightly tawny, not quite half so long as the fruit. Colour of the culm and leaves deep green.

Flowers in June—grows in wet meadows on the *Muskingum river.*

Mr. Schweinitz, to whom I am indebted for the plant, found it in great abundance, and remarked in a letter its strong resemblance to C. *scoparia.* It differs however from this species in the shape and magnitude of its spikelets; in its fruit and scale; and in its colour and size; and is a well characterized species.

82. C. *nigromarginata.* Schw. An. Tab.

Spicis distinctis; spica staminifera solitaria sessili; spicis fructiferis tristigmaticis binis ovatis sessilibus staminiferæ aretè approximatis; pedunculis longis radicalibus subternis e radice eadem ortis; fructibus ovatis subtriquetris subconico-rostratis bidentatis pubescentibus, squamæ ovatæ acutiusculæ æqualibus.

Culm, or rather peduncles, radical, two to four from the same root or sheath, slender, triquetrous, slightly scabrous above, one to eight inches long, decumbent; leaves radical, striate, carinate, flat, longer than the peduncles, reddish-brown at the base; staminate spike single, sessile, short, often very obscure, from the same scale-like bract with the lower pistillate and often not rising as high as the pistillate, with an ovate and obtuse scale dark brown, white on the edge, green on the keel; pistillate spikes two, rarely one, sessile, ovate, about four-flowered, approximate, close to the staminate, the lower with an ovate-lanceolate, scale-like bract; fruit ovate, somewhat triquetrous, rostrate and tapering above, pubescent, two-toothed, stigmas two; pistillate scale ovate, rather long obtuse, dark brown, green on the keel, about as long as the fruit. Colour of the plant rather light green.

Flowers in May—grows on hills in Penn. *Schweinitz.*

This is a singular and beautiful species. By some it has been thought a variety of C. *pedunculata*, and by others, of C. *marginata.* The former, it resembles in its peduncles and leaves; the latter, in its spikes and fruit. From the former, it differs entirely in its fruit and scale; from the latter, in its culm and leaves, &c. Could we suppose it to be a species formed by the union of the two, it would be far too different to be called by the name of either. Constant as Mr. Schweinitz found its characters to be, it deserved to be considered a distinct species.

33. C. *dioica*. L.
Wahl. no.1. Pers. no.1. Schw. and Torrey no.1.
Schk. tab. A fig. 1. and tab. Q and W fig. 2.
C. *Linnæana*, Schk. Car. II. p. 3. tab. A fig. 1.

Spica simplici dioica, rarissime androgyna superne staminifera, oblonga; spica fructifera *distigmatica* oblonga vel ovata subdensiflora; fructibus ovali-ovatis utrinque convexis nervosis erectiusculis superne serrulatè marginatis squamam ovatam æquantibus.

Culm 4—10 inches high, triquetrous, small, smooth, sometimes scabrous above in a slight degree; leaves triquetrous, setaceous, slender, erect, sheathing towards the base, about the length of the culm; spikes simple, dioecious; staminate spike oblong with an ovate or oblong, obtuse, tawny scale; pistillate spikes oblong, sometimes ovate, somewhat dense flowered; stigmas two, fruit ovate, or oval-ovate, convex, nerved, rather erect, with an entire orifice and a margin serrulate or scabrous above; pistillate scale ovate, somewhat acute, tawny, green on the keel, about the length of the fruit.

This plant is frequent in the north of Europe; found in the woods of Arctic America by Dr. Richardson; will probably be found in the Alpine districts of the Northern States.

β. C. *Davalliana*, Wahl. C. *Davalliana*, Smith.
Pers. no. 2. Rees' Cyc. no. 2.
Schk. tab. A fig. 2.

Spica simplici oblonga *distigmatica* subdensiflora dioica, raró androgyna superne staminifera; fructibus ovato-lanceolatis attenuatis convexis recurvis, squama ovata paulo longioribus; culmis foliisque serrulatis.

Culm often longer than the other; leaves similar, but only about one third the length of the culm, and serrulate or hispid; root like the other, creeping.

This plant is found with the other in Europe, and I have followed *Wahlenberg* in considering it only a variety of C. *dioica*. On the specimens of C. *dioica* received from Europe, the leaves vary from the smooth to the distinctly serrulate, and the capsules of some exactly resemble those of C. *Davalliana* as painted on the fig. in Schk. It may be found in our country with C. *dioica*.

84. C. *fœna*. Muh.
Muh. Gram. no. 14. Schw. Ell. no. 15.
Schw. and Torrey no. 35.

Spica composita; spiculis androgynis *distigmaticis* inferne staminiferis ovatis superne aggregatis; fructibus ovatis acuminatis scabro-marginatis bidentatis, squamam oblongam lanceolatam subæquantibus.

Culm 1—2 feet high, obtusely triquetrous, scabrous above, large; leaves linear-lanceolate, nearly flat, carinate, scabrous on the edge, nearly as long as the culm, with long sheaths; bracts long, setaceous, leafy, at the base of the spike; spikelets staminate below, ovate, numerous, eight to ten (Elliott), about four (Muh.), aggregated above and subapproximate below, sometimes in clusters; stigmas two; fruit ovate, acuminate, scabrous on the margin above, two-toothed; pistillate scale oblong or ovate-lanceolate, membranaceous, nearly as long as the fruit.

Found in Penn., Muh.: also in N. Carolina in marshy situations, Schw. This plant, which greatly resembles C. *festucacea*, I saw in the Herbarium of Mr. Schweinitz. It has not been found north of Penn.

Note. Figures of the following species of Carex accompany this paper and are contained in this volume.

Table D fig. 13. C. *umbellata*.
β. *vicina*.* Vol. X. p. 31.
" " 14. C. *Washingtoniana*. Vol. X. p. 272.
" " 15. C. *Xanthophysa*. Vol. VII. p. 274.
" E " 16. C. *aquatilis*. Vol. X. p. 267.
" " 17. C. *Hitchcockiana*. Vol. X. p. 274.
" F " 18. C. *siccata*. Vol. X. p. 278.
" " 19. C. *multiflora*.
β. *microsperma*.* Vol. IX. p. 61.
" " 20. C. *oligocarpa*.
β. *Van Vleckii*. Vol. X. p. 281.
" G " 21. C. *Michauxii*. Vol. X. p. 273.
" " 22 and 23. C. *Floridana*. Vol. X. p. 45.

* The name of this variety was omitted in the description.

ZOOLOGY.

Art. IX.—*Description of a New Species of North American Quadruped.* By Richard Harlan, M. D. Professor of Comparative Anatomy to the Philadelphia Musuem, &c.

Arvicola Ferrugineus. (nob.)

Vulgo.—*White-bellied Cotton Rat.*

Char. Body large, ferruginous, brown above, whitish beneath; fore legs very short and slender; tail more than half the length of the body.

Dimensions. Total length from the snout to the root of the tail 7 inches; length of the tail 4 inches.

Description. Head long; snout tapering; whiskers white, fine, and sparse, some long, others short; ears rather large, broader than long, sparsely hairy within, naked without, anterior borders covered with long hairs—the teeth do not differ essentially from those of the *A. hortensis* (nob.)* the upper molars are rather more compressed in their antero-posterior diameter, and the curved lines of enamel on the crowns of the inferior assume, in some instances, the form of the Greek epsilon. Body massive, tapering towards the root of the tail in the same manner, though not to the same degree, as in the Norway rat; covered with fine long hairs of a dark plumbeous colour, tipped with brown, and intermixed with black. Inferior parts of the body plumbeous white, the hairs being plumbeous, tipt with white; tail slender, tapering, covered with hair, brown above, whitish beneath; feet grayish, white

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* Vid. Fauna Americana, p. 138.

anteriorly, in form and structure resembling those of the *A. palustris* (nob.),* but in proportion are exceedingly small and slender, being very little larger than those of the common mouse—in an animal 7 inches in length of body, and nearly 6 inches in girth, the forelegs measure less than one inch and a half to the extremity of the nails; the latter are black ,compressed, sharp, and hooked as in the squirrel.

Habit. According to Mr. J. J. Audubon, (to whom I am indebted for this specimen,) this animal never burrows, but conceals itself in hollow trees, generally forming a hole in the side, somewhat after the manner of the woodpecker, where they retreat in case of emergency. They inhabit the cotton fields exclusively; carry their young on their back, and, with their family thus secured, climb dead trees as nimbly as the squirrel.

Inhabit the borders of the Mississippi—the present specimen from Beech woods near Natchez.

On the whole, the present species bears a near resemblance to the *Arvicola hortensis*, but is sufficiently distinguished by the extreme proportional minuteness of the fore legs and feet, by the colour of the fur, as also in size and in the tapering form of the body at the root of the tail, the manners of the animal, &c.

ART. X.—*Notice of a New Species of Salamander, (inhabiting Pennsylvania.)* By RICHARD HARLAN, M. D. Prof. of Comp. Anat. to the Phil. Mus.

S. *flavissima.*

Char. BROWNISH, yellow above; clear bright yellow beneath; beak marked with three black lines; tail compressed, longer than the body.

Dimensions. Total length three inches two tenths; length of the tail one inch nine tenths; of the body, head inclusive, one inch three tenths.

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* Vid. Fauna Americana, p. 136.

Description. A long and slender animal, head broader than the body, rather depressed; eyes prominent, iris gilt yellow; a broad black line on each side of the spine extending from the eye to the end of the tail; a narrow depressed black line extending along the spine from the occiput to the base of the tail; all the under parts of the animal of a deep yellow; head separated from the neck by a transverse line under the throat; tail compressed, much longer than the body and head.

Note. I have caught several of these animals beneath the stones in moist places, or on the borders of brooks in shady situations; it is a very active species and sometimes attains to three inches in total length; the black line in the dorsal furrow is sometimes wanting, in which case the back is mottled with black—placed in spirits the yellow colour is destroyed. This species will occupy an intermediate station between the S. *bislineata* and S. *rubriventris.* (A specimen in the cabinet of the Acad. of Nat. Sc. of Phil.)

For the American Journal of Science.

Art. XI.—*Facts and Observations intended to illustrate the Natural and Economical History of the Eatable Clam of New York and its vicinity.* In a letter to Lewis Weston Dilwyn, F. R. and L. S. &c., author of a work entitled a descriptive catalogue of recent Shells. By Samuel L. Mitchill, M. and LL. D., &c.: dated New York, Oct. 20th, 1825.

Sir,

Having noticed in your excellent and instructive work upon modern conchology, that you arrange under the second division of the family *Venus*, defined as being somewhat heart-shaped, the species *mercenaria*, I have thought proper to address you the present communication on the character and uses of that remarkable animal, which is very plentiful on the coast of New York, and known popularly by the name of the *Hard Clam.*

Speaking in the common phrase, there are four bivalve shell-fish known as *clams*. One is the huge oceanic mollusca, living in the Atlantic ocean, found in the stomach of the Balœna, washed to the shore alive by severe winds from the south-east upon the beaches of Long Island, known to be a nice article of human food, affording shells convenient enough to be employed by dairy women as skimmers, and sufficiently prominent to have been made the *Mactra solidissima* of your arrangement. The second is the Hairy Clam, inhabiting the muddy bays of Long Island, and not eaten; has some resemblance to your *Arca barbata*; though in a matter of such intricacy, revision may be required. A third is the animal inhabiting the sandy shores, usually between high and low water marks, called by the native Mohegans *Susquahog*, and by our white folks the Soft Clam or Pisser; is much esteemed for eating, and employed very much as bait for fish; and comes very near to your *Mya arenaria*, if it is not the same. The fourth is the Hard Clam, or *Quahog* of the Indigenes, inhabiting both the sandy shores and muddy bays all around Long Island and the coast of New Jersey, and seems to be the *Venus mercenaria*, or clam from whose shells certain articles of value and ornament, in the esteem of the Indians, are manufactured. There are numerous varieties of this shell along the shores of New York. At least I choose to consider those differences as varieties which other inquirers might perhaps view as species. The eight following, from the shore of Plandome and Cow bay, take their discriminative character from the shell, especially as they happen to be coloured.

Var. 1. Clam or Quahog, with shells *wholly white.*

Var. 2. C. or Q. with a *faint and just distinguishable colouring of blue*, usually where the muscle of the prominent angle is inserted at the extremity, or end opposite to that where the cordiform or heart shaped configuration is seen.

Var. 3. C. white internally like the preceding, but *with a more distinct and extended tinge of blue*, (*or purplish*, *or even violet as it may sometimes be called*,) prevailing at the beak, and predominant near the hinge.

Var. 4. C. with a deeper blue (purple or violet) at the prominent angle, and showing the hues over the place of muscular insertion in curved lines and clouds.

Var. 5. C. having a complexion yet more intense than any of the preceding, extending over the spot of muscular insertion to the furrows or grooves of the hinge, and impart-ing delicate shades of bluish or violet to the opposite muscular insertion, and thence along to the very hinge.

Var. 6. C. with still deeper purple (blue or violet) along and around the inside of the shells.

Var. 7. C. of a huge size, more than three inches and three quarters long, and more than four inches and a quarter broad; whose purple beautifully encircles the white almost all round, though with a deeper or more intense stain near the prominent angle.

Var. 8. C. a still larger size, and with stronger and deeper colourings; being about four inches long by four inches and one half broad.

There is likewise a considerable variety in the external figure and appearance of clams; insomuch that persons conversant in the trade can form a tolerably correct judgement from their aspect and physiognomy, from what place they were brought. Among the memorable varieties of this denomination are these:

Var. 1. C. from Shrewsbury on the Jersey coast.

Var. 2. C. from Pelican Bar, Var. 3. C. from Fire Island,	South side of L. Island.
Var. 4. C. from Flushing bay, Var. 5. C. from Cowbay,	From the north side of Long Island; which are reckoned the best that are brought to market, and not unfrequently bring from a dollar to one hundred and fifty cents the hundred.

The market of New York city is regularly supplied with clams, of which the consumption is very considerable. Throughout all the maritime region they are sought with such avidity that the traveller sees a heap of shells in the vicinity of almost every dwelling-house. They are carried alive to great distances up the rivers, and sold to the inhabitants of the fresh-water counties at the several landings; for, like oysters, by being kept cool and wet, they can be preserved alive a long time. The people ascribe to them highly nutricious and prolific qualities. They are very commonly eaten raw in the city at the stalls in the streets after the manner of oysters, to which many lovers of these crude relishes prefer them.

It is reported that the Mohegans formerly paid a tribute of clams to the Iroquois. These were prepared by roasting. For this operation an *Indian bed* (as it is called) was fixed by placing as many clams as it was intended to roast, close together on the ground with their edges downward, and keeping them snug in their positions by a circle of stones. A fire is then kindled by means of dry brush, sticks, or stuff on their backs, and continued until they are completely cooked. They were then arranged on strings and dried for use. This method of roasting clams is frequently followed by the white people to the present day, when they wish such a regale, a short distance above high water mark, under a shady tree during a warm day. They are eaten by such parties hot from the shells.

It is remarkable in the history of the clam, that the shells alone, particularly of the varieties 6, 7, and 8, have been frequently sold by the dealers for a higher price than they fetched when entire and containing the animal. It is a constant practice in New York to open the clams alive by means of a strong knife, and to scoop out their bodies to be fried, made into soup, and otherwise prepared for food. Great numbers of the freshest and finest shells are thereby procured. For these shells, or the coloured parts of them, there is a steady demand by the persons in the neighbourhood, who manufacture the blue and purplish parts into an article called by the Indians and the fur traders, the former of whom are the chief consumers, *Wampum*. It is a constant material of demand in the intercourse with them, and is accordingly sent to the factories for making payment for peltries and skins. The quantity sold, and the price it bears, vary with the circumstances of the season. Wampum is employed as an ornament of the highest fashion. It can therefore be bought only when the hunters have furs enough to purchase their necessaries, with a surplus for luxuries; in other words, when they are rich. On such occasions wampum brings a good price. But, when from laziness, wars, sickness, or bad luck in the chase, they have killed but little game, and are poor and empty-handed, wampum is low, because they cannot afford to buy it. This has, for some cause, been the case for several years. The clam-mongers have been under the necessity of throwing away many of their shells; and the women who are the principal manufacturers of wampum, have experienced rather a decline of their business.

The coloured portion of the clam shell is ground into oblong pieces, varying from one quarter of an inch, usually, to three quarters of an inch in length, and of the diameter of a crow's quill. Each piece is bored through lengthwise, whereby it becomes a hollow cylinder. The pieces are then strung like beads to the number of about two dozen and a half to three dozen on a string. This is called a *string of Wampum.*

Besides its employment for the purposes of dress and decoration, a string of wampum is a denomination of value. Hence, the price of a horse, a pack of beaver, or any thing else, can be estimated exactly in strings and pieces of wampum.

The worth of wampum is regulated very much by its exemption from white, and by the intensity and integrity of its blue and purple. It mostly happens that the pieces are veined or striped with white, like cameos and onyxes. On this account the manufacturers prepare two kinds which are of different value. According to their deepness of blue, or freedom from white, is the estimation in which the pieces and strings are held.

A white wampum is prepared from the shell of the Bahama conch or strombus. The pieces of this are of about the same diameter with the preceding, but longer, and from the same shell are prepared white ornaments for the ears of the warriors, about two inches long, and as thick as a pipe-stem. These sorts are cheaper than the other.

Pieces of wampum are strung and connected in such a manner for solemn purposes, as to make what is called a *belt.* It is believed the Indians adapt and arrange them in such a manner as to be significant like writing. Belts of wampum are therefore mostly delivered at treaties and on great public occasions. But whether they convey a meaning or record of the transaction or not, they indicate a generous spirit on the part of the donor as being valuable presents. Blue is a favourite colour in the Indian taste and ornament. Through the vast range of Polynesian islands, situated between America and Asia, blue beads of glass are in the highest estimation; and a string of them will go very far in the purchase of provisions or any thing else the natives have to sell. The

Indians of our continent have a similar predilection for blue, or the colour that comes near to it in a shell. For a string of wampum, bears a considerable resemblance to a string of glass beads. Indeed it may be considered as an assemblage of shell beads.

There seems to be no reason for believing the Indians used a drill, or possessed any instrument with which they could bore through solid cylinders of clam shell. It is not probable they manufactured wampum any more than glass beads, but derived both from the Europeans or other white people. In confirmation of this opinion, it may be stated that the North American Indians are fond of bedecking themselves with the *dentalium*, or *tooth shell*, which they procure along the North West Coast. Now the dentalium, as you perfectly know, is a univalve, hollow, or tubular, nearly straight, without any internal partitions, and open at both ends. The convenience of being strung is understood by the natives, who seem to prize it accordingly. But as the the colour is not blue, it appears to have declined in value and demand as soon as the blue wampum could be procured. The partiality of the natives for the small univalve shells of the ocean is evinced by the earnestness with which they beg them when they visit museums; and by explorers finding some of them, apparently buccinums on opening a grave at St. Regis island, buried with the arms and utensils of the deceased.

High and extensive heaps of clam shells exist at the present time on the shores of Long Island, indicating that the natives who piled them up fed upon the animals. They have evidently undergone the operation of fire, or in other words, had been roasted. These hillocks of clam shells have been employed by the proprietors of the adjoining lands for manure. They are abundantly scattered over the ground in fragments, where the Indians were anciently settled; and by their gradual decomposition tend to fertilize it.

Besides the before-mentioned uses of the clams and their shells, it ought to be mentioned that the latter are convertible by fire into excellent quick lime; and are frequently calcined for the purpose of furnishing that material for a cement.

Mr. Crooks, a very intelligent and communicative gentleman in the employ of the American Fur Company, has, in addition to his other communications, given me samples of the several wampums now in use; to wit:

1. Blue wampum of the first quality, from the clam.
2. Blue wampum of the second rate, from the same.
3. White wampum from the conch; and
4. White ear ornaments in imitation of the dentalium shell, from the same.

All of which are manufactured at this day for the Indian trade.

Clams not uncommonly contain pearls. These are coloured as the shells themselves are; that is, white, blue, purplish, violet, and mixed; but they are seldom beautiful enough for jewellers' use. Their shapes are various, being spherical, oval, orange-shaped, and irregular. I have a purplish one that weighs sixty-nine grains, which surpasses all that I have heard of. To form an opinion of the frequency of their occurrence, I may mention a circumstance that happened on Long Island. A man desirous of making a collection of clam pearls, gave notice through the neighbourhood that he would pay a quarter of a dollar each for those of proper size; and in the course of a few months he received two dozen. The clam-mongers in the city save the pearls they find on opening the animals alive, and sell them to persons who come to the stalls in the market to purchase them.

I have the honour to acknowledge the receipt of your last, and to renew the assurance of my good will.

SAMUEL L. MITCHILL.

PHYSICS, &c. AND MISCELLANIES.

Art. X.—*Thermometrical Observations made by President Caldwell, at Chapel Hill, N.C., during the years* 1820, 1821, *and* 1822. Lat. 35° 54′. Communicated by Prof. Olmsted.

1820.	Maximum.	Minimum.	Range.	Mean.	Daily Range.
January	59 .50	12	[illegible] .50	36 .86	22
February	80	28	52	56 .80	8
h	78	19	59	50 .80	32
	89	27	62	63 .50	3
May	88		37	66 .36	22
June	93 .50	55 .50	38	78	22
J	89 .50	66	23 .50	78 .16	13
gust	86 .50	64	22 .50	76 .03	1[illegible]
September	85	50 .50	34 .50	71 .20	13 .50
October	79	32	47	56 .81	[illegible]4
November	73	30		50 .52	25
Decemb	70	20	50	44 .76	28 .50
A Results	93 .50	12	81 .50	59 89	35

1821.	Maximum.	Minimum.	Range.	Mean.	Daily Range.
January	72	6	66	35 .32	27
February	7	0	41	49 .17	24 .5
M ch	76	20	56	47 .95	41
April	80	31	49	57 .20	27
May	85 .50	46	39 .5	68 .01	22
J ne	92	52	40	77	20
July	88	65 .50	22 .5	76	12
August	89	64	5	77 .33	16 .5
September	91	57 .50	33 .5	75 .44	17
tober	78	33	45	61 .86	3
November	70	27	43	45 .91	33
December	65 .50	15	50 .5	39 .19	29
An[illegible] Results	92	6	86	59 .19	41

1822.	Maximum.	Minimum.	Range.	Mean.	Daily Range.
January	60	0	60	36 .65	31 .5
February	73 .5	17	61 .5	43 .93	37 .5
March	78 .5	29	49 .5	53 .71	35
April	82	35	47	61 .29	28
M	85	51	34	69 .24	20
June	95	59	36	78	24
July	93	65	28	79 .88	21
August	95	60	35	75 .90	20
tember	91	52	39	72 .14	27
October	85	38	47	64 .76	29
November	81	32	49	59 .56	32 .5
December	74	13	61	43 .33	32
Annual Results	95	0	95	61 .53	37 .5

GENERAL RESULTS.

	1820.	1821.	1822.
1. Hottest day,	June, 93.50	June, 92.	June & Aug. 95.
2. Coldest do.	January, 12	January, 6.	January, 0.
3. Hottest month,	July.	August.	July.
4. Coldest do.	January.	January.	January.
5. Greatest mth'y r'ge,	April.	January.	February.
6. Least do.	August.	July.	July.
7. Greatest d'ly range,	April.	March.	February.
8. Least do.	July & Aug.	July.	August.
9. Extremes of the y'r.	81.50	86	95

REMARKS.

1. Our *hottest month* is commonly July, but sometimes August. Our hottest day is usually in June.

2. Our *coldest month* is January, and the coldest day usually occurs near the beginning of the same month.

3. The *temperature* of our climate varies from 0 to 95° in its greatest extremes; but the mean of the three years above gives only 87° 5′, as the annual range.

4. The greatest *monthly range* is from 61° 5′ to 66°, and occurs from January to April inclusive: the least monthly range varies from 22° 5′ to 28°, and occurs in July or August.

5. The greatest *daily range* varies from 35° to 41° and occurs in February, March, or April; the least daily range is from 12° to 20°, and occurs in July or August.

6. The annual mean, from the observations of 1820 and 1821, is 59° 54′, corresponding very nearly with the mean as laid down in Humboldt's *Isothermal Lines*. The observation of 1822 would carry it a little higher; but the accuracy of this last is doubtful.

7. It was found that the observations of 10 o'clock, A. M. correspond very nearly with the annual mean.

ART. XI.—*Notices of the Excessive Heat during some parts of the late summer.* (1825.)

1. *Observations on the Heat, &c. at Brooklyn, New York, for the month of July, 1825. The thermometrical observations exhibit the lowest temperature in the morning and evening, and the highest during the day. The lowest are from a thermometer always out of doors; the highest from one in an open hall, where no refraction or reflection can have effect* Communicated by the Rev. Dr. S. WOODHULL.

1825. July.	Morning. } Usually at 6 o'clock	Usually at half past 2 o'clock, P. M.	Usually at 10, P. M.
1.	73. Clear. S. W.	89. Clear. N. W.	71. Clear. N. W.
2.	72. Clear. W.	91. Cloudy. S. E.	81. Cloudy. S. E.
3.	71. Cloudy. S. W. Drizling.	77. Cloudy. E. Rain.	73. Clear. N. W.
4.	74. Clear. W.	87. Clear. W.	75. Clear. S. W.
5.	76. Clear. S.	89. Cloudy. S. Rain.	71. Cloudy. S. W.
6.	67. Clear. N. W.	87. Clear. N. W.	74. Cloudy. S.
7.	70. Clear. S. W.	85. Clear. N.	73. Clear. N.
8.	67. Clear. N. W.	89. Clear. S.	79. Clear. N. W.
9.	69. Cloudy. N. E.	87. Clear. E.	68. Cloudy. E.
10.	75. Clear. N. W.	93. Clear. W.	86. Clear. W.
11.	79. Clear. W.	94. Clear. W.	87. Clear. S. W.
12.	79. Clear. W. S. W.	94. Clear. W.	88. Clear. S. S. W.
13.	76. Clear. N. W.	89. Clear. W. N. W.	81. Clear. N. W.
14.	72. Cloudy. N.	85. Clear. S. E.	79. Clear. S. E. Light rain.
15.	71. Clear. S. W.	82. Clear. S.	72. Clear. S. S. E.
16.	70. Clear. W. N. W.	85. Clear. S.	74. Clear. S. S. W.
17.	72. Clear. N. W.	89. Clear. S. S. W.	78. Clear. Calm.
18.	74. Clear. N. W.	94. Clear. S. W.	80. Clear. S.
19.	77. Clear. W.	92. Clear. S. S. W.	82. Clear. S. W.
20.	77. Clear. S. W.	94. Clear. S. W.	85. Clear. S. S. W.
21.	79. Clear. S. W.	96. Clear. S. W.	86. Clear. S. W.
22.	80. Clear. W.	95. Clear. W.	84. Clear. S. Lightning and Thunder.
23.	78. Clear. W.	97. Clear. S. S. W.	79. Clear. S. W. (same.)
24.	74. Clear. S. W.	93. Clear. S. W.	80. Clear. W.
25.	77. Cloudy. Calm. Rain. A. M.	79. Cloudy. N. W.	73. Clear. S. W.
26.	69. Clear. N.	84. Clear. S. W.	73. Clear. N. W.
27.	67. Clear. N. E.	86. Clear. S. W.	68. Clear. S. S. E.
28.	67. Clear. N. N. E.	87. Clear. E. N. E.	71. Clear. S. S. E.
29.	68. Clear. N. E.	85. Clear. S.	70. Clear. S. S. E.
30.	68. Clear. S. S. W.	81. Clear. S.	74. Clear. S.
31.	74. Cloudy. S.	90. Clear. S. Light rain in the afternoon.	76. Cloudy. N. W.
		Average nearly 90°.	

2. *Temperature at Williams College, during the late excessively hot weather.*

1825.	VII. A. M.	II. P. M.	IX. P. M.	Mean.	Wind.	
July 10.	72.0	92.3	81.1	81 80	N. W.	At 3½ P. M. temp. 93.3
11.	80.0	96.8	77.0	84.60	S.	2½ " " 97.0 Sunset 98.5
12.	75.7	93.6	74.6	81.30	N. W.	Thunder shower at evening.
19.	66.5	91.5	78.4	78.80	N. W.	
20.	75.5	95.1	76.3	82.30	S.	
21.	74.7	95.3	75.0	81.67	S.	Some rain at sunset.
22.	78.2	92.8	78.2	83.07	S.	
23.	76.5	98.0	83.6	86.03	S.	Some rain. Temp. 98.5 at 3 P. M.
24.	74.0	87.4	74.5	78.63	N. W.	
		average 93.5 nearly.				

The mean temperature of the month is 74.95, which is a little less than that of July 1820. The temperature was at no time in that year so high as that given above. The mean temperature of the month of July for the last *nine* years is 69.61, and for the last ten years including this July, is only 70.14. This shows the excessive heat of the late month of July.

There were some hot days in June, but the temperature was not above 96° in the hottest part of the day.

The thermometer is suspended six feet from the ground on the north side of a house, exposed to a free circulation of the air, but protected from all *reflected* heat.

Aug. 22. Observed three spots upon the sun—two large and black.

3. *Notices from the Newspapers.*

Hartford, Connecticut, July 18.—Such excessive hot weather as prevailed during the last week, has rarely, if ever been experienced by our oldest inhabitants. During Sunday, Monday, Tuesday, and Wednesday, the thermometer ranged from 96 to 102 degrees in the shade. On Monday, most of the labouring people were compelled to quit their work, and our farmers out of humanity or self-interest, probably a little of both, permitted the horse and the ox to remain undisturbed at home.

Salem, *Massachusetts*, *July* 13.—Terrible weather—some of our glasses in the shade are as high as 104. Several gentlemen who have been in Mocha, when for many days the thermometer stood from 102 to 108, say they never felt the heat more oppressive there.

Newburyport, *Massachusetts*, *July* 12.—The weather yesterday and the day before was oppressively hot. The thermometer stood 95 on Sunday and 98 on Monday.

Dover, *New Hampshire*, *July* 12.—On Sunday last, at 3 o'clock, P. M. the thermometer in the shade stood at 97, one degree higher, we believe, than it had stood before this season. (In one place it stood at upwards of a hundred.) On Monday, at noon, the thermometer stood at 94.—At 2 P. M. at 99 in the shade of a tree.

Portland, *Maine*, *July* 11.—The weather on Sunday was unusually hot and oppressive—about two o'clock the mercury in the thermometer rose to 93, and continued at that height almost the whole afternoon, and at sunset 91. In the evening there was much sharp lightning, and about ten o'clock a smart shower.

New Bedford, *Massachusetts*, *July* 12.—Our thermometer stood at 90 degrees yesterday (Monday) morning before sunrise; about noon the mercury rose to 95 in the shade, and varied very little from that point till sunset.

Several persons died at Philadelphia on Tuesday, July 19, in consequence of drinking cold water, and the heat of the weather.

A thermometer in the shade, in the village of Pennyan, Yates county, New York, stood at 106, on Sunday, July 7, at 12 o'clock.

Orange Springs, *Virginia*, *July* 20.—Thermometer 99 in the shade.

Albany, *New York*, *July* 20. The thermometer at the academy, on Monday night at 9 o'clock, was 81. Yesterday at 7 A. M. 91.

Newburgh, *New York*, *July* 19.—The heat on the 10th, 11th, and 12th of this month, was more oppressive than has been experienced for a number of years. The thermometer in this village, fluctuated during the three days from 90 to 98 degrees, in cool situations.

Montreal, Lower Canada.—Thermometer at 7 A. M. and 3 P. M. July 9th, 76, 85. 10th, 75, 91. 11th, 77, 93. 12th, 81, 90. 13th, 69, 91. 14th, 70, 89. 15th, 73, 89.

Wiscasset, Maine, July 15.—During the present week we have had uncommonly warm weather. By a thermometer kept in Edgecomb, it is stated that the mercury stood on Monday, 9 o'clock, A. M. at 103. Tuesday morning, 107—104 in the shade.

It has been much warmer however in the interior—at Gardner, on Sunday, the mercury stood at 130 degrees in the sun.

Baltimore, Maryland, July 19.—The heat in this city on Sunday and yesterday was again very oppressive. The thermometer at the Exchange ranged as follows:—Sunday, at 8 o'clock, A. M. 81; 2 o'clock, P. M. 88; Monday, (yesterday) at 8 o'clock, A. M. 82; 3 o'clock, P. M. 89.

Norfolk, Virginia, July 16.—We observe from our northern papers received during the last week, that the excessive heat of the weather is not confined to this section of the country, where the thermometer during the last fortnight has ranged far above its accustomed temperature, and for many days in succession from 88 to 92 degrees of Fahrenheit, in fair exposures. Still our town continues very healthy. Copious showers of rain within the last forty-eight hours have much mitigated the intensity of the heat, and reanimated the drooping vegetation of our fields and gardens, but it is still very close and sultry.

Windsor, Vermont, July 18.—The temperature of the air by a well situated thermometer, on Monday last, was 96 degrees F. and continued near that temperature for several hours. Tuesday at 1 o'clock P. M. it indicated the same, but fell much more rapidly. The Dew Point, was also unusually high, on the latter day it was 95 F.; quantity of water in the atmosphere such, that if wholly condensed would be nearly nine inches deep.

Poughkeepsie, New York, July 20.—After three of the hottest days we have felt this season, our village and vicinity was visited, Tuesday evening, with an uncommonly severe storm of thunder and lightning.

It is believed that the present is the warmest summer we have had for the last fourteen years. The summer is but little more than half spent, and yet we have had more extremely hot days than we frequently have in the whole season.

Yesterday the mercury was at 93½, nearly as high as it has been this season.

Vergennes, Vermont. July 14.—On Sunday last, about six o'clock in the afternoon, a violent gale of wind passed through this and several of the adjacent towns. The weather had for some hours previous been excessively hot, the sky entirely unclouded, and scarce a breeze of air was perceptible. A few moments before the storm commenced, a small cloud, attended by terrific explosions of thunder, and sharp flashes of lightning, appeared in the north-west. The wind first breezed moderately, but soon its velocity and force increased to so great a degree of violence that it seemed for a time as though the earth would be stripped of its vegetation and the people deprived of a covering. The damage to crops, orchards, &c. is very great.

Kingston, Upper Canada, July 8.—We regret to learn that the crops in different parts of the Province have suffered severely from the dryness of the season. The face of the country however, in this neighbourhood, is much improved in appearance since the heavy rains, which we had on Tuesday and Wednesday last. But those rains we fear have come too late to be of much advantage to the wheat crop, which, from the heat of the weather, has been brought prematurely forward.

Such was the extraordinary heat of the 10th, 11th, 12th, and 13th of this month, as to deserve a full and minute record. We have taken the highest elevation of the mercury that is reported.

In this town, on Monday, at 2 o'clock P. M.,	98½
Albany, N. Y. same day and time,	98
New York city, July 12, 1 o'clock P. M.,	93
Philadelphia, Pa. July 11, northern exposure,	96½
Southern do.,	123
Newark, N. J. July 11,	98
Hudson, July 11, 12 o'clock,	98
New Haven, July 11, 3 o'clock, P. M.,	92
Providence, R. I. July 11,	91½
Boston, Ms. July 11, 3 o'clock, P. M.,	100
do. do. 12, 2 o'clock, P. M.,	100
do. do. 12, 4 o'clock, P. M.,	98
Salem, July 12, in the shade,	104
Newburyport, Mass. July 11,	98

Dover, N. H. July 11, 2 o'clock, P. M., . . .	99
Portland, Me. July 10, ...	93
Gardiner, Me. July 10, in the shade, ...	92
do. in the sun, ... , ...	130
New Bedford, July 11, noon, ... , ...	95

Hampden (Massachusetts) Journal.

On Thursday July 21st, the mercury stood at New Haven in the same situation as reported on the 11th, at 94.

New Haven (Connecticut) Journal.

The thermometer, we believe, for the last two days, has scarcely varied during the day, from 95 degrees in the shade, and the mercury has not fallen much in the night season. The ravages of death, yesterday, were truly melancholy. Twenty-five inquests were held upon the bodies of persons who came to their death by means of the heat, or by drinking cold water; and there have been several cases to-day—some before 8 o'clock this morning. It seems to do no good for the press to admonish the public upon this subject; and those who return from the burial of friends, with a strange fatality, drink and die in a few minutes afterwards. So true is it that "all men think all mortal but themselves."

We observe this morning that the civil authorities are putting cautions upon the the pumps, printed in large letters.

New York, July 25.

On Wednesday, the mercury at Salem rose to 102 degrees. On Monday and Tuesday, at the same place, it rose no higher than 90. At Albany, during the first five days of the week, the mercury has stood at about 97 in the hottest part of the day, and morning and evening at 80.

The heat in France has been exceedingly oppressive. On the 19th of July, about 30 miles from Paris, on an elevated spot, and in a shade with a northern exposure, the mercury rose by Reaumur's scale to 32 degrees above 0, equal to 104 of Fahrenheit. Water, in a brass kettle, was so heated that persons could not hold their hands in it, and stones and metallic substances were so hot that they could not be held in the hand. There had not been for seven weeks the least moisture in the air, or the least dew on the leaves, and there had been a constantly burning sun, without clouds, and a parching wind from the north-east during the whole time.

4. *Extract of a Letter to the Editor, dated*

New York, July 22, 1825.

We are suffering an intensity and continuance of heat, altogether unexampled; to-morrow will be the fourteenth day, during which the thermometer has ranged from 88 to 92 and 95.—frequently 87, at 7 o'clock in the morning, and little depression during the nights, which are suffocating. Not a drop of rain has fallen during this time; and except a little lightning last evening no symptom of change.

5. *Diary of the weather at Fort Brady, Sault de Ste. Marie, outlet of Lake Superior.*

(Communicated by Dr. Lyman Foote.)

June.					July.					August.				
Date	AM. 7	PM.	PM.	Remarks.	Date	AM. 7	PM. 2	PM. 9	Remarks.	Date	AM. 7	PM. 2	PM. 9	Remarks.
1	48	58	44		1	61	66	60		1	58	66	56	45 at 4 A. M.
2	49	58	47		2	59	74	64		2	59	71	56	
3	58	72	59		3	62	78	65		3	61	77	64	
4	58	76	60	79 at half past 2 P. M.	4	67	71	61		4	66	72	59	
5	64	80	61		5	64	67	56		5	63	76	64	80 at 3 P. M.
6	61	78	67		6	57	61	51		6	65	80	66	
7	69	81	58	83 at 3 P. M.	7	62	71	56		7	71	76	62	
8	71	88	75		8	64	66	60		8	67	84	68	
9	65	81	64		9	64	78	70	82 at 4 P. M.	9	66	62	55	
10	68	80	69		10	74	82	75	90 at 4 P. M.	10	57	67	55	
11	67	74	59		11	66	58	53		11	62	72	66	
12	63	69	57		12	61	70	58		12	69	74	65	82 at 1 P. M.
13	63	61	52		13	64	80	64		13	71	79	66	
14	62	76	55		14	66	83	69		14	69	81	71	
15	62	64	57		15	71	79	66		15	69	70	62	
16	66	68	55		16	61	76	62	Temp. of the river is 62	16	64	70	60	
17	64	72	61		17	71	82	69	84 at 1 P. M.	17	65	74	60	
18	69	80	56		18	73	89	76	91 at 1 P. M.	18	57	70	55	
19	52	66	56		19	74	88	75		19	58	72	58	
20	59	75	65		20	76	78	75	84 at 1 P. M.	20	63	76	59	
21	65	54	49		21	74	80	68		21	73	76	65	
22	57	62	50		22	71	78	67		22	68	80	65	
23	58	71	57		23	67	70	58		23	67	84	73	
24	59	74	62		24	62	64	56		24	67	84	70	89 at 3 P. M.
25	59	54	51		25	61	66	53		25	70	88	78	87 at 3 P. M
26	57	59	51		26	57	72	54	44 at 4 A. M.	26	73	87	76	92 at 3 P. M.
27	52	60	50		27	61	76	62	44 at 4 A. M.	27	71	77	70	
28	54	56	48		28	67	80	66		28	69	59	58	
29	59	68	64		29	69	83	68		29	64	76	64	
30	64	63	59		30	71	81	66		30	66	78	62	
					31	69	60	52		31	66	62	56	

REMARKS.

I have never known so much warm weather at this post as we have had this summer. This place is remarkable for sudden changes of temperature. The water of Lake Superior is always cold, and the wind blowing off the lake twelve or twenty-four hours will frequently produce a change of from 15 to 20 degrees. See the 10th and 11th of July at 2 o'clock, P. M.—30th and 31st of July, 2 P. M.—18th and 19th of June.—27th and 28th of August, &c.

Art. XII.—*Notice of the Peninsula of Michigan, in relation to its Topography, Scenery, Agriculture, Population, Resources, &c.* By James Pierce, Esq.

The peninsula of Michigan situated between the 41st and 46th degrees of north latitude, is nearly environed by the waters of lakes Erie, St. Clair, Huron, and Michigan. It is about 260 miles in length, by 150 in breadth, embracing almost as much territory as the state of Ohio, and will ere long constitute an important member of the confederation.

The surface of Michigan in general, has but little elevation above the adjacent lakes, and presents no height of ground approximating to mountain altitude. It is bordered on the eastern side, from Ohio to the western part of Saganaw bay on lake Huron, by an alluvial plain, between fifteen and twenty miles in breadth, with a slight inclination from the interior. Much of this district is low and wet, but heavily timbered. Thinly wooded sand ridges of no great height or extent, and wet meadows divested of trees and hrubs are insulated in this forest. The banks of the rivers Detroit and St. Clair, and often the shores of lakes Huron and St. Clair, rise from fifteen to thirty feet above the water, and have a small descent to the wet ground of the interior.

The soil of the low woodland plain, is sandy loam and clay, rich with vegetable mould, often, if not generally resting on clay which I found in various places effervesced with acids, indicating calcareous ingredients.

At the interior termination of this level district, the surface becomes undulating, and presents to lake Michigan, an alternation of moderately elevated hills and plains, ravines formed by water courses, openings and thickets, swamps and prairies, lakes and ponds.

There are no ranges of hills that assume a regularity of direction, but the country gradually rises to the centre of Michigan, attaining apparently no very great altitude above the level of the great lakes.

The north-western part of the peninsula is broken, and has been little explored; adjacent to lake Michigan in this section, sand hills conjectured to be 400 feet in height, are located. An undulating surface, having a meagre sandy soil, with a few swamps, and wet meadows, forms a barren western margin to the territory of about four miles in breadth, extending to the southern extremity of the lake.

Small prairies occur in many parts of the country, but the most extensive are situated in the southern division. They are a continuation of the wide verdant plains divested of timber, so frequent in Indiana: some of them extend twenty miles into Michigan, with a breadth of five miles, having in places sandy bottoms, but generally a rich medium soil.

A considerable proportion of the interior of Michigan is thinly wooded, and assumes in a state of nature, the aspect of a partially cleared country. A traveller may proceed in a wagon for days through a trackless wilderness, with little interruption, enjoying diversified views of handsome lakes, hills and plains, prairies and meadows, adorned by a rich variety of annual plants in bloom.

In the eastern part of the open rolling interior, yellow oak, often of diminutive height and thinly scattered, is almost the only tree found on a considerable portion of the hills and dry surface; many small meadows and plains are entirely divested of trees and shrubs, and, exclusive of groves on wet ground, there is scarcely timber sufficient for first division fences. "Oak openings" is the descriptive appellation affixed by settlers to this region. In the centre, and on the western declivity of the peninsula, hickory and bur oak lands are prevalent.

The scarcity of timber in a considerble part of Michigan, is doubtless occasioned by annual fires, kindled by the aborigines to facilitate the pursuit of game, and promote the growth of grass—where burnings have been prohibited by settlers, forests containing a diversity of trees are rising. Yellow and bur oak, as it is called, and hickory are less affected by fires than most timber trees.

Mr. Risden, a very intelligent and respectable surveyor in the service of government, to whom I am indebted for many facts relative to the interior, in surveying a road from Detroit to Chicago, near the head of lake Michigan, passed over thirty miles of heavily timbered land, fifty of light oak openings, 105 of hickory and bur oak openings, of very good soil, and 30 of prairie. Except in the eastern section, wet timbered and swampy land rarely occurred, not exceeding five miles in the whole distance.

The face of the country in the western part of Ohio and northern part of Indiana, much resembles the south of Michigan in presenting good openings on rolling ground and prairies interspersed with swamps and thickets. The plains, prairies, and swamps, are however more extensive in Indiana; they are interspersed with ponds. Between Chicago and the head waters of the Illinois, is a low, wet, grassy plain, without timber, except on the banks of rivers.

The Chicago, a short, deep, sluggish stream, that discharges into lake Michigan, and the Plaines, a considerable branch of the Illinois, emanate from a swamp, ten miles from lake Michigan, and scarcely eight feet above its level. In the rainy season a lake is formed in this swamp connecting those rivers. Boats can then pass from Michigan to the Mississippi.

A road has been recently laid out from Detroit to the river Saganaw. In this direction, the oak openings terminate fifty miles from Detroit—thence for fifty miles the country is mostly well timbered, and rich plains are interspersed with broken ground. White oak, hickory, black walnut, butternut, bass, and white pine, occur in the forest. Dark coloured sand is often blended in the soil of this region, with a rich vegetable mould—settlements extend in the direction of this road between forty and fifty miles. Good roads are easily made, and kept in repair in the gravelly openings.

The soil of Michigan, as far as the country has been explored, is generally a sandy and gravelly loam. In the oak openings it is often compact, and hard to break with a plough—the surface strata rest usually on hard-pan or clay, as is exhibited in sinking wells, and in the many natural and artificial excavations I examined, and confirmed by the observations of settlers and surveyors. These earths, I found almost uniformly to effervesce with acids, evincing much lime. They have quick sand for a basis, at various depths, according to the elevation of the ground. The pebbles and sand embraced in the soil are mostly siliceous, with small lumps of indurated marl sometimes intermingled. The earth on the surface rarely effervesces much with acids, the carbonate of lime having been taken up by plants, or decomposed by vegetable acids. Oak openings are at first much less productive than heavily timbered land where vegetable mould accumulates. On dry ground accessible to frequent fires, the grasses, leaves, and annual plants are dissipated, leaving a lean soil, which is said to improve much under cultivation—the roots and plants turned in, decay after the first season, and deep ploughing brings to the surface, fertilizing calcareous earth. In the soil of oak openings, from 15 to 25 bushels to the acre of good wheat are procured. For this crop, lime is a valuable ingredient in the soil, which might be rendered much more productive by ploughing in clover, fostered by gypsum. This mineral can be procured at a small expense from the south-western part of Sandusky bay, where it has been recently discovered of superior quality, in great quantity, and of easy access. It is compact, white, and embraces considerable gypseous alabaster.

Rich fresh water shell marl, is of frequent occurrence in tamerisk swamps, ponds, and wet basins that were formerly ponds, in various parts of the interior. Strata from two to five feet in thickness are common in Oakland county, and are constituted almost exclusively of decayed shells. Good lime is calcined from this material in pits, with alternate layers of wood and marl. It may be advantageously used in agriculture. Pipe and potters' clay is found in Oakland county.

The soil of the hickory openings of the centre and western declivity is much superior to that of the eastern oak region. The land is generally good from Oakland county to within four miles of lake Michigan.

The oak openings of the southern part of the peninsula are represented as superior to the northern division, the soil containing more clay.

Loose stones, mostly primitive, rest in small quantities on the surface in various parts of the interior, rarely more than sufficient for the security of wells and cellars. They occur on the Chicago road. I noticed large bowlders of granite and sienite on parts of the shore of lake St. Clair, and rolled stones in Oakland and other counties. But of rocks in situ, few sections of our country are so destitute of accessible beds for economical purposes; though there are indications that many districts of the peninsula, where no rocks appear, have a calcareous basis. Sinks which are rarely observed except in limestone countries, are often seen in the undulating interior. Springs are there found copiously depositing calcareous tufa. Extensive beds of limestone occur in lakes Michigan, Huron, and St. Clair, and there are calcareous rocks in place, in the St. Joseph, Grand river, and other streams of the western declivity. Limestone and sandstone ledges are located in the north-western part of the peninsula, on the shores of lake Huron and the banks of Flint river, where slate embracing considerable sulphur, and indications of coal exist. Coal has been discovered on another branch of the Saganaw.

A considerable part of lake St. Clair is reported to have a limestone bed, often covered by a thin stratum of sand. The connecting streams, St. Clair and Detroit, contain limestone rocks in situ. From an island situated in the latter river, eighteen miles below Detroit, large supplies of excellent building stone are quarried. It is secondary, compact, light coloured limestone, is easily wrought, and is a good material for lime. Fine specimens of carbonate [suphate? Ed.] of strontian have been found on this island.

Large beds of limestone containing petrifactions of marine shells, occur on the river Rouse, commencing about fifteen miles from its termination in lake Erie. Most of the numerous islands in the western part of lake Erie, are based on secondary limestone, and bordered by ledges of that mineral.

In extensive tracts of the north-western part of the adjacent state of Ohio, the soil rests on limestone. Beds of that rock have been frequently noticed in the northern part of Indiana. They are generally covered by clay.

Argillaceous oxide of iron exists in many parts of the territory, but has not been found in large beds. Yellow ochre and chalybeate springs are common. Saline waters have been discovered in several districts, but do not hold in solution a profitable quantity of muriate of soda. It is probable that richer springs may be obtained by boring. In Monroe county there is a very strong and copious sulphur spring.

It deposits calcareous tufa, and is supposed to issue from a limestone bed.

Bituminous springs containing petroleum indicating coal, occur in the north-west part of Michigan.

Small lakes and ponds are numerous in the peninsula, and are generally deep. One situated in Oakland county, was found not fathomable by a line more than 200 feet in length. Lake Erie has about thirty-five fathoms of water above its lowest bed, though it is not often more than twenty-five in depth. Lake St. Clair is shallow, rarely exceeding four fathoms.

Lakes Huron, Michigan, and Superior are in places 900 feet deep, sinking about 300 feet below the level of the ocean.

The lakes and ponds of Michigan are filled with pure water, abounding in fish—they have sandy bottoms, and often marl on their borders, and originate many of the large rivers of the territory. They are the most numerous in the rolling oak openings of Wastenaw and Oakland counties, where about 200 are located.

From a moderate elevation in Oakland county, forty miles north-west from Detroit, thirty considerable sheets of water are in view, after the leaves of the forest have fallen. In riding the distance of four and a half miles from Pontiac in this vicinity, I passed near the borders of eight lakes and ponds. Two of them, lakes Orchard and Cass are more than ten miles in circumference, and are handsome, pure bodies of water : they have sandy bottoms and borders. Their banks generally rise about thirty feet, with a steep acclivity. The adjacent ground, which is table land, or slightly undulating, was decked with a profusion of gay autumnal flowers. Trees of yellow oak are thinly scattered on the surface, or associated in groups.

A pleasant fertile island, containing about fifty acres, on which there is an orchard, rises in the centre of Orchard Lake, and is cultivated by Indians, who occupy good bark huts in the primitive state, situated adjacent to the lake on the table land isthmus, that separates lakes Orchard and Cass, and commands a view of these extensive sheets of water. An old Indian burial ground is placed near the dwellings. Ears of corn mottled with a diversity of colours, and dried fish, were suspended within and around their huts. The little furniture they possess is mostly of their own fabrication—blankets spread on the ground, or on wooden platforms constitute their beds. Ornamented dresses, and implements of war and hunting, were displayed. The females are comfortably clad, and some much decorated with silver. Indians were seen navigating and fishing in the adjacent waters. This remnant of the aboriginal proprietors, will soon be driven from their native lakes, their orchard, and favourite isle, by swarms of emigrant pioneers.

Some of the lakes have no apparent outlet, but their waters derived from springs are pure and contain fish.

The western declivity is much less known than the eastern, but is supposed to have fewer lakes. Not many were past in surveying the western section of the Chicago road.

Though there is a deficiency of small rivulets and springs in parts of the territory, rendering some sections, otherwise good, undesirable for settlement, yet valuable streams often occur, and there are many rivers that derive a peculiar advantage from having their sources in numerous large and deep reservoirs, making the quantity discharged much less variable than from most streams of the west. The waters slowly drain from the lakes, swamps, and flat country of Michigan, filling the river channels in rainy seasons, but rarely overflowing the banks, which are almost invariably higher than the adjacent district, and seldom fail in any season of affording a sufficiency for navigation, mills, and manufactures. The rivers St. Clair and Detroit seldom vary a foot in altitude. In the Ohio the variation is in many places forty feet, and this stream is annually for months fordable, and too low for navigation—some rivers west of the Mississippi that in winter wind several hundred miles with full banks, are often dry in summer. The St. Joseph and Grand river, are the principal streams of the western declivity of the peninsula that discharge their waters into lake Michigan. The St. Joseph has its origin in the rolling country of the interior of the peninsula and in Indiana. It is navigable 150 miles for large boats. The portage between the waters of the St. Joseph and the Maumee, is but a mile and a half in width, at which place the former river, though narrow, is not fordable, as experienced by Mr. Risden: he remarked that the western part of the course of the St. Joseph is through a beautiful, fertile, and healthy valley; the ground on each side rising with a gentle acclivity to a considerable elevation, presenting hickory and oak openings, coppice, prairies, and natural meadows. In fertility, it has been compared to the valley of the Mohawk, to parts of which the scenery has a resemblance. There is no obstacle to the navigation of the St. Joseph for a great distance from the lake.

Grand river has a bar at its mouth, but within, the water is deep, and it is navigable a considerable distance. In the soil adjacent to this stream, in many places, sand and gravel predominate, and it is considered by Mr. Risden and others, as much inferior to that in the valley of the St. Joseph.

Several minor streams of the western declivity, have a course of between forty and sixty miles from the interior hills to lake Michigan, watering a generally rich country. Some are navigable a considerable distance for boats.

The Saganaw, one of the largest rivers of Michigan, rises in the centre of the territory, and discharges its waters into Saganaw bay in lake Huron. It has a deep channel, and is navigable to the old cantonment for lake vessels, and fifty miles for considerable craft. Its auxiliary branches, the Sawasse, Flint, and Tiptuosse are considerable rivers, that together with the Saganaw drain a level, rich, but often low and wet region, described as being about seventy miles in breadth, and generally clothed with lofty forests. Much of it will probably be unhealthy until it is extensively under cultivation. The Saganaw often overflows its banks in rainy seasons, forming morasses in the adjacent flat country, which is less elevated than the borders of the stream.

The river Clinton, formerly called Huron, which terminates in Lake St. Clair, and the rivers Rouse and Huron, that discharge their waters in Lake Erie, have their origin from the numerous lakes and ponds of the undulating interior, principally situate in Wastenaw and Oakland counties, in almost every part of their course, as they pass through the oak openings, they afford rarely failing mill streams. Their waters are limpid and pure. They slowly wind about twenty miles through the rich wood-clad plain that borders the eastern part of the territory; the current is often impeded by fallen timber. The Clinton is accessible for large boats six miles to the village of Mount Clemens, and a considerable extension of its navigation is practicable by clearing out obstructions. Adjacent to this river, I noticed much white oak timber of uncommon size.

The Rouse is navigable fifteen miles. It passes through a good tract of openings; large oak, hickory, and black walnut, often occur on its banks.

On the Huron and Raisin there is much good land, and numerous settlements.

But a small part of the course of the Maumee is in Michigan. It passes through a rich, but usually unhealthy region. Between the Maumee and Sandusky Bay, is located one of the most extensive swamps of the western country. The climate of the Peninsula is affected by contiguous deep water, and the little elevation of the country. The autumn is usually exempted from frost until a late period, the air being tempered by the warm vapours from the lakes. The weather in winter is variable; snow rarely continues long; spring is often protracted, and frosts occur until May, resulting from the cold water of the lakes, and ice on their borders.

In forests situate on low and generally wet ground, elm, sycamore, white oak, bass, and maple, are the predominant trees.

On drier rich soil, hickory, black walnut, butternut, ash, and varieties of oak, are common. Chestnut is of rare occurrence.

In the colder districts adjacent to Lake Huron, the evergreens, white pine, hemlock, and spruce, are mingled with hard maple, beech, oak, and other trees of annual verdure: the land in this section is said to be generally good, though better adapted for grazing than grain.

Upon the Saganaw and its branches, and in the county of St. Clair, are many valuable forests of white pine. This tree is rarely seen in the Peninsula, except in the northern section. It is the predominant timber in extensive tracts of Upper Canada. In Ohio there is scarcely a single grove of white pine. Yellow pine is rare in Michigan. It occurs most frequently in the southern part. Tamerisk is seen in many of the interior swamps. Dwarf willows are often met with, and are considered an indication of good soil. The climate and soil are favourable to the growth of apple, pear, peach, and many other fruit-trees.

Of shrubs, the hazlenut, whortleberry, black, and raspberry, are common.

The plants appear to be much the same as those that grow on sandy soils in the New England states. Numerous species of the genera, aster and solidago, many of the gentians, cleome dodecandra, liatris scariosa, the buffalo clover, the common species of geranium, pedicularis pallida, euphorbia corallata, the Virginia thyme, with many of the sunflowers and hawk weeds.

Panthers have been rarely seen in Michigan. Wolves are numerous; bears and deer are not abundant. Otters, minks, foxes, muskrats, raccoons, opossums, and black squirrels, are common; beavers are taken near remote waters. Swans in large flocks frequent the numerous islands in the northern part of Lake St. Clair; they are all white, and twice the size of the wild goose. They are a very shy bird; their meat is tough and black; the Indians hunt them for their valuable down. Eagles, hawks, turkey-buzzards, numerous black-birds and crows, herons, geese, ducks, pigeons, turkeys, partridges, are observed among the birds that frequent the Peninsula. Wild bees are diffused through the country.

Black bass, pike, pickerel, perch, sunfish, and catfish, abound in the lakes and streams; white fish and salmon are taken in the rivers Detroit and St. Clair.

Black and checkered rattlesnakes are very frequently met with; we killed several of both varieties, adjacent to the road, in travelling in Oakland and St. Clair counties, and heard the warning rattle of others. In dry seasons, the wet natural meadows and thickets are much infested by these dangerous reptiles; they seldom exceed three feet in length. A poisonous serpent inhabits some of the waters.

Indians were formerly numerous and warlike in the Peninsula, but are fast diminishing by emigration and disease. They will probably, ere long, be removed beyond Lake Michigan, and finally swept from our rich borders into the inclement wilds of the north, or the barren region of the west, by the irresistible tide of population that is incessantly rolling from the east.

In character, the aborigines of Michigan differ little from other northern tribes. By intercourse with traders and settlers, they have contracted habits of intemperance. Within a recent period, numbers from remote tribes of the north-west territory, visiting the settlement at Green Bay, have refused ardent spirits, as it had not been rendered agreeable by use.

The Indians of the Peninsula exhibit a little of the vivacity observed among the tribes of Lower Canada, probably derived from the French population. They are indolent, improvident, and uncleanly, and have a great aversion to agricultural pursuits. Occupying the richest part of the territory, they are much of the time dependent on traders for supplies of corn, in exchange for furs, skins, sugar, and honey. They frequently after harvest part with the corn not immediately wanted, which they are subsequently compelled to repurchase at an extravagant advance. They manufacture considerable maple sugar for sale, using little themselves. The sugar is of good colour and grain, but sometimes has a taste derived from a characteristic practice of cooking fish in boiling sap. Some have cattle, and many have horses of a small breed.

They exhibit little evidence of religious impressions. The idolatrous worship of an image elevated on a pole, is said to be practised on the Saganaw. Large mounds, and stone dams, the result of much Indian toil, are seen in the route to Chicago.

During my visit to Detroit, there was a considerable body of Indians assembled in that city, to receive their annuities. Several of the chiefs and their wives were well dressed, and wore ornaments of silver. Among the chiefs, Kiskaco, a noted warrior, and man of blood in peace and war, was conspicuous for height, muscular frame, and magnitude of head. He is by birth a Huron, but was early in life adopted by tribes near the Saganaw, over whom he acquired an ascendancy, by strength, courage, and address, usurping the place of a chief of mild, and very intelligent aspect, who at the council held with the agents of the United States at Detroit, was chosen orator. The debates were conducted with much decorum. Several of the chiefs spoke with fluency and good sense. Indian groups of all ranks and ages, males and females, were daily seated, or reclining on the ground, in the streets of Detroit.

In the afternoon a part daily retired in bark canoes paddled by females, to their encamping ground, near the river Detroit. In these frail barks they had crossed Lake Huron and St. Clair, and navigated three hundred miles.

On the eastern or Canadian side of the Detroit, there is a remnant of the aborigines, occupying a reservation, who are much superior in character to the Indians of Michigan. Some of them cultivate the ground with skill; have orchards, good frame houses, good furniture, and live in the style of wealthy farmers.

The white population of the territorial government, which extends to the river Mississippi, is estimated at rising of 25,000. Of these about twenty-three thousand are located in the Peninsula of Michigan and the isle of Mackinac. The inhabitants of French descent constitute near a third part. They occupy sections of the shore from Lake Huron to Lake Erie. Their farms, adjacent to Lake St. Clair and river Detroit, are in narrow zones, commonly less than three acres in breadth, and extend back from the shore three miles, with rarely more than twenty acres in depth of tillable surface. This strip of table land is elevated from fifteen to thirty feet above the water, and generally descends westwardly to a dense wet forest, but in open places, extensive swampy meadows occupy the rear of the farms. In the soil cultivated, clay predominates, embracing calcareous ingredients. Good water is rarely found by sinking wells in these banks of clay. The inhabitants rely on the neighbouring lake and passing stream.

The French are indifferent farmers, but their ungrafted orchards produce much good fruit. The dwellings are pleasantly situated near the water, a road intervening, and command beautiful lake and river views, bounded to the east by the Canadian Peninsula. For upwards of fifty miles, with the exception of a few wet uninhabitable tracts, an almost continued village is presented. The fences are a rude picketing of poles. The ride on the banks of Lake St. Clair, and river Detroit, is one of the most agreeable in the western region. The Canada shore presents a similar range of French occupants: the elevation of the banks, soil, and face of the back country adjacent, much the same as in Michigan. Autumnal fevers are very prevalent in this part of Canada. The population in Michigan and Canada, of French descent, are deficient in information and enterprise, and have much occasion for moral as well as intellectual improvement.

Though the interior of Michigan remained, until lately, unoccupied by whites, and almost unknown to the French residents on the shore, yet Detroit is one of the oldest western settlements, being occupied by a colony iu the year 1670. This city is pleasantly situated on a ridge that rises gradually from the river, about thirty feet above its level. Numerous dwellings of the French inhabitants, located with good taste, occupy the margin of the stream in the vicinity of Detroit.

The principal street runs on the flat summit parallel to the river. It is wide, extensive, and well built. This city is fast rising to importance, from the rapid settlement of the interior. Its healthy and pleasant site, the depth and safety of its harbour, and its location between great navigable waters, give it a great advantage over the villages of the Peninsula, and western part of Ohio, often occupying unhealthy situations.

The river Detroit, opposite the city, is half a mile wide. Below it is divided by a beautiful and fertile isle nine miles in length, and is in places so rapid, that it cannot be stemmed except with a favourable wind ;—this difficulty will soon be obviated by numerous steam-boats traversing the lakes.

The wet sections of the alluvial plain in the eastern part of Michigan, are avoided by settlers from a well-founded apprehension of the unhealthiness of the region, upon which the effect of extensive clearings is yet to be tried. It is apprehended that a considerable part will remain long in a state of nature and insalubrious, as the waters are much confined by natural dykes bordering on lakes and rivers, and slowly drained by sluggish streams.

I visited English settlements of thirty years duration, situated on the eastern part of the river Rouse, and found scarcely a family exempted from fever, and the sickly aspect of the inhabitants indicated the unhealthiness of the district. I was informed that fever and ague, bilious and intermitting fevers, have there increased with the progress of clearing.

The Rouse in this part of the level country, winds deep and slow between high banks from which the ground gradually descends to swamps and wet wood-clad basins. The rich tillable ground was clothed with good crops, and would be a desirable location if attended by health ; but the productiveness of the soil, cannot compensate for the annual loss of time, and injury of constitution by sickness. Cattle and sheep are more subject to disease in this part of the country, than on the hills of the interior.

Large sections of the alluvial plain, capable of being rendered tillable by draining, and extensively exposing the surface to the sun, will it is hoped at some future period, support a dense and healthy population. The removal of timber from streams, and the exhaustion of the vegetable accumulation by crops, would have a tendency to lessen disease.

Water procured by sinking wells in the low country is generally bad—Good may perhaps be obtained by deeper excavations, and the exclusion of stagnant surface water, contaminated by plants and decaying vegetables.

Much of the flat country I examined, bordering on the rivers Clinton and Rouse, and the road to Pontiac, would if cleared, afford a fine grazing region. Many cattle are now supported in the woods and natural meadows, with but little aid from hay.

During the past summer fevers have been prevalent in most of the interior settlements, particularly on the banks of streams obstructed by dams, or timber, and in the vicinity of swamps. Decaying plants are exposed in the dry season to the sun and a warm atmosphere.

The annual recurrence of fevers in Michigan, in the western parts of Ohio, and in most new countries, is a serious evil to settlers. But I apprehend the rolling interior of the peninsula will soon be healthy in ordinary seasons—should this be the result, the lake region will be among the most desirable places of residence in the territory.

The undulating district west of the wood clad plain of the coast, is rapidly settling, principally by emigrants from the states of Ohio and New-York, of New-England descent, or birth. The judicious restriction of public lands to cash sales, has a tendency to secure a valuable population free from debt. I was informed by Major Biddle, United States land commissioner, who favoured me with many interesting facts, that a majority of the settlers have confined their purchases to eighty acres. A section of six hundred and forty acres, or a square mile, is frequently occupied by eight families. Few large tracts have been taken on speculation, to interfere with dense settlements, so necessary to promote education, and moral, and religious improvement.

Emigrants endeavour to obtain well watered farms, that have a portion of good timbered land, a tract of openings, and a natural meadow. A scarcity of timber for fuel and fencing will soon be experienced in parts of the interior, limiting the population, if measures are not taken to secure the growth of wood. The soil and climate are well adapted to the production of the chestnut tree, which excels in durability for timber and fencing. In fifteen years valuable forests may be formed with little trouble by planting the nut, and a new supply will arise spontaneously when these groves are cut.

In the oak and hickory openings clearings are easily effected. A settler can clear, fence, and put down to wheat, thirty or forty acres the first season. The rich hickory openings, and prairies of the interior, present a good grazing region. Cattle and sheep are healthy among the hills, thrive on native grasses, and can be supported through the year in considerable flocks at moderate charge—sheep must be penned at night, they range during the day undisturbed by wolves.

The peninsular situation and numerous streams of Michigan are highly favourable for commerce, and will enhance the value of its agricultural productions, by affording easy access to market. Three fourths of the territory is within a day's journey of navigable waters, and there is not a section that is more than fifty miles from a lake or boatable river. The abundant supply of water, the little elevation of the interior, and ease of excavation, render this country very favourable for artificial navigation. A canal from the St. Joseph to lake Erie, would insulate the territory, and save a circuitous voyage of eight hundred miles. It would be the route of numerous emigrants to the southern desirable part of the North-West and Missouri territories, and to the adjacent states. Navigation will in time be much extended by a canal down the rich valley of the Illinois, uniting the waters of Lake Michigan with the Mississippi. The descent is supposed to be about one hundred and fifty feet. By an extra deep cutting of a few feet at the summit level, the lake would afford a never failing supply of water for a canal of any magnitude.

There is a resemblance in many features, between the territorial peninsula of Michigan and East Florida: they have much the same shape and extent; both present alluvial plains on their eastern borders, and an undulating surface in the interior and western sections, where thickets, openings, prairies, and wet meadows, and numerous lakes, are interspersed. In their surface soil, silex generally predominates with a basis of compact earth or clay, embracing carbonate of lime. Both have many circular basins or sinks, and light coloured secondary limestone as the predominant rock;—but in Michigan the soil is much less sandy, and is a far better medium, than in most parts of Florida, and there is no comparison in respect to the extent of surface fit for tillage. There will probably be as little waste ground in Michigan as in any section of the Union, of equal extent, and if that paralyzing disease, the fever and ague, should cease like an incubus to oppress the land, it may in forty years present a population of a million, busily engaged in agriculture, manufactures, and commerce.

A rapid settlement of the peninsula will be promoted by the ease of clearing, low price and good quality of land, and the security of title derived from government. For years, a good domestic market will exist for the surplus products, from the influx of settlers, and there will be permanently established an easy, certain, and cheap conveyance of exports to New York or Canada, aided by never failing rivers, deep lakes, and canals abundantly supplied with water.

Art. XIII.—*Notes on certain parts of the state of Ohio, by Dr.* Hildreth—*continued from page* 162 *of this volume.*

Trees of different kinds and their uses.

For a list of our forest trees, I shall refer you to the descriptions published by Bartram, Catesby, and Marshal—but I shall speak of the uses of some of them. The bark of the Quercus Citrinus, or yellow oak, is not only used for tanning leather, but also affords a very beautiful, and permanent yellow. It is much used by our cloth dressers for that purpose. The bark of the Juglans cinerea, or butternut-walnut, is also used for dyeing—and affords a great variety of shades from deep black to a light brown. An extract carefully prepared from the bark, is a valuable, and salutary physic, while the wood makes a very tight, and useful kind of coopers' ware. The bark, from the roots of the Cornus florida, or dogwood, collected in the spring, dried and pulverized, is nearly or quite equal to Peruvian bark, in curing intermittent fevers, or as a general tonic. The bark of the Liriodendron tulipifera, or poplar, is also valuable for the same purposes, and is far more pleasant to the taste. The bark of the Æsculus flava, or buckeye, is said to be a valuable tonic medicine ; and the wood split into fine shreds, and macerated in water, is used in the manufacture of paper. The cones, or pods, of the Magnolia acuminata, or cucumber tree, steeped in spirits, are used in the form of a tincture, for the cure of rheumatism, and I believe advantageously. The wood of the wild cherry and black walnut, affords handsome stuff for cabinet work, and from the yellow and white poplar we obtain the principal part of our boards and plank for building. The yellow pine abounds in some parts of our country, and affords excellent boards for floors or wainscoting, and I have reason to believe that the western part of the country was, formerly, nearly or quite covered with groves of pine. The remains of pine trees are found scattered all over that part of the country; and the manufacturers of tar, often find the greatest quantities of pine-knots, in situations where at present there is not a living pine tree within two or three miles—this is usually on flat land, and amidst forests of oak trees of at least a century's growth. What could have been the occasion of this great mortality amongst the pines I do not know; but I once saw, in the western part of the country, a grove of one or two acres that had been killed the year before by some kind of worm. The trees were completely girdled, by their working between the bark of the tree and the wood.

The wood of the yellow locust, was formerly used, in finishing the upper works of vessels—it having almost the durability, if not the strength, of iron. It is also valuable for posts. The wood of yellow poplar, black walnut, and chestnut, is much used for shingles; and until within a few years, when white pine has been brought down the Alleghany river, they were in general use for covering the roofs of buildings. The wood of oak is also used for the same purpose, but generally manufactured into what are called long shingles.

"*Besides wood, other fuel, such as coal, turf, peat, and the quantity and quality of each.*"

Wood, is the article, principally used in this country for fuel. Peat, or turf, is not used at all; nor do I know that it is to be found in any part of the country in this vicinity. We have none of the swamps, or bogs, necessary for its formation. Coal is used in a few stores and offices; but little if any is used for family purposes. The greatest consumption of it is in manufactories and smiths' shops. It is found in various parts of the country, but the bed most wrought is on the Muskingum river, eighteen miles above Marietta. Here it is found to extend across the river, and as the earth is all washed away from it, when the water is low, the workmen have nothing to do but to quarry it from the bed, and throw it into their boats. When the water is too high, or too cold to obtain it from the river, they follow the same bed on the shore, and find it at the depth of eight or ten feet from the surface of the earth. A large hill puts in near the river, the base of which appears to be coal. Should this be properly worked, it will no doubt furnish an inexhaustible supply. Its proximity to a large navigable stream, adds much to the value of the mine. The coal which is obtained from the bed of the river is of an excellent quality, and burns freely, without leaving much cinder. That obtained from the earth is not quite so good; probably owing to its lying nearer the surface of the mine, and being more mixed with slate and sulphate of iron.

The state of agriculture, the price of land, of provisions and labour.

The agricultural affairs of this county have much improved within a few years. We have many farms in a high state of cultivation; and as a proof that the farming interest is in a flourishing state, a great many of our farmers, in various parts of the county, have built, and are building, commodious, and in some instances, very elegant brick houses. They have usually preferred building of brick, as their own farms furnish the materials; and the greater part of the labour, in making the bricks, can be done by themselves. A considerable number of our farmers have turned their attention to *Dairies*, for a few years past. A greater quantity of cheese has been made in the township of Newport, I believe, than in any other. Some farms have made as many as six or eight thousand pounds, in a year; and their sales, made on the farm, have amounted to eight hundred or one thousand dollars. The purchaser usually ships it to Louisville, and the towns below this on the Ohio, where he realizes a handsome profit. Our orchards are another source of profit to the agriculturalist; almost every farm, particularly on the rivers, having an orchard, of from one hundred to four hundred bearing apple-trees. Many of these are composed of large trees, having been put out from fifteen to twenty-five years. A great proportion of these are of the best kinds of engrafted fruit, collected from all parts of the older states. No climate in the world, is better suited to the growth of apples; the soil is also well calculated to ripen them into luxuriance; and in a bearing year, thousands of barrels, of as fine apples as any country can produce, are sent down the river to market. Cider is also made in great quantities; and from its liability to sour in a warm climate, a great deal of it is distilled into brandy. In plentiful years cider is sold for from one to two dollars per barrel.

Our other articles of export are, wheat, hemp, corn, flour, lard, salt pork, and bacon. Our beef is principally taken on the hoof over the mountains, and sold to the graziers on the eastern side. Our hogs were formerly marketed in the same way; but of late years our merchants have been buying them, and either sell their lard and pork down the river, or ship it to the Atlantic states. This year two merchants of this place have put up thirty-three thousand pounds of lard; thirty thousand pounds of pickled pork, and forty-five thousand pounds of bacon—the principal part of which was raised in this county.

The price of land varies from one dollar, to fifty dollars per acre. The bottom lands on the Ohio are most valuable; those on the Muskingum, next in value—the creek bottoms, and rich uplands, are next in demand, and sell from two to four dollars per acre, as they are more or less conveniently situated, in the neighbourhood of mills, public roads, &c. There is yet a large quantity of fine uplands in this county which remains unsettled.

The prices of provisions the past year have been as follows.—Beef $5; Pork $5; Wheat $0.75; Rye $0.50; Indian Corn $0.33; Oats $0.33; Potatoes $0.33; Flour $3 per hundred weight; Butter $0.17; Cheese $0.12 1-2; white Beans $1.50 per bushel; Barley $0.40. The price of labour, on a farm, is about twelve dollars per month by the year. Mechanics' labour is generally fifty per cent. higher than in the eastern states.

The Grasses, whether native or imported.

The grasses in cultivation in the county of Washington are principally imported. Those cultivated in meadows, are Timothy or Herds grass, Red Clover, and "Red-top" grass. The pastures are occupied by native grasses, white clover, and two kinds of spear grass. Our lands are so full of the seeds of white clover, that on ploughing them, the white clover springs up spontaneously; and if the clover becomes rooted out by the springing up of other grasses, and the present growth destroyed by successive years of pasturage, we have only to plough the land afresh, and the clover springs up as thick and as luxuriantly as it did at the first ploughing. How long this will remain to be the fact, is yet to be proved by the succeeding age. The lands in some parts of Massachusetts, were formerly covered with white clover; but for the last twenty or thirty years it is rarely seen, in those places where it was once so common. I have been told by a person who was an eye-witness, that he saw a piece of land covered with white clover, in consequence of its being manured with marsh mud. The seed must have lain in this mud, probably for an age or two, and yet retained the principle of life. Some attempts have been made at cultivating Luzerne—but they have not been successful; from some defect in the soil, or peculiarity in the climate, the plants have dwindled and never came to maturity.

Manures, the different kinds and effects.

The land in this county, has as yet borne cultivation so well, that but little attention has been paid to manures. But where they have been applied, the additional increase of the crop has well repaid the labour and expense bestowed. There are no other manures in common use, than the usual stable manures—no attention is paid to composts, marl, lime, or plaster of Paris. Some of our farmers, however, when preparing their grounds for wheat, are careful in ploughing in a crop of some kind of grass, usually clover. This not only enriches the earth, but leaves it light and mellow for the roots of the wheat to vegetate in, and thereby to produce a better crop of wheat, both in quantity and quality. The low meadow grounds on the Ohio and Muskingum, are kept fertile by the earthy depositions left on them, by the overflowing of the banks in the spring, or fall freshets. This deposition, in many places, is made to the depth of one or two inches. It is of a very fertilizing nature, and keeps the earth rich, and very productive wherever it falls.

The number of Sheep, Horses, Swine, and Neat Cattle.

As to their numbers, I am at present unable to answer. The horses and cattle, of a certain age, could be ascertained from the County Books of taxable property—This I will endeavour to do. The sheep and swine are not taxed, and therefore it will be difficult to find their numbers. Sheep are owned in great numbers in this town and county, particularly the "*Merino*" breed. I believe the first in this state were owned in this town, and brought here by Seth Adams, Esq. in the year 1807.

Manufactures, of what kind, and the number of Manufactories.

These, I believe have all been mentioned in some of the preceding articles.

The State of the Roads.

The roads, through the summer and autumn months, are tolerably good. In the winter and spring, they partake of the quality of all the Ohio roads, an abundance of mud. In those roads, which border the Ohio and Muskingum rivers, the travelling is very delightful in the summer months. The bridges across the small streams are generally kept in repair; though subject to many casualties, from the high water. We have two handsome toll bridges across Duck creek—one at the mouth, and one about two miles up the creek. We formerly had one across Little Muskingum, at the mouth. It was thrown across with one arch, of about one hundred and fifty feet, supported with stone abutments. The abutments are yet standing; but the arch was demolished by a high freshet in 1808. A grant was made last winter by the Legislature, to a company to rebuild it, with the privilege of taking toll.

Trade and Commerce, what kind of boats and ships employed in them, their number and of what, and how constructed.

The trade on the rivers, is carried on by keel boats, barges, and flat bottomed boats; or as they are usually called "Orleans boats," from their being used for transporting flour, &c. to New Orleans. The keel boats, are from fifty to eighty feet in length, and about nine or eleven feet in width; built with a keel and frame, a little after the manner of a ship's long boat. They will carry from ten to thirty tons—are propelled against the current, by poles; and of late years they use a mast and large square sail—and as the wind blows up the Ohio for at least two-thirds of the time, from March to November, the sail is of great use to them. In their voyages down stream, they make use of oars. The principal commerce of the country, is carried on in these boats. They are usually navigated by six or eight men. Ship-building was carried on here, quite briskly, for a number of years; and as many as twelve or fourteen vessels were built, of from one hundred and fifty to three hundred tons burthen. Some of them were completely rigged, at Marietta; others were rigged at New Orleans. The embargo first gave a check to the spirit of building; and the loss or damage of several ships at the falls of Ohio, has put a stop to any further attempts. Steam-boats now seem to be the order of the day, and will probably take the place of nearly all the other kinds of navigation.

Fisheries, the kinds, quantity and value of fish; the mode of taking and curing them—an account of the different species of fish in the streams, ponds, and lakes.

When the first settlement was made in the country, fish were found in the greatest abundance in all the streams; but since so many boats are employed on the rivers, the fish have become scarce and more difficult to take.

The kinds which are usually caught, are yellow and black catfish, white perch, spotted perch, pike, trout, buffaloe, suckers; two kinds of sturgeon, one with a broad flat nose, usually called shovel-nose sturgeon; eels; a fish called herring, but much larger than any of that species which I have seen, and only taken in nets; garfish, chubs, sunfish, and minnies.

The greater quantity caught in this neighbourhood, are taken in the spring months, by setting a line, called a "*trot line*," where the water is tolerably still and deep: this line is usually from forty to sixty yards in length, the middle supported by buoys, and the two ends kept at the bottom by stones; to this line are attached a large number of hooks, baited with crayfish or minnies. It is usually visited morning and evening, or oftener if necessary, the fish taken off, and the baits renewed. In this manner they sometimes take catfish, weighing nearly 100 pounds.

In the summer months, when the water is low, seines are used, with which considerable quantities are taken; amongst them we sometimes find pike, weighing 30 or 40 pounds. Another mode of taking fish, is by the spear, or "*gigg*." This is usually done in the night by the assistance of torchlight. The fish, attracted by the light, comes to the surface of the water, and falls an easy victim to the expert spearman. But they are not in sufficient abundance to become an article of export, or even to supply our own demands; many barrels of salt fish being annually brought from the lakes and sea coast, and sold in this market.

Wild animals, serpents, tortoises, and other amphibious animals; quadrupeds, insects, or the bones of the animal called the mammoth, or of any other unknown animal.

The wild animals of this county are of those kinds common to the state of Ohio. Amongst the carniverous animals, we have the bear, wolf, panther, wild cat, and fox. Of the fox we have two varieties, the red and the gray: the gray is by far the most common. Of those which are partly carniverous and partly graniverous, we enumerate the opossum, raccoon, polecat, and mink. The ground hog, or woodchuck, and rabbit, are herbiverous. The gray squirrel, the black squirrel, and the chipping squirrel, are the only kinds I have seen. The red squirrel and flying squirrel are not common here, though I believe they are found on the waters of the Ohio, near the mountains. The native rats are black, and small. The wharf rat has found his way into the country within a few years, and is now common in the neighbourhood of the Ohio river. Mice, of the same kind, common to the east side of the mountains, are found here. Beavers were once common here, but the hunters have destroyed them all long since. A few otters and mink yet remain, and the musk-rat is common. Our serpents are, two kinds of rattlesnakes, black and spotted; copperhead, water-snake, water-adder, garter-snake, and two kinds of black snakes, one very long and slim, the other with a white ring round the neck. These are all harmless, I believe, but the first two.

Rattlesnakes and copperheads were very abundant in the woods at the first settlement of the country; but since our hogs have been suffered to run in the woods, they have nearly destroyed the race of snakes. It is said, that the bite of a poisonous snake does no injury to a hog. If this is the fact, I know not how to account for it, unless it be that the great quantity of fat with which the cellular membrane is loaded, prevents its absorption into the system, or acts as an antidote to the poison, in the same manner that olive oil does. It is certain that hogs are fond of this kind of food, and eat it whenever they can catch it. Our tortoises are of three kinds —the large black tortoise, small brown tortoise with yellow spots, and the soft-shelled tortoise. The latter kind lives altogether in the water, will weigh from six to ten pounds, and is said to be nearly or quite equal to the sea-turtle, for the table.

Lizards are very common in the woods, and in pleasant weather may be seen on old logs, lying basking in the sun. Newts are found in our small streams; and in the Ohio an animal, between the newt and the aligator, is often taken on the hooks set for fish, in the spring of the year. It is between two and three feet in length, and of a most disagreeable and disgusting appearance.

Cray-fish are very abundant in the low grounds: they are sometimes found six inches in length, and weighing nearly half a pound. They taste very much like the lobster; and, like him, have the property of reproducing their antennæ, or their limbs, when broken off, in the course of a few weeks. I have tasted their claws, when broken from the live animal, and found them really salt or brackish, like an oyster or lobster. Land snails abound in the woods; and in the spring and fall, after a fire has destroyed the leaves, the ground in many places is seen almost covered with their calcined shells. I have noticed only one kind of them. We have a species of insect which resembles the snail, but is destitute of a shell. It is common in our gardens, and is fond of crawling upon ripe fruit, which it finds on the ground, such as peaches, melons, &c.

Our insects are so numerous and so various, that it would take a volume to describe them alone. One of the most interesting and curious of this class is the Cicada. It nearly resembles the harvest-fly, but is smaller. They are said to appear only at stated periods, which some have fixed at seventeen, and others at fourteen years. I have one record of their appearing in this country, the 14th of May, 1812. I was then told it was seventeen years since they were last here, viz. in 1795. They gradually disappeared, and by the first of July were all gone. The month of May was cold and wet, and very unfavourable to the egress of the cicada from the earth. From the 24th of May to the 3d of June, their numbers increased daily, at an astonishing rate. The cicada, or "*locust*," as he is vulgarly called, when he first rises from the earth, is about an inch and a half in length, and one third of an inch in thickness. While making his way to the surface, he has the appearance of a large worm or grub; the hole which he makes is about the same diameter with his body, perpendicular, and seems to be made with equal ease through the hardest clay or softest mould. When they first rise from the earth, which is invariably in the night, they are white and soft. They then attach themselves to some bush, tree, or post, and wait until the action of the air has dried the shell with which they are enveloped: the shell then bursts on the back for about one third of its length, and through this opening the cicada creeps, as from a prison. Their bodies are then very tender, and they can neither fly nor crawl to any considerable distance. In this state they remain until morning, their wings gradually unfolding, and as the day increases, they, by little and little, and frequent attempts, learn to fly for a few feet, so that by night they are able to fly for several rods. In their efforts to disengage themselves from their shell or envelope, I noticed that many of them lost their lives—either from a want of strength to burst away, or from the narrowness of the passage, occasioned by their coming to the surface of the ground too early, and the action of the air drying, burst their covering before their bodies were prepared for the change. In a diary which I kept at the time I find the following observations.

June 3.—Yesterday the cicadæ were seen making preparation to lay their eggs.

June 4.—The cicadæ begin to deposit their eggs in the tender branches of apple-trees: they appear to be very fond of young trees of this kind, and of the forest-trees they seem to have a decided preference for the beech, on which they collect in vast multitudes; and when any one passes near, they make a great noise, and screaming, with their air-bladders, or bagpipes. These bags are placed under, and rather behind the wings, in the axilla, something in the manner of using the bagpipes, with the bags under the arms—I could compare them to nothing else; and indeed I suspect the first inventor of the instrument borrowed his ideas from some insect of this kind. They play a variety of notes and sounds, one of which nearly imitates the scream of the tree-toad.

June 12.—The cicadæ still very busy depositing their eggs in the tender branches—which branches die and fall off. The male only makes the singing noise from the bladder under his wings. The female has no wind instrument, but an instrument like a drill or punch, in the centre of her abdomen with which she forms the holes to deposit her eggs—the same instrument also deposits an egg at the instant the hole is made. The punctures, or holes are about an eighth of an inch apart, and in the heart or pith of the branch on its under side. One cicada will lay an immense number; by the appearance of one I opened to day each fly is furnished with at least one thousand eggs.

May 27.—I find the following record. "This day, and for two or three days past, the locust, or cicada is beginning to appear in vast quantities on the trees and bushes in the woods; they seem yet not to be fully grown, nor very active, but are easily caught. The hogs are very fond of them and devour all they can find, and indeed they seem to have commenced their attack upon them, by rooting, before they left the ground. It is thirteen days since they first began to break from the earth, but did not leave their holes, in any great numbers, on account of the cold, till lately." The last of June, the cicadæ gradually disappeared. At this time the females were very weak and exhausted; and some which I examined, appeared to have wasted away to mere skeletons, nothing remaining but their wings and an empty shell of a body. Since that time few, or none, have appeared in this county; but I have heard of their being seen in some of the neighbouring states, I believe east of the mountains.

While the cicadæ remained with us, I could not discover that they made use of any kind of food, although I examined them repeatedly and particularly for this purpose. All the injury they did to vegetation, was in depositing their eggs; by this process they materially injured, and in some instances nearly destroyed, young orchards of apple-trees. Many of them to this day will bear ample testimony to the truth of this remark, in their mutilated limbs and knotted branches.

In addition to the foregoing observations, I have learnt to a certainty, that it is seventeen years since the cicadæ were here before. Early in the spring of 1795, a clearing was commenced eight miles above this place, on the Muskingum, and an orchard put out on the piece, perhaps half an acre, that was cut over before the cicadæ appeared; the rest of the clearing was made the same season, after they had disappeared. When they again appeared in 1812, it was observed by Mr. Wright, the occupant of the land, that not one cicada came out of the earth on that piece of ground where he had cut the trees before they appeared in 1795; but that on all the rest of the land, wherever there was a stump, or a tree had stood, the earth was full of holes made by the ascending cicadæ. These facts are in my mind a sufficient evidence that it is seventeen years between the laying of the egg, and the re-appearance of the cicada. Through how many transformations they pass, is to me unknown; but from the length of time they lie in the earth, it is probable the changes are more than one. But that they do not travel far is evident, from their coming up immediately by, or under the spot, where the tree stood in which the eggs were deposited.

An account of the Birds, whether migrating or resident—the periods of their arrival, departure and uses.

Our birds, with a few exceptions, are the same as those which are common to this country and common to the eastern states. I shall mention a few of those which are constant residents. Amongst these, are the turkey, raven, crow, turkey-buzzard, three kinds of hawk or vulture, pheasant, partridge or quail, blue jays, a small kind of sparrow, red birds, wren, and two kinds of owls, the large and small, or screech owl, turtle dove—one or two kinds of wood ducks, five kinds of woodpeckers, amongst these are the wood-cock and yellow hammer, the king fisher, the bald headed eagle, and gray eagle. These are all that I recollect at this time. Amongst our migrating birds, we enumerate the wild pigeon. They usually appear the beginning of March, on their journey northward—they pass about a month with us, and proceed on their journey. In September they visit us again, on their return to the south; they then spend about six weeks, feasting on the new acorns, beach nuts, and berries of the phytolacca decandra, or poke, of which they are so fond that the plant has from this circumstance been called "*pigeon berry*," and is generally known by that name. They seldom pass the summer with us; but used to do so sometimes in the first settlement of the country; when they built nests, and hatched and reared their young in vast multitudes.

Several species of ducks visit us spring and autumn; also the wild goose occasionally stops awhile with us, in her journeys north and south. Loons are frequently seen, but seldom amongst the spoils of the hunter. Their eyes and ears are so good that they dive beneath the water, before the shot of the fowler can reach them. The heron and crane visit us in the spring, and rear their young in the course of the summer. The robbin-red-breast, black-bird, and blue-bird, were seen this year the first of March; they sometimes appear in in February. The bob-of-lincoln, or magpie, appears at a later period in April or May. The chimney swallow, barn-swallow, and martin, make their appearance, as soon as the warm weather has produced a supply of insects for their support. But last year the weather was so cold about the middle of April, that a great number of those birds which live upon insects, died with famine, and with cold. A vast variety of other kinds also suffered, and were so benumbed and weak that the boys caught them by hand. Amongst these were a number, which were said never to have been seen here before; their plumage was very beautiful and variegated. Amongst those of our acquaintance, was the humming bird, goldfinch, red bird, yellow bird, &c.

The brown thrush is one of our finest singing birds, and its rich and mellow tones are fully equal to those of the Canary bird; from its powers of imitating the notes of other birds, it has acquired the name of the "mock-bird." The cat-bird is also a singing bird, and appears sometimes to nearly equal the thrush; but has not that variety and melody in its notes so much admired in the mock-bird. We have two or three kinds of sparrows, larks, snipes, the real ortolan, and marsh quails. The whip-poor-will, visits us with the first warm weather; but I have not heard his note yet, although it is the 31st March. The king-bird, so called from his superior courage and strength, is common; and is very troublesome amongst our domestic bees. He watches them with great diligence, while they are feeding on the blossoms of white clover, and as many as thirty or forty bees have been found in the stomach of one king-bird. The wren and "pewee" visit us in the spring, and retire on the first appearance of cold weather. The paroquet has been seen as far east, on the Ohio, as the mouth of the little Hockhocking, but is only a transitory visiter. Gulls are frequently seen in the summer before a storm, from the south-west. We have, besides those enumerated, many other birds whose names I do not know.

Art. XIV.—*Anthracite Coal of Pennsylvania, &c. Remarks upon its Properties and economical Uses.* By the Editor.

I may refer my readers, for an introductory view of this subject, to the memoir of Mr. Cist on the anthracite of Wilkes-barre, published Vol. IV. page 1, of this Journal, and to the certificates there annexed, of practical men, relative to its uses and value. As I have, however, within a few months, enjoyed considerable opportunities of observing the utility of this invaluable combustible, I will add a few remarks, the result of my own experience, and also cite some of the observations of others.

In our domestic commercial language, the anthracite of Pennsylvania is called Wilkesbarre, Susquehannah, Lehigh, and Schuylkill coal, and by other names, having reference to the principal places from which it is obtained. Although Pennsylvania is stored with this mineral to an unparalleled extent, it is found also, abundantly, in Rhode Island, and more or less, as is said, in Massachusetts, and other parts of the United States.

It is not my object, at this time, to give a precise description of our anthracites: there is a considerable variety among them, and there are differences in their properties more or less conspicuous, which adapt them to different uses.

In mineralogical books, the anthracite is usually described as burning with little or no flame, and it is of course inferred, that such varieties of coal afford little or no inflammable gas.*

This is substantially true of many varieties of anthracite; but, in observing the combustion of that of Pennsylvania in the close stove, (or, more properly speaking, in the *chemical furnace*, which is now employed for warming houses,) I was, from the first, struck with the abundance and long continuance of the flame. I first observed this fact in the Lehigh coal, but it is certainly not less remarkable in the Schuylkill. This led me to make a few easy experiments on the quantities of gas afforded by several varieties of mineral coal. The several specimens of coal were heated, separately, in wrought iron tubes, about one inch in the interior diameter, stopped with a welded iron plug at one end—coated with a fire lute of sand and clay, connected by a flexible lead tube, with a hydro-pneumatic cistern, and placed in a Black's universal furnace, having a flue of 20 feet in height, and affording a heat which is above that necessary to melt cast iron: the furnace was allowed to draw with nearly its highest power. The Lehigh coal, that of Wilkesbarre, and the Schuylkill coal, of each 876 grains, or about two ounces, were exposed to the heat of the furnace in different tubes,† the result was as follows:

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* "The anthracite burns slowly and with difficulty, *yielding little or no flame*;"—"*as it burns without flame*, it cannot be employed in reverberatory furnaces."—*Cleaveland's Mineralogy, 2d ed. vol.* II. *page* 499 *to* 502.

The foreign systems of mineralogy give substantially the same account of anthracite.

† The Lehigh and Schuylkill coal were in the furnace at the same time.

The different varieties of coal began to give out gas within a few minutes—but the Schuylkill began before the Lehigh, and in the earlier stages of the experiment, the gas from that coal was the most abundant; soon however the gas came from both with apparently equal rapidity, the Schuylkill ceased first, and that from the Lehigh continued to come over after the other had done, until the entire product of gas was nearly the same from both varieties of coal, but rather greater from the Lehigh. The Wilkesbarre coal much exceeded both the others in the abundance of gas which it afforded. The more precise results will be given in a table farther on, along with those obtained from some other varieties.

The most remarkable of these was the Rhode Island anthracite. From this I obtained no gas at all, although the experiment was conducted in the same manner with the others that have been related. The specimen of coal was one that had lain several years in a garret, but I am not aware that this could have had any other effect than to dissipate any moisture that might have been in the fissures. *Combined* hydrogen, or *combined* moisture, could scarcely have been affected merely by exposure to a dry atmosphere; still I presume that a specimen recently taken from the mines, would afford some gas. The Wilkesbarre coal had however lain several years in a very dry upper room. I next tried a comparative experiment with good bituminous Liverpool coal, using the same quantity, and proceeding in the same manner. I found the result such as I had many times before obtained, from this species of coal. The inflammable gas was readily and abundantly obtained, but not much more so than from the Lehigh anthracite. It will be seen in the table that it yielded but one twentieth part more gas than the Lehigh, and only half as much as the anthracite of Wilkesbarre.

Anthracite.	grains.	Sp. grav. before ignition.	Sp. grav. after ignition.	Weight lost by ignition, grains.	Inflammable gas given out wine pints.	Hardness after ignition.
Lehigh,	876	1,55	1,77	259	19	Scratch the hardest window glass readily.
Schuylkill,	876	1,52	1,77	324	18	
Wilkesbarre,	876	1,55	1,77	170	40	
Rhode Island,	876	1,75		100	0	do. do.
Bit. Coal.						
Liverpool,	876	1,33	0,65	336	20	do. do.
Cannel,	876	1,33	0,83*	352	40,75	do. do.

* It may at first view appear very extraordinary, that while the anthracites experienced so remarkable an increase of specific gravity by

None of these varieties of coal would, before ignition, impress glass, but the Pennsylvania anthracites, after having sustained the heat of the furnace, became so hard that with an angular piece, I could write my name, on green window glass, with a flourishing hand, much as with a piece of quartz. This is in accordance with what many persons have observed with respect to the effects of heat upon different varieties of carbon, as in the Surturbrand of Iceland—a variety of wood-charcoal, which is supposed to have acquired its power of scratching glass, from having been long and intensely heated beneath a current of melted lava. Similar results were obtained by Sir Humphrey Davy, with the great battery of the Royal Institution, and those observed in the use of Dr. Hare's instruments have been already described in this Journal.

I have often observed that well prepared charcoal, after very strong ignition, speedily spoils a knife, used in shaping it into points, and even the best files do not long withstand its action, as their teeth are eventually worn down by the hard integrant molecules of the charcoal.

I have observed also that even the coak obtained by igniting the bituminous coal rapidly destroyed the polish of glass, thus producing upon its surface, the effects of the gritty powders, used in grinding this substance ; these effects do not appear to result from the impurities but from the induration of the carbon.

I was surprised to find that the residuum, both from the common bituminous Liverpool coal, and from the Cannel coal, allowed me to write rapidly and distinctly with the pieces upon the hardest green window glass, and when two or three points

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ignition, the bituminous coals should, in this respect, have been still more remarkably diminished. Perhaps a satisfactory solution of the difficulty can be found in the fact, that the anthracites, containing no bitumen, do not cake or grow soft in the fire, which the bituminous coals do, to such a degree, as to undergo almost an apparent fusion in their own bitumen—a little as many salts, when suffering the aqueous fusion, do in their own combined water of crystallization. Thus the coaks of the bituminous coal are in consequence of the escape of gas left exceedingly porous, from innumerable cavities, so minute that being, of course, occupied by air, which the hydrostatic power of the water can not displace, they are necessarily rendered very light, while the trials made on glass evince that their *integrant particles* are very hard and dense, and that the small specific gravity is really an illusion ; pumice-stone is an example which illustrates this case, and appears to be perfectly analogous.

of the carbon touched the glass at once, each gave its distinct trace, and thus, in rapidly writing, two or three parallel letters were produced at the same moment.

I was thus led to observe whether prepared charcoal would scratch the same green glass, and found that it speedily spoiled its polish, and gave furrows distinguishable by the eye and by the finger nail, and perfectly visible by a magnifier. The same effect, although in a less degree, was produced by common charcoal, when the pieces were selected from among those made from young and vigorous limbs, and the residuum of the coal gas retorts from Glasgow produced a similar effect, but by no means so distinctly, as the coak which I prepared from the bituminous coal; probably because the heat is not pushed so far in the ordinary process preparatory to gas illumination.

The inflammable gas, obtained in the experiments already related, stood over water two or three days before I had leisure to examine it. I did not remove the carbonic acid, which is produced in all such cases, but as there was but little more diminution in the volume of the gases in the glass jars, than might be presumed to arise from mere cooling—(the gases having issued hot from the furnace) and as there was no discoloration in the water of the cistern, although it was painted with oxide of lead, it seems fair to infer that there was not much carbonic acid or sulphuretted hydrogen.* For the sake

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* In a subsequent experiment, I washed, with solution of caustic potash, a portion of the gas from the Wilkesbarre coal, and found the absorption so small that I believe it did not exeeed one fiftieth. I also agitated with solution of acetate of lead another portion of this inflammable gas which had not been washed with alkali, and found that there was not the slightest change of colour; there was, therefore, no sulphuretted hydrogen and no sulphur of any amount in this anthracite. I burned a jet of this gas in a glass tube half an inch in diameter, and four feet long; it gave distinct musical tones, and lined the tube with innumerable drops of water, which even ran down in tears. Another portion from which the mixed carbonic acid had been removed by washing, was burned in a jet, in a quart bottle of common air, which after the combustion was ended, precipitated lime water abundantly.

If there could have been any question as to the nature of the combustible gas evolved by heat from this coal, these facts prove, decidedly, that it is nearly pure carburetted hydrogen. In the actual *combustion* of the fuel for use, there will of course be a great amount of carbonic acid, and other gases, formed, of which it is foreign to my purpose now to speak. I am not at present, able to account for the great difference in of comparing the colour of the flame, I burned the gases, successively, from a jet, with the aid of pressure;—the gas from the Schuylkill coal burned with a yellow flame—that from the Lehigh with a similar appearance but paler—that from the Wilkesbarre coal was tinged with blue, purple and red—while that from the bituminous coal and especially from the cannel coal gave, in its combustion, a brilliant white light, similar to that of the heavy carburetted hydrogen gas, but less intense.

The flame from both Lehigh and Schuylkill coal is often of a delicate yellow in the furnaces, and not unfrequently, it is tinged with rich green and blue, indicating foreign substances, perhaps copper, and sulphur, in solution in the gas or in mixture in the form of vapour.

If we admit the Pennsylvania coal east* of the Alleghany, to be anthracite (and no one I believe has ever questioned the fact) we must hereafter qualify our statements as to the flame obtained by the combustion of the anthracite, and say that *it sometimes burns with abundant flame*—so abundant indeed that it affords an easy method of obtaining a pleasing variety of carburetted hydrogen gas, for exhibition in a lecture room.† No one would, however, have supposed that the anthracite would in any case afford as much inflammable gas as the bituminous coal, and even sometimes as much as the richest variety. The difference then seems to be not so much in the quantity, as in the quality, of the gas: that from the anthracite is unfit for artificial illumination, as the light which it affords is too pale, while that from bituminous coal burns with a brighter flame—sometimes equal to that of the brightest lamps and candles—but at other times it is comparatively pale, although it is believed to be generally brighter than that from the anthracite. I have not recently seen the Rhode Island anthracite burn; we should expect

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the loss of weight sustained by the different varieties of coal, and for its want of correspondence with the gas evolved. It is certainly *possible* that it may be owing to water, no steps having been taken to collect that fluid.

* That west of the Alleghany is bituminous as that at Pittsburgh, &c.

† And this without the incumbrance of bitumen and other products of the distillation of that species of coal, of wood, &c. and probably with less carbonic acid than in most similar cases.

(what indeed accords with my recollection as to the combustion of this coal, when I saw it burning in Newport, eighteen years ago,) that it would burn with intense ignition, but with very little flame.

It is obvious that the comparatively abundant flame of the Pennsylvania anthracite must fit this fuel for some important purposes, (principally for varieties of furnace operations,) which are very important in the arts—thus combining the advantages of both kinds of coal. It is well known that the most intense heat is not produced by the bituminous coal, until it has been coaked—that is—the volatile part, including the gas and bitumen is driven off by a smothered heat, and the purer carbonaceous part is obtained by itself. Now the anthracite, properly burned, produces always the intense heat of coak, and if it give at the same time the effects of abundant flame, it is obvious that it must answer in reverberatory and other furnaces, which require flame, such as the cupola furnace, &c. That it is actually so applied, in the arts, will appear farther on, in the testimonials of artists which we shall have occasion to cite. In domestic economy, both the Lehigh and the Schuylkill coal are applied with great advantage, both in parlour grates, and in close stoves, for warming apartments, as well as in cooking.

My own experience is limited chiefly to the stove or furnace,* which is constructed to stand in a hall or entry, or in some small apartment or recess, and it warms the contiguous apartments in consequence of the revolution in the atmosphere of the rooms, arising from change of specific gravity, the colder air going to the stove, to be warmed, and then ascending and diffusing itself around,—thus giving place to more cold air, and so on, in a constant succession of currents. In this manner a stove which stands in a small entry between the family parlour and the office, effectually and agreeably warms both these apartments, and the connecting passages, and in a great measure warms the two chambers and the passages immediately above. The parlour is 22 feet, (24 including recesses,) by 18 feet, and the office and passages 20 by 16, the height of the whole is $9\frac{1}{2}$ feet. The stove or furnace which warms these apartments is constructed of Russia iron and lined, in the part exposed to the fire, with fire brick. Its diameter

* I have repeatedly seen the anthracite burning, in parlour grates, but have never had one in my own house.

within the brick is 12 inches; including the brick it is 16 inches. It is formed of three cylinders of sheet iron, growing smaller and smaller, and standing vertically one on another, to the height of about 6 feet. A tube, of 4 inches in diameter, goes off from the top, to conduct away the gases produced by the combustion, for there is no smoke, in the common sense of that word, and although this tube is 25 feet long, and most of it horizontal, there are only two joints where there is the least appearance of condensed water, and as this occurred but once, I am inclined to attribute it to some other fuel which was put into the stove, wood having been a few times used. The supply of air is through the ash-pit, which is furnished with an iron drawer to receive the ashes, and the front of this is pierced with register holes to regulate the admission of air. When the drawer is shut, the air passes in only through those holes, and when a greater supply is needed, the drawer is pulled out to any desired degree. The bars of the grate should be about an inch in diameter, and nearly or quite that distance apart.

The fire is first kindled with charcoal, and when this is well ignited, the anthracite is added in pieces of the size of a fist, or larger; and at first, only to the depth of a few inches. When this is kindled, which will happen in 15 or 20 minutes, more is put in, until the furnace is filled to the top of the bricks, or the bottom of the door—less, however, as the weather is milder.

The fuel may be added once in three, four, five, or six hours, according to the weather, and other circumstances. It will need no other attention, than occasionally to stir the ashes, with a crooked poker, applied underneath, between the bars of the grate, or to run a straight one down to the bottom of the fire, to make a passage for the air, when the furnace is choked. This is done most in cold weather; when it is very mild, it may be best to let the ashes accumulate, and then the fire will burn very gently and agreeably for a long time.

The heat produced by a stove or furnace,* of the description now given, is very mild and agreeable, without any oppressive effect, or any effluvium, except occasionally a trifling odour of sulphur, &c. for a few minutes when the furnace is recruited. The temperature, in my apartments, is gene-

* I have a similar stove in a convenient recess in the kitchen, which effectually warms that apartment and tempers the lodging rooms above, while the consumption of wood for cookery is the same as in summer.

rally from 65° to 72° or 73° of Fahr't. It is not difficult to raise the heat higher; but in winter weather, a regularly diffused temperature of 70° is perhaps high enough, both for health and comfort. The temperature is very nearly equal through the whole of the apartments warmed, and often for many hours scarcely varies a degree or two; at least this is true of the parts that are not warmed immediately by the radiation. In a room warmed by a common fire-place, it is not unusual for the temperature of 80° or 85° to exist immediately before the fire, and perhaps 40° or 45° or 50° in the remote parts of the room. It is a common error to suppose that an atmosphere, uniformly and comfortably warmed, exposes people to take cold. Experience does not confirm this impression, nor ought theory to induce such a conclusion. Colds arise much more frequently from the currents of a room very unequally warmed, or from the cold air in halls and passages, &c.; and there is no danger in going from the most comfortable temperature into the cold, if we adopt proper precautions, and especially if we continue active, while we are exposed. This evening, 9 o'clock, Jan. 31, 1826, the thermometer has gradually sunk from 0 to 5° below,* while the temperature of the parlour has been 71° for three hours—but there is no wind, and there is no fire on the hearth, the fire-board being shut as in summer. The adding of more fuel depresses the thermometer a little until the fire burns actively again.

There is some difference of opinion as to the comparative value of the Lehigh and Schuylkill coal. The value of both is very great, and although there are points of difference, a comparison will not be invidious. A correspondent under date of Jan. 1, 1826, writes thus, respecting the Lehigh coal. "The structure of the Lehigh coal is more dense and compact, and consequently as the heat is less rapidly absorbed, it does not ignite quite so readily, as the Schuylkill; it makes less ashes, enduring from 15 to 20 per cent. longer, and produces a more intense heat than can be produced by any other known fuel. It is, generally speaking, free from sulphur, a point of great importance to malsters, iron workers, &c. Some experiments have been made in *smelting* iron with it and charcoal mixed, but with various success. Some think the heat produced, is so great as to *burn up* a portion of the iron. No theory has yet been formed of any value, nor will there be perhaps for some time to come.

* At 11 o clock, P. M. it was 11° below 0.

A little practice will enable any one to make and control a fire in a good stove, but not so readily in a grate, unless the "draught is strong." I have a sheet iron stove, lined with fire brick, in which *the fire* is six inches in diameter, and I can keep in it a bright and beautiful fire of coal but two inches deep. There are few grates, where a handsome fire can be kept with less than six inches of coals, although in some instances, three inches will answer. I believe the most economical application of the coal, is beyond question, in lined sheet iron stoves.

As to future supplies of this coal, there is no doubt they will be abundant, as the Lehigh Coal Company can easily furnish 100,000 tons per annum from their territory, since it is not mined but quarried in an open basin, where almost any number of men may be employed—so that they are limited only by the capacity of the Lehigh river to float it down to the Delaware.

The price in New York, will not probably vary within two years, or until the completion of one of the New Jersey canals from the Delaware to the Hudson or Raritan river, when the price will be $7 or less in New York.

Another correspondent, whose letter is dated Dec. 30th, 1825, remarks, "It appears to be the settled opinion, both in New York and in Philadelphia, that the Scuylkill coal has a decided preference, and particularly so for parlour grates and domestic uses. It is lighter, purer, more easily ignited, gives more flame, and burns freely with less draught. The ashes are of a brown colour, and more ponderous than the Lehigh; and consequently less annoying to the lungs and furniture, &c. and what may be considered, perhaps, of primary importance, is the fact, (resulting from those peculiar properties before named,) that you can regulate the *quantity* and *degree* of your fire, according to the temperature of the weather, as completely as with Liverpool coal, or any other fuel. The Schuylkill coal is a *new article* in New York. In the fall of 1824, the Schuylkill Company brought on about 500 tons, which was widely dispersed, by way of experiment. This season, nearly 3000 tons have been received, and there has not been any occasion to put a bushel into the yards, orders having constantly anticipated the supplies, and that too at an advanced price. The opinions of *manufacturers*, such as iron founders, brewers, soap boilers, hatters, &c. &c. in so far as *experience* and *comparison* have been made, are decidedly in favour of the Schuylkill coal. Some, however, say that the Lehigh is the most *durable*—and this is doubtless true, under some circumstances—viz. If the same *volume* of Schuylkill coal (which is probably about 8 per cent. *lighter than Lehigh*) should be submitted to the same powerful draught, or blast, as the Lehigh, it would consume faster—but I be-lieve an equal *weight*, and with a properly graduated draught, to produce the *best combustion*, that the Schuylkill coal will be found a *little superior* to any other of the *Anthracite coals yet discovered.*

The grates for the Schuylkill coal are of various construction, but generally with *vertical bars*, although many persons burn the Schuylkill coal in the old Liverpool grates, with some slight alterations in the draught. The best *kindling* is *charcoal*, and a little light wood to give it a quick blast, and with the aid of a *sheet iron blower*, I have my grate well ignited in *eight to ten minutes.*

As to future supplies from the mines, there is but *one limiting cause*—and that is the *capacity* of the *canal* to float it to Philadelphia. It is intended to bring 25,000 tons next year, which will be equal to 100 tons per day, for eight months. It is expected that ultimately, four times that quantity will be brought to market annually."

It is stated that 8,800 tons of the Lehigh coal had been received in New York during the present season up to January 1, and that 6,000 tons had been sold in New York, besides what is allotted to other markets. The ton is twenty eight bushels.

It is not necessary for me to decide between the claims of the two principal varieties of the anthracites of Pennsylvania, as they exist in the markets of New York and Philadelphia. They are both so valuable, that there need be no competition between them, and the anthracite of Wilkesbarre is, I presume, not inferior to either, although at present it does not find its way to the eastern Atlantic cities.

It appears to me that the Schuylkill coal kindles more readily than the Lehigh, and *begins* to warm the apartment sooner, but with the same draught of air, it does not endure so long. I see no great difference in the degree of heat which is *finally* produced, and by checking the draght after ignition is thoroughly established, it may be made to last nearly as long as the Lehigh.

So far as my information extends, the anthracites of Pennsylvania are the most valuable fuel in the world, and if I am not deceived, they possess a character, with respect to flame, different from any other anthracites. They are also very pure, in quantity inexhaustible, and accessible in the easiest and least expensive manner.*

I am not able at present to say any thing of much importance, as to the Rhode Island anthracite. A quantity which had been promised to me for comparative experiment not having arrived, I have not been able to compare it with the Pennsylvanian anthracite, except as regards the gas. I hope to make these trials before the season is through, and cannot doubt that the Rhode Island coal will prove an important addition to our national resources, especially with the aid of the practical knowledge which has now been so extensively obtained, with respect to the use of the anthracites.

In the domestic use of the anthracite, for warming, where only one room of moderate size is to be heated, there are peculiar advantages in using a parlour grate, but there is no doubt that the most comfortable method of diffusing heat through two or more apartments is by placing a close stove or furnace in an entry-hall or recess, or in some small apartment, which may be given up, to be used as a stove room, and with which other rooms are made to communicate by doors. It is not necessary, as some suppose, that a tube should pass into a room which is to be warmed; this will indeed increase the effect by means of radiation, but the circulation of the air is quite sufficient without radiation,† and no one wishes to see an iron tube pass through a handsome apartment. In future, those who construct houses, in situations where the anthracite can be economically obtained, will do well to have reference to warming their apartments from a central situation. It is, however, necessary that the communication from below with the chambers should be so arranged, that it can be opened and shut at pleasure. If it cannot be closed, the lower rooms are occasionally chilled by the descent of the cold air from the apartments above, and the latter are occasionally too much heated from below; but a door, like a valve in mechanics, enables us to preserve the equilibrium, and by shutting doors leading to other rooms, any one apartment connected with the source of heat, may be immediately heated for use, and others in succession, as they are needed. In houses having a hall through the middle, it is necessary

* See Mr. Maclure's remarks on this topic, page 205 of this volume.

† Direct radiation, except in a very large room, would prove inconveniently powerful unless the stove were very small.

to divide the hall by a partition with a door, and it is easy, with a moderate expense, to render this arrangement ornamental as well as useful, the upper half of the door, and perhaps the parts above and on the sides, being glazed.

In most houses, it is, however, not difficult to find a situation where an anthracite furnace can be conveniently placed, with the aid of bricks and plate tin—viz. tinned iron; a very small space will answer, as it is easy thus to protect the wood that may be contiguous. The tube to convey away the gases may pass into any convenient flue, only it must be one devoted to this purpose, as two draughts cannot usually be maintained in one flue, and the interference would be particularly inconvenient, in this case, as a strong current is necessary to maintain the combustion of the fuel. The principal advantages of the anthracite as a fuel for houses, are as follows:

1. *It is, in most of our cities and maritime regions, cheaper than any other fuel:* this is believed to be true even at this time, and when the facilities of mining and transportation are increased, the expense must be much diminished.

2. *It is the safest fire known.*

In furnaces or close stoves, properly placed and secured, it is entirely without danger, and may be left in full action, through the night. In grates, there is very little danger, and none if they are prudently managed.

3. *There is no smoke, and of course, the tubes and chimneys do not become foul:* they need neither sweeping nor burning; and provided no other fuel be used, they cannot be made to burn, as there is nothing deposited but a little earthy or metallic ashes, entirely incombustible.

4. *The heat produced, is the most intense that can in any way be used for economical purposes.*

5. *The heat is also the most enduring and equable.*

6. *It is capable of being adapted to the mildest as well as the severest weather.* This remark is especially true of the entry or hall stove, in which three or four inches of coal in depth can be kept in active combustion, and by opening and shutting doors, the heat, at pleasure more or less diffused, or diluted with colder air.

7. *The fire will, without attention, burn through the whole night*—thus maintaining the rooms at a temperature comfortable for those who may be obliged to rise at unseasonable hours, and convenient for early breakfast.

8. *The heat is maintained with less trouble than in any other way.* Less frequent replenishing and less watching are necessary, and there is less annoyance from dirt and effluvia, than in the case of any other fuel.

In the case of the entry stove, the whole bustle and inconvenience of the fire are removed from the apartments, which may thus be kept as neatly as in summer, as there is no serious annoyance to the most delicate drapery, clothes, or furniture.

9. *The halls and passages of the house may thus be kept permanently warm.* The cold of these spaces is unpleasant to the healthy, and very injurious to the infirm, whose comfort and safety are therefore in this manner essentially consulted.

10. *As this fuel will not burn without a strong draught, there is no annoyance from foul gases*, which are necessarily carried up the chimney. It is not true however, as some imagine, that these gases are less injurious than those from burning charcoal. They are equally noxious, and the very same deadly gas which is produced by burning charcoal, (the carbonic acid gas,) is generated in equal abundance by the anthracite.

11. *These anthracites are among the purest of all varieties of fuel.*

According to Professor Vanuxem's analysis, the anthracite of Lehigh and that of Rhode Island* contains ninety per cent. of carbon, there being, strictly, but from three to five per cent. of incombustible matter—the rest being water.†

It is not the object of the preceding remarks to depreciate the bituminous coals; they are of great value, and they certainly afford a heat *more at command* than the anthracites.

Many will continue to prefer them for parlour grates, and from the abundant, bright, and hot flame, which they afford, there are some processes in the arts to which they are more peculiarly applicable. The territory of the United States is richly furnished with bituminous coal, and although most of it is west of the Alleghany mountains, our rivers and canals,

* Dr. William Meade many years ago stated nearly the same result with respect to the Rhode Island coal. See Bruce's Min. Jour.

† I do not question the existence of combined water in coal, but if the above experiments are correct, there is probably in the anthracites, a considerable quantity of hydrogen besides what may proceed from the decomposition of water, by the ignited carbon. This accords also with Dr. Thompson's opinion as to the bituminous coals.

aided by the all-conquering power of steam, will soon diffuse it over every portion of our territory, where it can be usefully and economically employed. Those persons who prefer the bituminous coal for parlour grates, will find it useful to add charcoal to the coak or cinder as it is commonly called; viz. the dead mass which remains after the bitumen and gas are burned off. The charcoal will reignite this residuum, which is really the purer carbonaceous portion of the bituminous coal; approaching more nearly than before, to the usual condition of the anthracite; and a very serious addition will be thus made to the heat of the apartment and to the economy of the fuel.

It will probably be found useful to burn, occasionally, the bituminous coal in the parlour grates along with the anthracites, thus combining the activity and quickness of the former with the durability and intenseness of the latter. Those who rely upon the anthracite alone will probably find it useful to furnish themselves with both the Lehigh and Schuylkill coal. I have found them, when mixed, to burn in a very desirable manner, but I have tried them in the hall furnace only, and not in the parlour grate. Our cities are however now becoming very well informed in regard to the use of the anthracites, which are coming more and more into use, especially in New York and Philadelphia.

The extension of the use of our mineral fuel as a substitute foro ur forest-trees, (which are destroyed with thoughtless prodigality) being one of great national interest, I shall finish this miscellaneous notice by citing some facts relative to the use of the Lehigh coal in the arts. The citations will be made from a pamphlet, which although compiled to promote the sale of the fuel, contains many valuable documents from respectable mechanics and heads of manufacturing establishments. The pamphlet contains some remarks and attestations in common with that from which quotations were made in Vol. IV. of this Journal; these will be omitted, and such only introduced as appear to be in addition to those before published.

It will be observed that all these documents relate to the Lehigh coal; we have seen no printed statements, of this kind, relative to the Schuylkill coal, although we must presume that they could readily be obtained. We cannot however but regard the slight distinctions which are pointed out in relation to the qualities of the Pennsylvania anthracites as on the whole very unimportant. This anthracite is evidently substantially the same thing at Mount Carbon, Mauch Chunk, or at Wilkesbarre.

"We have used the Lehigh coal in our cupola, and after an experience of two years, we find that by using one bushel of Lehigh coal to five bushels of charcoal, we can melt double the quantity of iron in the same time—for instance, where we formerly melted twenty-five hundred weight of iron in our cupola, starting at 10 o'clock, A. M. and ending at 6 P. M. we, by using Lehigh coal mixed with charcoal as aforesaid, now melt fifty hundred weight. By using charcoal exclusively we formerly considered castings over ten hundred precarious to run by cupola, we now by using Lehigh coal can run castings over twenty hundred without danger. We discover Lehigh coal does not harden the iron, but it comes out gray."

City Foundry, Phila. May 26, 1824. CAD. & O. EVANS.

"This certifies that having used the Lehigh coal for some time past, and fairly tested its qualities, we do not hesitate to state, that it is, for use in a Cupola Furnace, entitled to a decided preference over any kind of fuel we are acquainted with, as it regards economy, and that the iron is not injured, but, on the contrary, rather improved in quality."

(Signed) ROBERT M'QUEEN, and others.

"I have used Lehigh coal for melting copper and brass, for the last two years, and give it the preference to any other fuel.

"I consider common pine coal a nuisance in a brass founder's shop for melting metal."

CHARLES GREEN,
Philada. May 14*th*, 1824. Brass Founder, No. 54, New-street.

"We, James and Joseph Whitaker, proprietors of the Delaware rolling mills, have used Lehigh coal for rolling our iron for nearly three years, and find it so much superior to all other species of fuel which we have ever used, that we would, now that our workmen are accustomed to and prefer it, rather pay thirty cents per bushel for it, than get Richmond or Liverpool coal for nothing."

Philada. May 24*th*, 1824. J. & J. WHITAKER.

"We are of opinion that Lehigh coal is much to be preferred to wood, as fuel for drying malt, being more economical, requiring less room for storage, and less attention whilst burning, from its steady heat and great durability. The danger of accidents from fire is so much diminished by the use of this coal, that *it* alone would be sufficient to give it a decided preference."

DAWSON & MORRISON.

"We are of opinion that the Lehigh coal is much to be preferred to wood as fuel for drying malt, being more economical, requiring less room for storage, and less attention whilst burning, for its steadiness and great durability. The danger of accidents from fire is so much diminished by the use of this coal, that *it* alone would be sufficient to give it decided preference; in short, we have never used any species of fuel combining the same, or as many, advantages."

New York, Sept. 26, 1825. (Signed) PETER SKINNER, and others.

"From considerable experience I have found the anthracite from Lehigh much superior either to the Rhode Island or Kilkenny, (Ireland.)"

Philada. 5*th Mo.* 8*th,* 1824. WILLIAM MORRISON.

"The subscribers have used Lehigh coal for melting copper and brass, for some time past, and do not hesitate to state, that we consider it for this purpose, superior to any fuel we are acquainted with."

(Signed) JOAN AYRES, and others.

"For melting brass the Lehigh coal is preferable to any other; for one ton of Lehigh will do as much work as two hundred bushels of charcoal for melting, beside is not half the labour in attending the furnace; and likewise for soldering our work. One person can do more than double the work with the Lehigh than they could with charcoal on the forge, and I find a great advantage in using it at the rolling mill, for heating the oven in which we neal the brass for rolling, for two fires will serve for the whole day.

"I therefore think it is the cheapest by one half."

May 8*th,* 1824. J. BARNHURST.

"Having a mill for rolling and slitting of iron, we have for many years been in the habit of using the Virginia coal for heating the iron, until about six months ago we were induced to try the Lehigh coal, and find it so much superior to any other, that we now use it exclusively, and we believe there is a saving in the expense of about fifty per cent. in favour of the Lehigh at the present prices of each, as we can perform the same business with two tons of the latter that we could with eighty-five bushels of Virginia.

" Our workmen also prefer the Lehigh as they have much less trouble in keeping their fire with it than any other that we have used."

JAMES & MAXWELL ROWLAND.

Philada. 5*th Mo.* 22*d*, 1824.

" We have made experiments in all the different kinds of coal sold in the New York market, and find the Lehigh better for our use than any other. It does not ignite as quick as the Schuylkill, but lasts much longer; and Mr. Hitchcock, the master blacksmith, thinks it the best coal he ever worked."

I am respectfully, your obedient servant,

(Signed) ELAM LYNDS,

Agent for building N. Y. State Prison.

Mount Pleasant, N. Y. October 2, 1825.

" This is to certify, that I have had used at one of my blacksmith forges, for some time past, the Lehigh coal, and (am about adopting it in all of them) find that one bushel of it will last longer than two of Virginia or Liverpool, it being much cleaner, and the smith likes it better, and can safely say that I have had a larger day's work done with that coal than I have had with any other for ten years."

JONAS GLEASON.

" N. B. I find you must alter your bellows tue-iron by making it about twice as large as is common, and begin your fire with a little charcoal or wood at the bottom, and not let any dead coal get to the tue-iron and you have no difficulty, and when you leave your fire, put in a small piece of wood or charcoal, to keep it while at dinner, &c.—A little instruction is necessary to a new beginner, or he is apt to get too soon prejudiced." J. G.

Philada. May 7*th*, 1824.

" I hereby certify that I have, for twenty years past, been accustomed to the use of anthracite coal, from nearly all the coal formations of that description in this country, and feel fully warranted in saying, that, for the purposes of parlour grates, forges, air furnaces, distilleries, and breweries, it is decidedly superior to any coal I have ever used. in point of durability and its capacity to produce clean, sharp work. It contains less sulphur and slate than the Susquehannah or the Lackawana, but whether less than the Schuylkill I cannot state, except from report, having never used it.

"I am satisfied that more work can be done with it, in a given space of time, than with any other coal I am acquainted with."

New York, July 15, 1825. (Signed) WM. BARKER.

"I, Thomas Barnhurst, brass founder, &c. of Philadelphia, certify, that I have been in the use of the Lehigh coal for several years, for brazing and melting brass and copper; and my experience authorizes me to say, that in brazing or soldering, my hands can do in a given time, with one half the expense, three times as much work as they can with any other kind of coal that I have ever used. And for melting any kind of metal, one fire will answer the place of eight fires of charcoal, at no greater expense than each fire of charcoal;—that taking into view the great saving of expense of fuel, and the very great additional quantity of work my hands can do with Lehigh coal more than any other kind, I think it invaluable either for melting or brazing."

Philadelphia, May 10*th*, 1824. THOS. BARNHURST.

"I Samuel Heston, of Bucks county, have followed the business of a blacksmith for thirty years, and until the year 1819 was in the habit of using charcoal and Richmond coal. Durthe war I obtained a parcel of Lehigh coal for trial, but could do nothing with it and considered it a worthless article. In the year 1819, I made a visit to Mauch Chunk and there had an opportunity of seeing this coal properly used. I brought some of it back with me in my wagon, and have been in the use of it ever since, hauling it from Philadelphia a distance of 28 miles, rather than purchase charcoal in my neighbourhood. I can do more work with one bushel of the coal than any man can do with three bushels of Richmond coal or six bushels of charcoal. In short, I consider the discovery of Lehigh coal one of the most important ever made in this country, and should hardly be tempted now to use any other if it were given me for nothing. When I went up to Mauch Chunk for curiosity, I had sold out all my stock, intending to move to the state of Ohio, and nothing but the prospect of being able to carry on my business to great advantage by using this coal, induced me to alter my mind and remain. Fifty people in my neighbourhood know that I should have gone but for this accidental circumstance."

May 20th, 1824. SAMUEL HESTON.

"PENNSYLVANIA HOSPITAL, 10th mo. 14th, 1825.

"RESPECTED FRIEND,—Since I wrote to thee yesterday, I have had an interview with two of the managers, to whom I showed thy letter (asking information) relative to the use of Lehigh Coal in this institution; and although as a board of managers, they declined giving a statement, nevertheless, they have no objections, if applied to individually, to satisfy any person to the extent of their knowledge. I therefore feel a perfect willingness to answer thy queries.

1st. To what different purposes has this coal been applied? I answer, to warming the different chambers of this establishment to an extent of comfort that has not been experienced while confined to wood-fires, owing to the regular temperature of heat constantly kept up, and that in the most distant part from the fire in each apartment. To cooking in every shape, viz. in large and small boilers, in ovens for baking meats, pies, puddings, &c. in boiling any thing wanted over the kitchen fires, in pots, or kettles, and we confine the wash-house, and ironing-room entirely to the use of it.

2dly. Thou desirest to be informed what the saving has been when compared with wood. The amount of expense for wood and coal last year was $2125.59, and I have examined the disbursements for five years, viz. 1817–18–19–20, and 21, (previous to using this coal,) and find the average expense for each to be $3188.39. The ensuing winter, I have no doubt, will contribute very considerably to the economy of fuel, by making a proper allowance for the number of fires that will be in operation more than any previous year: there will be in all eighty-eight fires. From my knowledge of the advantages of using this coal in preference to wood or any other coal that I know, I cannot recommend it too warmly for general use, both in point of economy, comfort, and safety. I can also add that I never owned a share in the stock of the Lehigh Coal Company."

Respectfully thy friend,

(*Signed*) SAMUEL MASON, *Steward.*

"GREENWICH VILLAGE, 8th Oct. 1825.

"It has been our custom to use Virginia Coal for concentrating Sulphuric Acid ; but having determined to try Lehigh Coal, one of our furnaces was altered for that purpose by Jacob F. Walters. We find that 97 lbs. of Lehigh Coal will do as much work as two bushels of Virginia coal of good quality. And also that the operation which with Virginia coal requires sixteen hours, is completed in eleven hours with the Lehigh Coal. It may be used with advantage in most of the operations of Chymical manufacture."

(*Signed*) EDWD. BIRCH,
Foreman of the N. Y. Chymical Manufactory.

"Memorandum of an experiment made with Lehigh and Virginia Coal in the concentration of Sulphuric Acid (Oil of Vitriol) at the Laboratory of the Chymical Manufacturing Company at Greenwich village—

I certify that I made fires in two furnaces, one each of Lehigh and Virginia coal, at 40 minutes past 2 P. M.

At 7 minutes before 5 P. M. Lehigh furnace boiled—time required to boil being 2h. 13m.

At 15 minutes before 6 P. M. Virginia furnace boiled—time required to boil being 3h. 05m.

The process in the Lehigh furnace was *completed* at 12 o'clock, 9 hours and 20 minutes from the time of commencement, and the Virginia furnace was left *unfinished* at 5 o'clock the next morning, being 14 hours and 20 minutes from the commencement—the time required to bring the fluid to the boiling point, was owing to its great specific gravity, requiring 600 degrees of Fahrenheit, while water requires but 212.

The fuel required for the above experiment was as under.

Virginia Coal at $9 per chaldron—25 cents per bushel, 2 bushels and three-fourths - - -		70
Lehigh coal at $9 per ton—40 cents per hundred weight—97lbs. say - - - - -	40	
For coal not consumed, sufficient to have kept the retorts boiling 2 hours, deduct - - -	8	
		—32
		cents 38

Difference in favour of Lehigh coal being more than 50 per cent."

New York, Oct. 8, 1825. (*Signed*) JACOB F. WALTERS.

Art. XV.—*Topaz.*

LABORATORY OF YALE COLLEGE, Jan. 10th, 1826.
TO PROFESSOR SILLIMAN.

Sir,

To the interesting mineral from the town of Huntington in this State, which you recently put into our hands for examination, we have devoted as much time and attention as were in our power, availing ourselves of the instruments and re-agents, &c. of this Laboratory, and of your occasional advice and assistance. Had your duties permitted you to examine it yourself, its characters would no doubt have been more accurately and clearly exhibited, but such as we have found them, we present them for your disposal.

1. *Crystallization.*

This mineral occurs both massive and crystalline, always however distinctly foliated in one direction. The crystals are either four or eight-sided prisms. The largest crystals are four-sided, and the angles of the base oblique; but not to be measured with accuracy, on account of their imperfection. In no instance have we found a crystal sufficiently perfect to ascertain its terminations, though some of the terminating faces are visible. A fragment of an eight sided prism, was found by a common goniometer to measure as follows:

The two most acute angles, each	- -	92°
The two next less acute,	do. - -	125°
The four most obtuse,	do. - -	162°

The measures of the corresponding angles of an eight-sided prism of the *topaz*, as given by Cleaveland, 2d edition Mineraology, p. 292, are, 93° 6′—124° 22′—161° 16′; and when we consider that the specimen we measured was quite imperfect, so that it was scarcely possible, without a reflecting goniometer, to ascertain the angles nearer than one or two degrees, we can have little doubt, that the crystal described by Prof. Cleaveland, and that under consideration, are identical.

Several other crystals, partly imbedded in the gange, presented one or two angles of about 120°: and we presume that they are six-sided prisms, though we do not state this as certain.

2. *External Characters.*

The structure of this mineral is always distinctly foliated at right angles to the axis of the prism, and often the folia are quite brilliant; but more frequently little more so than feldspar. It cleaves also in some specimens, but with difficulty and indistinctly, in one or two other directions whose relative inclination we have not been able to determine. The fracture is uneven, glimmering, slightly conchoidal, and vitreous. Sometimes imperfect prisms are partially united together; not however in the decided and delicate manner of the pycnite; in other cases the mineral consists of a solid irregular mass several inches in diameter, exhibiting however when broken the foliated structure, parallel to the base of the prism, or prisms, which are frequently irregularly divided by seams filled with thin layers of mica. Crystallized mica usually invests the crystals, its prisms penetrating the mineral under consideration to a considerable depth. The sides of several of the specimens which we have examined are longitudinally striated. The colour of the best characterized specimens is honey yellow, sometimes limpid as quartz in small pieces and sometimes white. It is mostly only translucent, resembling light-coloured feldspar.

By mere friction it is not perceptibly electric; but on heating it, it becomes decidedly so, and on applying the different extremities of a crystal to a suspended magnetic needle, it was found to possess polarity. This needle was used merely as a convenient electrometer.

The specific gravity, as determined by six trials with different specimens, is as follows:

1st	trial	3.44
2d	"	3.47
3d	"	3.42
4th	"	3.47
5th	"	3.44
6th	"	3.46
	Mean	3.45

It scratches quartz, zircon, and emerald, slightly; but is scratched by the oriental sapphire, corundum, and crysoberyl, easily, and by the spinelle ruby.

It possesses the property of double refraction in an equal degree with the topaz, as was indicated by several fragments, the mineral being too opaque to exhibit it in the mass.

3. *Chemical Characters.*

Before Hare's compound blowpipe, this mineral melts with ebullition into a white enamel.

We put about 100 grains of it in powder, into a glass tumbler, and poured upon it a quantity of hot blue cabbage liquor. In four or five minutes, the liquor was changed to a lively green. On repeating the experiment with cold cabbage liquor, the change from blue to green was as decided; though it required one or two hours to effect it.

We put a portion of this mineral, in powder, into a platina crucible, and poured upon it a quantity of distilled sulphuric acid. On applying heat, the glass plate that covered the crucible was in a short time acted upon over the whole surface exposed to the ascending gas, indicating in the most decided manner, the existence of fluoric acid in this mineral. This experiment was several times repeated with the same result, particular care being taken that the mineral was pure, and that no portion of fluor was mingled with it.

To determine, with still greater certainty the nature of this mineral, we were desirous of ascertaining the principal elements that enter into its composition. To effect this object, we attempted the following analytical trials. We did not expect to obtain an accurate analysis; and therefore, did not pay that scrupulous attention to every part of the process which exact analysis requires. We are likewise aware, that some parts of the process are not so strictly scientific and direct as might have been pursued.

Yet as it is not in our power at present to repeat the following steps, we have put them down merely as a tentative process, in the belief that they may throw some light on the nature of this mineral.

A. Fifty grains of the mineral were reduced to an impalpable powder in a porphyry mortar, and subjected to a full red heat, in a covered platina crucible, for one hour. The mass became indurated, and lost 1.45 grain; which we conclude to be the water contained in it.

B. To the calcined mass (A) were added 300 grains of crystallized carbonate of soda, and the whole subjected to a high red heat, for one hour and a quarter. After cooling, distilled water was added and the temperature again raised to 212° Fahr.; and the boiling was continued for some time. The whole contents of the crucible were then thrown upon a filter, and an insoluble residue (No. I.) collected. The filtered solution having been necessarily left three or four days in a glass tumbler, the fluoric acid it contained, acted with considerable energy upon the glass at the surface of the liquid, decidedly corroding it and destroying its polish. On adding an excess of acetic acid to this solution, a copious white precipitate (No. 2.) was thrown down with strong effervescence. This being collected on a filter, washed, and calcined, weighed 13.2 grains. It was soluble in diluted sulphuric acid, and the solution being mixed with sulphate of potash, afforded, on evaporation, octaedral and other crystals of alum, characterized by the peculiar taste of that salt, and thus proving the precipitate to be alumine. The liquor that remained after this second filtration, having acetic acid in excess, was heated with carbonate of ammonia, for silex, bu it gave no precipitate. It was again treated with acetic acid in excess, boiled to expel the carbonic acid, and treated with muriate of lime, which occasioned a white precipitate (No. III.) whose weight after washing and calcination, was 11.8 grains. This was heated with sulphuric acid, and a glass laid over the crucible was deeply corroded; showing the precipitate to be fluate of lime. Taking the proportions of fluoric acid and lime in fluate of lime, as stated by Berzelius, to be as 100 to 258.9, we obtain 4.56 grains for the quantity of fluoric acid in 50 grs. of the mineral under examination. This is probably less than the true quantity, as some of the acid was lost by its action on the glass as above stated.

C. The insoluble residue (B. No. I.) was digested for some time in a silver crucible, with pure muriatic acid and thrown upon a filter. The filtered solution was saturated with carbonate of ammonia, which produced a precipitate (No. I.) whose weight, after calcination was 9.7 grains. The insoluble gelatinous residue (No. II.) remaining on the filter after the separation of the above solution, was digested with distilled water, filtered, dried, and found to weigh 14.8 grains, which from its being insoluble in acids and gritty between the teeth, we concluded to be silex. The liquor in which this residue was digested, and which was separated by the filter, was treated with carbonate of ammonia and a white precipitate obtained (No. III.) which being calcined, weighed 0.9 grain. This was entirely soluble in a mixture of diluted sulphuric acid and sulphate of potash, and crystals of alum resulted; showing it to be alumine.

D. The precipitate (C. No. I. 9.7 grs.) was observed to be but partially soluble in sulphuric acid mixed with sulphate of potash; and although alum was formed, yet an insoluble residuum always remained. Hence we suspected, either that the silex and alumine were not well separated by the fusion of the mineral with carbonate of soda, or that the muriatic acid as it sometimes does, had taken up some of the silex in solution. Circumstances beyond our control prevented our treating the mineral, as would have been proper, with borax. We therefore digested this precipitate (C. No. I.) repeatedly in sulphuric acid mixed with sulphate of potash, to separate the alumine and form alum. After several trials of this kind, the insoluble residue was dried and weighed, and found to have lost 6.3 grs. (No. I.) The remainder, 3.4 grs. (No. II.) appeared to be silex. This result led us to suspect that the siliceous residue (C. No. II.) might contain a small proportion of alumine. We accordingly subjected it to the same process as the precipitate (C. No. I.) just described. Alum was formed and there was a loss of 3.33 grs. (No. III.) which was shown to be alumine. The remainder 11.47 grains, (No. 4.) was doubtless silex.

E. The liquor that remained after the separation of B. No. 3. was tested with an infusion of galls, and gave decided indications of the presence of iron. No attempt was made to ascertain the proportion of this ingredient; and indeed, we are not quite sure, but that the muriate of lime used might have contained a small quantity of iron.

F. From the dark stain that appeared on the platina crucible, in which the mineral was heated with carbonate of soda, a suspicion was excited, that lithia might be present. We made an attempt to decompose a small bit of the mineral with pure soda, by means of the common blowpipe, on platina foil; and we likewise began the like comparative trials with spodumene from Sweden and Massachusetts; a dark stain in most instances appeared upon the foil around the alkali, (which stain could not be removed without washing and thoroughly heating the foil,) not as deep however, in the case of the mineral under consideration, as with the spodumene. But the trial we made was not thorough; yet as we have not had leisure to pursue it farther, we merely make the suggestion that this mineral may contain lithia; and if so, it will account for the remarkable change from blue to green, which its powder produces upon vegetable infusions. The following are the collected results of the above imperfect trials. Fifty grains contain

Water, - - - - - - - -	1.45
Alumine (B. No. II. = 13.2 gr.) + (D No. I. = 6.3 grs.) + (C. No. III. = 0.9 gr.) + (D. No. III = 3.33 grs.)	23.73
Silex (D. No. II. = 3.4 gr.) + (D. No. IV. = 11.47 grs.)	14.87
Fluoric Acid (B. No. III.) - - - -	4.56
Iron? Lithia? and loss, - - - -	5.39
	50.00

After this examination we cannot hesitate to pronounce this mineral to be the *topaz*; agreeably to your opinion expressed upon first inspecting it. If this opinion be correct, it adds another interesting mineral to the list of American localities, since, as we believe, no certain locality of the topaz has been announced in this country. The enormous size of some of the crystals hitherto found does indeed detract from their delicacy and beauty, so that in these respects they will not compare with the topazes of the eastern continent. But we doubt not, finer crystals will ere long be disclosed. At any rate, it is certainly a very curious fact, that several of the rare minerals of Europe, should occur in this country on a large scale, and in great abundance. For example, the beryls of Haddam, the spodumene and siliceous oxide of manganese of Massachusetts, the spinelle of New York, and very especially the mineral which is the subject of this article. A crystal of the topaz, found in Aberdeenshire, which is supposed to be the largest ever seen heretofore, weighs but little more than seven ounces Troy, and the largest fragment but one pound; while two crystals aggregated in our possession, weigh, allowing for portions detached for examination, two and a half pounds, (much the greater bulk, however, is occupied by one of the crystals, which by calculation must weigh about one pound and three quarters.) and a fragment two pounds and one ounce.

It ought not to be forgotten, that in Europe, the topaz is frequently associated with *tin*. Perhaps this important metal is yet to be added to the numerous ores found in Huntington, since the geological features of this region are those with which *tin* is usually found, and most of the minerals which accompany this metal in its known localities, exist here in very considerable abundance; such as arsenical iron, the ores of tungsten, quartz, topaz, hornblende, mica, and the fluate of lime.

4. *Geological Situation.**

We have not visited the locality of this mineral, but it occurs in a magnificent vein of fluor spar, consisting principally of that variety called the chlorophane. It is in Monroe, next to the town of Huntington, 20 miles west of New Haven; the vein of fluor spar traverses granular limestone in gneiss. Of this vein you have given a description in the second Vol. of the American Journal of Science, page 142. Some specimens in our possession exhibit the fluor spar on one side, and this mineral on the other. Quartz, and a fibrous, talcose mineral, which we have not thoroughly examined, are also intimately associated with it.

Very respectfully, your obedient servants,

EDWARD HITCHCOCK,
Professor of Chemistry, &c. in Amherst College, Mass.
BENJAMIN D. SILLIMAN,
Assistant in the Chemical and Mineralogical department of Yale College.

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* The notice of the vein referred to by the writers of the above article was drawn up several years ago from facts stated verbally by Mr. Lane. I have since visited the place, and find his description correct. The veins of fluor spar are equalled for magnitude only by those of Derbyshire, in England, which I formerly explored and can therefore from personal knowledge compare them. When they shall be opened and wrought, it is probable that the massive fluor fitted for ornamental work to be turned on the lathe, will be obtained, and perhaps vases of American fluor may be fabricated. However this may be, every thing on the surface, announces that interesting minerals will be obtained beneath; we already find beryl and topaz, among the imbedded minerals of this vein, and the whole appearance of this region indicates a great mineral and probably metallic deposit. The locality of the fluor is four miles south of at is usually called Lane's mine, but it belongs to the same formation in every sense, both mineralogical and geological.—Editor.

Art. XVI.—*Notice of certain processes in the Arts.* Communicated to the Editor in a letter from an American gentleman, dated Glasgow, Nov. 25, 1825.

Singeing of Cotton Stuffs by the gas flame.

The manufactories here are generally closed against strangers; but I have obtained access to two of them, which are highly interesting. I believe the process of singeing muslins by means of the gas flame has been described in our publications. Within a year past it has been brought to a great degree of perfection here. The process by which these fine textures were passed over red hot cylinders uninjured, was sufficiently astonishing; but one is ready to doubt the evidence of the senses, when he sees a web which is so delicate as to be transparent, subjected to the direct operation of flame, two or three times in successi m, and with no change but an improvement in beauty.

The machine on which the operation is performed, consists of an upright frame, sustaining two large rollers, one on each side at the bottom, and two pairs of rollers like those of a rolling-mill immediately above these, at the top. Between the upper rollers, the gas pipe passes the whole length of the frame, thickly set with openings serving as burners, so that there appear to be from 50 to 100 in the space equivalent to the breadth of the cloth. In performing the operation, the muslin is placed upon the lower roller on one side. The web is then passed between the pair above, which serve to keep it smooth and prevent irregularity of motion over the gas burners to the opposite pair of rollers, and is attached to the lower roller on the opposite side. It is then drawn over the flame by the motion of the roller, originating in a steam-engine and communicated by drums and bands in the usual manner. It was not found sufficient merely to pass the muslin over the flame, and therefore another contrivance was added, of great ingenuity, which renders the operation more surprising. A pipe passes above the cloth in the same direction as the gas pipe, with longitudinal slits and openings to a main pipe above, corresponding nearly to the gas-burners. This is connected with the receiver of a large air-pump, which is kept in motion by the steam-engine. A partial vacuum is thus maintained at the openings of these tubes, and the flame from the gas-burners is drawn forcibly upwards, so that it passes directly through the meshes of the muslin, and is seen as distinctly above the web as below. This contrivance also serves to convey off the smoke produced by the burning fibres of the cotton, and which was formerly very disagreeable, and even distressing. The finest muslins are passed through this machine twice, once for each side, and the coarser four times. They rarely take fire, although the motion is by no means rapid and the improvement in the smoothness and texture, is obvious to the most inexperienced eye. In passing over the flame it is sustained by bands of fine twine at the distance of an inch from each other, and it is surprising to observe that after passing for months in succession over the flame, they experience no change butthe accumulation of tar from the gas.

Bleaching Powder, Sulphuric Acid, Alkalies, &c.

I was much interested in the manufactory of Mr. Charles Tennant, near this town, whose personal liberality and intelligence are not less gratifying than the results of his ingenuity. The original object was the manufacture of the bleaching powder now so extensively used; but he has combined several others with it, in a manner which materially contributes to the success and profit of the whole. The buildings of the establishment cover a space of five or six acres. One large section is devoted to the manufacture of sulphuric acid. The nitre, instead of being combined with the sulphur in this operation is placed in a separate portion of the furnace, and its gas is evolved by the heat of the burning sulphur. There are thirty furnaces and an equal number of leaden chambers, seventy feet in length, twenty in breadth, and sixteen in height, for the condensation of the acid, which appear as if they were competent for lodging the inhabitants of a village. A large part of this acid is employed in the production of chlorine for the use of the manufactory, and is therefore condensed only to the degree necessary for this process. The remainder is rectified by distillation in platina retorts. There are nine of these vessels holding fifty gallons each, and weighing 500 or 600 ounces. Their value cannot be estimated at less than $2500 each, or $22,500 for the whole, and yet it is believed to be more economical than to employ the perishable vessels of lead. Mr. Tennant informed me that they appear to suffer no diminution or decay, but are liable to bend and break from the intensity and continuance of the heat. The whole produce of sulphuric acid is about 12,000 gallons weekly.

The next process in order is the formation of the chlorate of lime. There are 15 or 20 leaden retorts for the evolution of the chlorine, about 5 feet in diameter, and weighing nearly three tons each. They are heated by steam, and the usual materials are employed for the production of the gas. Within two years, the inconvenient apparatus formerly employed for the impregnation of the lime, has been greatly improved by the ingenuity of Mr. Tennant. The gas from the retorts, is passed into six chambers of hewn stone, about 30 feet long, 20 wide, and 6 high, which are covered with wood and rendered impervious to the gas by a resinous varnish. The lime is placed in shallow boxes at the bottom of these chambers. It is agitated during the process by iron rakes, inserted through a box filled with lime which serves as a valve. The impregnation is generally completed in two days, when the supply is renewed by means of wooden doors which are luted in. So accurately is every part of the apparatus fitted, that in the building containing these immense volumes of imprisoned gas, there was no disagreeable vapour, and the gas was not so perceptible as it usually is in a laboratory where a small quantity is forming for mere experiment. The powder, when completely formed, even in large quantities, has no perceptible odour, and thus shows the accurate manner in which the process is conducted.

The remainder of the establishment is employed in turning the residue of these processes to account. The sulphates of soda and potash are converted into the alkaline state by two successive burnings, in union with bituminous coal, and three lixiviations and evaporations. About eighteen tons of subcarbonate of soda in its purified state are produced weekly. By two successive crystallizations it is formed into large rhomboidal tabular crystals, and surpasses in beauty any specimens of the article I have ever seen produced in the large way. A part of the alkali is taken at an intermediate state, and employed in the last section of the manufactory, in the making of soap. It furnishes the chief supply of this article for this city and the surrounding country. Some idea may be formed of the extent of this establishment from the fact that it requires a daily supply of 60 tons of coal and 20 tons of lime, and the completeness of the parts is quite as surprising as the magnitude of the whole. It is only doing justice to the proprietor to state that it is the result of individual enterprise and ingenuity, operating at first on a small scale.

Lithography.

I have been much interested also in visiting a lithographic establishment here, which furnishes much encouragement to our countrymen to attempt the imitation of European arts, although they may have only descriptions to guide them. The proprietor has never visited any other lithographic presses; but employing his own ingenuity in adopting and improving the methods described by the foreign lithographers, he has brought the process to a degree of perfection which renders it perfectly adequate to the production of fine drawings and excellent fac similes, and all the purposes to which it has been applied on the continent.

Art. XVII.—*Illuminating Gas from Cotton Seed.*

In the eighth volume of this Journal, we published some experiments of Professor Olmsted on an illuminating gas, which he had obtained from Cotton Seed. The superior quality of the gas, the facility with which it is obtained from the seed, and the exhaustless abundance of the material in the southern states, suggested the probability that this article, which as is said constitutes by weight nearly three-fourths of the entire cotton crop, and which as we are assured, is now, in most of the cotton districts, neglected as useless, might be found an eligible substance for gas-lights, especially in the United States.

Not having repeated the experiments of Professor Olmsted, and understanding that a very inferior gas had been obtained by managing the decomposition in a manner different from that directed in the original memoir, we requested Professor Olmsted to repeat the experiment in the laboratory of Yale College. The result was entirely satisfactory—the gas was easily and abundantly obtained, and afforded a degree of illumination quite equal to that of the oil gas, (of which it is indeed only a variety,) and superior to most varieties of the bituminous coals. It was inferior to the pure olefiant gas and this is the fact with the inflammable gases obtained from perhaps every substance except alcohol decomposed by sulphuric acid. The kernel of the hickory-nut comes the nearest to the olefiant and is but little inferior ; the quality of the gas is considerably debased by using the entire nut—the woody covering of which affords a gas which burns with a paler flame.

It is very easy to injure the gas of cotton seed by a careless management of the heat, particularly by using too much heat, but this is true, probably, of all other substances which afford inflammable gases ; in general the lower the heat, provided it be sufficient, the better the gas.

The following remarks were furnished by Professor Olmsted at our request.—Editor.

" Cotton seed is highly oleaginous, and the object in my arrangements for obtaining the gas, is to bring the oily vapour, (which is expelled by a very gentle heat) into contact with a surface of ignited iron, by which it is decomposed into carburetted hydrogen gas. For this purpose, a heat not exceeding the *lowest degree of redness*, is all that is necessary. If it be carried higher, a lighter kind of gas is produced, which is greatly inferior to the other in illuminating power. A furnace of brick work, or even a common culinary fire, will afford therefore the requisite degree of heat. My method of proceeding has been as follows :

" 1. An ounce of cotton seed is dried on the fire in a ladle, and a red hot iron is introduced to singe off the small remnant of cotton that adheres to the seed. It is dried, because the moisture, by its decomposition, would produce an inflammable gas, not sufficiently luminous for our purpose, and it is singed for a similar reason, the gas produced by the cotton being inferior to that of the seed.

" 2. Thus prepared, the seed is introduced into an iron tube closed at one end like a gun-barrel, and is pushed down quite to the bottom of the tube by a ramrod.

" 3. The tube is next laid across a furnace (a common fire would answer) in such a manner, that the closed end of the tube containing the seed, projects out of the furnace so far, that the seed may be removed entirely from the direct action of the fire. A conducting tube is connected with the open end, to convey the gas into a receiver standing over water. Simply passing the gas through water purifies it sufficiently for use.

"4. A very moderate fire is applied, sufficient barely to keep the part of the tube exposed to its direct action at a perceptible degree of redness. The heat being thus slowly communicated to the seed, converts successive portions of its oil into vapour, which traversing the ignited parts of the tube, is decomposed into carburetted hydrogen gas. The first portions may be burnt at the mouth of the conducting tube, until the gas becomes as luminous as a candle, after which it may be collected for use.

"5. When the gas begins to come over less freely, the tube may be drawn forward, by little and little, into the furnace. Near the close of the operation, the gas becomes again less luminous, and it may be burnt off at the mouth of the tube as at first.

"If the furnace be of sufficient dimensions to permit a considerable space of the tube to remain ignited, the oily vapour will be all decomposed; but if the ignited space be small, a portion of vapour will make its way into the receiver undecomposed. A spiral or recurved tube for a small furnace, or a long iron tube for a broader fire, would effect the decomposition very perfectly.

"An ounce of seed, according to this process, yields 1018 cubic inches of gas, neglecting the first and last portions as before specified. Consequently, a pound of seed yields 16,288 cubic inches, or more than a hogshead of the gas.

"According to the former estimate, the quantity of seed annually produced in the United States, above what is required for replanting, would afford 2,827,500,000 cubic feet of illuminating gas, but little if at all inferior to that produced directly from oil. During the last year the culture of the cotton crop was greatly extended, perhaps doubled, and the quantity of seed proportionally augmented.

"It was suggested by a correspondent of South Carolina in a late number of this Journal, that the seed was more valuable than what I had represented it;—that it was a rich manure, and often sold very high for planting. It might doubtless be profitably applied as a manure, especially, in the way of a compost, where its volatile principles might be arrested, and its powers rendered more permanent; but the fact is, that in many parts of the cotton districts, no use at all is actually made of it, and the high price which it occasionally bears when re planting becomes necessary, is owing to the prodigality with which it is thrown out, and exposed to the weather, on the supposition, that there never can be any scarcity of a substance, which is accumulated in such quantities around the cotton-gins. The writer was assured by Henry Donaldson, Esq. the proprietor of an extensive establishment for cleaning and spinning cotton at the Great Falls of Tar river, in North Carolina, that boat loads of seed could be obtained there at five cents per bushel. I had also held some communication with this gentleman on the subject of lighting his works with cotton seed-gas; but my removal from the country, and devotion to other objects, have prevented. Should this article be found as eligible for gas-lighting as it appears to the writer to be, its employment for such a purpose will prove a public benefit, both by giving an increased value to this part of the cotton crop, and by diminishing the expense, and promoting the beauty and splendour of gas illumination.

"D. O."

Art. XVIII.—*Laboratory occurrences.*—Editor.

1. *Spontaneous combustion of Chlorine and Olefiant gas.* It has long been known that chlorine and hydrogen in mixture are liable to explode, when struck by the direct rays of the sun, and an instance is related in this Journal, (vol. III. pa. 341,) in which these two gases exploded, even in the diffuse light of a cloudy and snowy day. I have not met with any account of a similar action on the part of chlorine and olefiant or heavy carburetted hydrogen. It is well known that when mingled, in about equal volumes, they combine quietly, and become condensed into the peculiar aromatic, oily looking substance, since called chloric ether. This effect I had so often witnessed, and had never seen any material variation in the result, that I was not prepared to look for any thing else. But in an experiment of this kind, (January 5, 1826,) happening to mingle the chlorine with the olefiant gas in such a manner, that the latter gas was uppermost, the combination went on more slowly than when the reverse order was observed; and the oily matter was gradually pre-

cipitated, but was less abundant in quantity than usual. Repeating the experiment, in the same manner, the gases had remained in contact a few minutes, apparently without mingling much except at their surfaces—the chlorine preserving its peculiar colour and the other gas its colourless transparency, when, suddenly, a bright flash pervaded the bell glass, which was of the capacity of five or six quarts; it was raised out of the water with a slight report—a dense deposit of charcoal lined the glass and floated on the water of the cistern, and the chlorine disappeared. The appearances were much like those which are exhibited when a rag dipped in oil of turpentine is placed in a jar of chlorine gas.

Reflecting on the circumstances, I was led to believe that the peculiar effect, in this case, arose from the fact, that, owing to the great difference in the specific gravity of the two gases, the action took place principally at the two surfaces of contact and thus the chlorine acting upon a comparatively thin stratum of inflammable gas, the two became so heated, as to pass into vivid combustion. Every new occurrence in practical chemistry, which may involve danger, ought to be exactly stated, that we may be aware of contingencies not otherwise anticipated.

2. *Explosion of Pyrophorus.*

A preparation of this substance, having been made, was left eight or ten days well corked, in iron tubes, (the same in which it was prepared,) and being opened, for transferring to another vessel, a common ramrod was introduced, to loosen the pyrophorus, the motion of which, produced considerable friction; when an explosion took place, loud as a common musket, by which the contents of the tube were blown out in a jet of fire, two or three feet long, scorching the hair and eye-brows of the person conducting the operation, and a violent jerk was given to the hand that held the ramrod. The glove, with which his hand was fortunately covered, was burnt in several places to a crisp. His eyes and whole face were affected in the same manner as if gun powder had been discharged against them; and this sensation continued several days, passing off, however, without serious inconvenience. On putting the ramrod into a second tube, containing pyrophorus, and very cautiously and gently touching the substance with the end of the rod, another explosion took place, equally violent as the first. It was not thought prudent to repeat the experiment again, as the third tube contained a much larger quantity of the preparation. This pyrophorus had been observed to be unusually good, and when breathed upon in the air, kindled in many places at the same time, with a slight explosion. The tubes, stopped with particular care, had stood within eight or ten feet of the fire, in the laboratory, and could not possibly have imbibed moisture. The explosions doubtless resulted from the friction and pressure of the ramrod ; and they show us the necessity of care in regard to a substance, against which the books, we believe, give us no caution.

It may be proper to mention that the pyrophorus was, in this case, prepared from a recipe furnished to me by Dr. Hare ; it was as follows. Take lampblack three, calcined alum four, and pearlashes eight parts—mix them thoroughly, and heat them well in an iron tube to a bright cherry red for one hour.

This pyrophorus rarely fails. When well prepared and poured out upon a glass plate and especially when breathed upon, it kindles with a series of small explosions, a little like those produced by throwing potassium upon water. There is even some danger to the face and eyes from the number and rapid succession of these little explosions, and one is forcibly impressed with the idea that they must be owing to potassium. Since the discovery of this brilliant substance, there has been little doubt, that it is developed in greater or smaller quantities, during the formation of pyrophorus. The above process seems peculiarly adapted to the production of an unusual quantity of potassium, since there is in the mixture a large quantity of the alkali, and also of carbon, which, it is now known, is admirably adapted to the decomposition of potash. If a burning coal happen to drop into a silver crucible containing ignited caustic potash, there is a rapid succession of explosions, and the liberated potassium and potassuretted hydrogen burn with a brilliant flame and the fumes of regenerated caustic alkali are extremely conspicuous. Indeed it has long been known that charcoal will, by intense ignition, evolve potassium from potash. Curadeau first called our attention to this fact, and more recently Professor Brunner has shown that this process, skilfully conducted, is even preferable to any other.

[See Bib. Univ. Jan. 1823, quoted in this Journal vol. VIII. p. 372.]

Art. XIX.—*Notice of two halos with parhelia.*

1. Communicated by Isaac Lea, in a letter to the Editor, dated Philadelphia, Feb. 6, 1826.

My Dear Sir,

I have great pleasure in handing you a diagram and description of a halo, with parhelia, seen by my brother in Jackson, Tennessee, August 19th, 1825. The combination of the circles is remarkably beautiful, and the beholders must have been struck with delight on viewing so beautiful a phenomenon. Among the numerous parhelia described by Huygens Halley, Herelius Gassendi, &c. I find none that were equal to this in its beautiful combinations.

In accounting for parhelia, most philosophers, particularly Newton, ascribe them to the refraction of floating particles of hail or snow, and this is most likely to be their cause, as the refraction of their regular forms may be accurately calculated.

M. Mariotte and Mr. Wood attribute them to vapour which they say with Halley, consists of hollow sphericles of water, filled with an elastic fluid, and that the halos are produced by their refraction and reflection.

I am, very respectfully, your obedient servant,

ISAAC LEA.

At 9 o'clock the phenomenon first made its appearance—the weather hazy in a slight degree, 45 minutes past 9 the haziness increased—15 minutes past 11 o'clock it continued to increase, and the halo disappeared.

The thermometer for several days had ranged from 96° to 101° and a heavy thunder-storm, without rain, occurred the night previous.

The citizens of Huntingdon 35 miles east of Jackson, were gratified with a view of this splendid exhibition of nature, but it was not visible at Reynoldsburg, 65 miles E. of Jackson.

(*See the plate.*)

A the Zenith.

B the true sun.

C represents the 7 parhelia formed by the incidence of the circles.

D D two small segments of a large circle.

E W East and West points of the compass.

The luminous circles had much the appearance of a lunar rain-bow: that part of the small circle W. of the true sun, more bright than the rest: the extreme north and south portions of the two largest circles very dim—eastern extremity of the small circle somewhat flattened.

2. Communicated by Mr. Leonard Pierce.

Explanation of a Diagram of luminous circles about the sun, seen at Millbury, Mass. August, 14, 1825.

S the sun; AB circle having the sun for its centre, and being about the size of the common halo around that luminary; CD an elipsis running in about the direction here represented; EF a large circle at the west of the sun over the disk of which the circumference of this circle passed. The wind was in the west and the sky was obscured by Cirrose clouds which moved very slowly from west to east. But one stratum of clouds could be distinguished. Where the clouds were the most dense the colours were the brightest, except the points GH where the Ellipsis intersected the circle, it was uniformly bright and had nearly the appearance of a parhelion. Where there were no clouds there were no colours. The colours, except at the points GH, were like those of the rain-bow, but not very distinctly marked.

This phenomenon I first observed about eight o'clock in the morning, and it continued till past eleven.

Art. XX.—*Notice of Scientific Societies in the United States.* Communicated for this Journal.

The following enumeration of Scientific Societies in the United States, was originally drawn up, at the request of a foreign correspondent, who was desirous of information respecting the progress of the Natural Sciences in this country. It must be considered of course as very imperfect, but it will nevertheless be sufficient to show that no inconsiderable share of our attention has been devoted to philosophical inquiries.

Considered in a geographical order, we shall mention first,

The East India Marine Society. *Salem, Mass.* This Society was founded in 1799, and incorporated in 1801. It was originally instituted for the purpose of investigating and recording facts relative to the natural and physical history of the ocean. No one can be eligible as a member, unless he shall have actually navigated the seas near the Cape of Good Hope, or Cape Horn, either as Master or Supercargo. A blank journal is furnished to every member when bound to sea, in which he is to enter the occurrences of the voyage, observations on the variation of the compass, bearings and distances of Capes, &c. and on his return he is to deliver the same to the inspector of journals. Sixty-seven of these journals have been thus collected and preserved, and a museum of several thousand specimens in Natural History has been formed. The catalogue of this collection which was published in 1821, is drawn up with considerable ability, and we have a sufficient guaranty, as well for the present activity as the future usefulness of the Society, in the fact of its being under the auspices of Nathaniel Bowditch.

2. American Academy of Arts and Sciences. *Boston, Mass.* Instituted in 1780, and under the title of Memoirs of the Academy of Arts and Sciences have published four volumes quarto. The astronomical and mathematical papers are most numerous ; and the memoirs on Natural History by Messrs. Cutler, Cleaveland, and Peck, may be consulted with advantage. The paper by Mr. Cutler entitled *an account of some of the vegetable productions naturally growing in this part of the country botanically arranged*, is still occasionally referred to by botanists.

3. Linnæan Society of New England. *Boston, Mass.* Instituted ——. I am not aware that this Society has published any thing beside *a report of a committee relative to a large marine animal, supposed to be a serpent seen near Cape Ann, Mass.*

4. Franklin Society. } *Providence, R. I.*
5. Philophusian Society. }

The first of these societies is in active operation. A neat laboratory has been established, and the members are devoting much of their attention to the analysis of minerals. Perhaps no part of the union offers a richer field for researches of this kind, than the state of Rhode Island. As the objects of both these societies are precisely similar, we should imagine that more would be effected by a united effort, than by divided and rival institutions.

6. Connecticut Academy of Arts and Sciences. *New Haven, Conn.* Incorporated 1799. The first volume of their Memoirs was published in 1810, and contains papers by Dwight, on the *Meloe vesicatoria;* by Messrs. Silliman and Kingsley, on meteoric stones. The last part of their transactions appeared in 1813, since which the society have apparently relaxed their exertions. It may be mentioned that the celebrated *Experiments on the fusion of various refractory bodies*, by Prof. Silliman, appeared in these transactions. These experiments were strangely overlooked, and the priority claimed by Dr. Clarke of England, in a work published in 1820, although he could not have been ignorant that these experiments had been performed by Prof. Silliman, in conjunction with Dr. Hare, of Philadelphia, nearly twenty years previous.

7. American Geological Society. *New Haven, Conn.* Incorposated 1819 Meet annually in September, and its meetings are held provisionally at New Haven. No separate transactions have as yet made their appearance, but many of the communications made to the Society have been published in this Journal.

8. Pittsfield Lyceum. *Pittsfield, Mass.* Instituted 1823.

9. Society of Arts. *Albany, New York.* Instituted ——, and have, under different titles, published four octavo volumes of their transactions. Some interesting botanical and geological papers are to be found in these volumes; it has been recently incorporated with the Albany Lyceum, and is now known as the " Albany Institute." Arrangements are making to publish a volume of their transactions.*

* It will hardly be considered out of place, to speak here of the *Rensselaer School*, recently established by Stephen Van Rensselaer, of Albany, which bids fair to become a nursery for Naturalists. It is now in successful operation. Its object is to qualify teachers for instructing the sons and daughters of farmers and mechanics, by lectures or otherwise, in the application of experimental chemistry, philosophy, and natural history, to agriculture, domestic economy, the arts, and manufactures. Mr. Eaton is Professor of Chemistry and Natural Philosophy and Lecturer on Geology, land surveying, &c. Dr. L. C. Beck, a gentleman already advantageously known as a botanist, is Professor of Botany, Mineralogy, and Zoology. Well cultivated farms and workshops are established in the vicinity of the school, as places of scholastic exercise for students, where the application of the sciences may be most conveniently taught. They are also exercised in giving lectures by turns on all the branches

10. Utica Lyceum of Natural History. *Utica N. Y.* Incorporated 1820.

11. Chemical and Geological Society. *Delhi, N. Y.*

12. Troy Lyceum of Natural History. *Troy.* Incorporated 1819.

13. Hudson Lyceum of Nat. Hist. Incorporated 1821.

14. Catskill Lyceum of Natural History. Incorporated 1820.

15. Newburgh Lyceum of Natural History. Incorporated 1819.

16. West Point Lyceum of Natural History. Instituted 1824.

The greater number of these associations, although they have published no separate transactions, are spiritedly conducted; extensive and choice cabinets are formed, and a spirit of inquiry excited which cannot fail of producing valuable results. The numerous communications of the members of these societies, are usually published in some scientific journal.

17. Literary and Philosophical Society. *New York.* Incorporated in 1815. Meet monthly for the purpose of receiving communications on subjects connected with science and literature. This society has published one quarto volume of its transactions, and has another in press, which is expected shortly to appear.

18. Lyceum of Natural History. *New York.* Incorporated in 1818. Meet weekly. Under the direction of this society a *catalogue of the plants growing within thirty miles of the city*, was drawn up and published, and the specimens deposited with the society. Its advantageous situation for correspondence with all parts of the world, seemed to invite the establishment of a Cabinet of Natural History. This has

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taught by the Professors and their assistants. An ample scientific library, extensive apparatus, geological and other maps, and a very complete suite of American geological specimens are to be found in this establishment. There is likewise an extensive collection of plants, and the most necessary specimens in zoology. Of the feasibility and great excellence of the plan of this school, and the effective character of the instruction, the Trustees have already had a very gratifying proof by the exhibitions of several students. We know of no institution in our country more useful in its aim, viz. the application of science to the common purposes of life. See "Constitution and By-laws of the Rensselaer School in Troy, N. Y."

accordingly been attempted, and a collection, particularly rich in minerals and organic remains, has already been formed. During the past year, forty-seven papers, (excluding reports of committees on new works, which were presented by their respective authors,) were read before the Lyceum. During the winter months lectures are delivered in rotation, by the members, on the different branches of natural history. In 1824, the society commenced the publication of its *Annals*, in a cheap form, and as materials offered. This plan of publishing occasional sheets, presents decided advantages over the course pursued formerly by literary and scientific societies. The frequent periods of publication, keeps up an excitement in the society, and the members are encouraged to prosecute their researches, when assured that they will speedily meet the public eye.

19. New York branch of the Linnæan Society of Paris. Meets annually in May.

20. New York Athenæum. This is enumerated as an association, supported chiefly by the liberality of opulent merchants, for the encouragement of science and literature in general. During the last winter, lectures on chemistry, geology, botany, &c. were appointed; and the full attendance given to these lectures, was a pleasing evidence of the interest taken in these sciences.

In addition to these various institutions in the city and state of New York, we may allude to the recent establishment by law, of agricultural societies in every county in the State. Although they have but an indirect bearing upon the natural sciences, yet they are mentioned in this place, as they have originated several valuable geological essays with particular reference to the improvement of agriculture. In 1819, an act was passed by the Legislature, granting $10,000 annually to the different counties in the State, in proportion to their population. It was made a proviso, that an agricultural society should be formed in each county, the members of which should raise by voluntary subscription, an amount equal to the sum apportioned. The funds thus raised are distributed in premiums. Within one year after the passage of the act, twenty-six of the county societies were formed and in active operation. A central board of agriculture was organized, composed of deputies from the different county societies, and charged with the general superintendence of the whole. A farther sum of $1000 per ann. was granted to them by the state for the purpose of distributing seeds, &c. and publishing their transactions, of which two volumes have already appeared.

21. Literary and Philosophical Society of New Jersey. *Princeton, New Jersey.* Instituted 1825. The declared objects of this society, as set fourth in the *discourse*, recently delivered at its first annual meeting, by the Rev. Dr. Miller, are "the promotion of useful knowledge, and the friendly and profitable intercourse of the literary and scientific gentlemen of New Jersey."

22. American Philosophical Society. *Philadelphia.* Instituted 1769. The earliest in point of date established in North America. It is highly creditable to this city that two scientific societies should have previously existed there for many years.* The transactions of this society consist of two series; the first comprised in five volumes, the second in two, the last of which has just appeared. The early papers of Prof. Barton, of Mr. Jefferson on the great fossil Megalonyx, the geological papers of Mr. McClure, and the zoological communications of Messrs. Say and Lesueur, will deeply interest the American Naturalist.

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* To those who are curious in the early history of philosophical inquiry in this country, the following translation from a German traveller may be interesting. "This society is indebted for its establishment to the unwearied efforts of Dr. Franklin. For more than twenty years previous, he had established a private society composed of his particular friends. As many crept in, however, who had little pretension to learning, but were proud of parading among learned men, the society declined. Hence, in 1769, a new association was set on foot, without including all the former members. Those who were excluded, from a spirit of revenge, established an opposition society, and elected every one, and of course, some few good ones. After a time, however, for the good of science, it was deemed advisable to unite the two societies, but this did not allay the spirit of party. Many unworthy persons crept in to the great displeasure of the elder members. These unfortunate occurrences did not, however, materially impede the advancement of science. In the year 1771, appeared the first volume of the Transactions of the American Philosophical Society, in quarto, containing many papers relative to Natural History. The war has hitherto prevented the appearance of many papers that are now ready for the press. Congress however, although still *inter arma*, and with its very existence still precarious, has cast a favourable look upon the *musæ silentes*, and has vouchsafed to give to this philosophical society, solidity and increased activity. "Reise durch einige der mittlern und sudlichen vereinigten Nordamerikanischen Staaten." Von Johann. D. Schoepf. Erlangen. 1788.

23. Linnæan Society. *Philadelphia.* Instituted 1807. We believe that the members of this society have ceased to assemble for sometime past. It was founded by the late Professor Barton, whose discourse *On some of the principal desiderata of American Natural History*, was pronounced at the opening of this institution.

24. Academy of Natural Sciences. *Philadelphia.* Incorporated in 1818. Meet weekly. This active society has already published four volumes octavo, under the title of *Journal of the Academy of Natural Sciences*, and have nearly completed a fifth volume. It has the most complete and extensive library of works upon Natural History, in the United States, for which they are chiefly indebted to the liberality of Mr. Maclure, a gentleman equally celebrated for his zeal in prosecuting scientific inquiry, and his generosity towards those engaged in similar pursuits. The Journal of the academy, is absolutely indispensable to every American Naturalist.

In addition to the means of acquiring scientific information, afforded by these Societies in Philadelphia, the University of Pennsylvania, has a professorship of Natural History, at present filled by *Mr. Thomas Say.* Dr. Hare is professor of Chemistry; Mr. W. H. Keating of Mineraloy, applied to the arts; Dr. Barton of botany, and Dr. Hewson of comparative Anatomy. No salaries are attached to these professorships, and they are compelled to give at least ten lectures annually.

The Philadelphia museum was incorporated a few years since, and as a corporate body, were privileged to appoint Professors. Accordingly the following gentlemen have been elected, and have already given several courses of lectures. *Dr. Troost*, on Mineralogy and Geology, *Mr. Say*, Zoology, *Dr. Godman*, Physiology, and *Dr. Harlan*, comparative Anatomy. It is gratifying to see in one city, these various efforts to promote and extend the study of the natural sciences: may others follow this good example.

25. Academy of Science and Literature. *Baltimore, Maryland.* Instituted 1821. Arrangements are making to commence a volume of their transactions.

26. Columbian Institute. *Washington City.* Incorporated ——. The President of the U. States is, ex officio, the President of this society. Under its auspices a *Florula Columbiensis* has been published, and spirited efforts are now making to establish a botanic garden.

27. Western Museum Society. *Cincinnati, Ohio.* Established in 1818. The objects of this institution are stated in the public address to form an extensive museum of, 1. Our metals and minerals, generally including petrifactions. 2. Of our indigenous animals, embracing the remains of those now extinct. 3. The relics of the unknown people, who constructed the ancient works now found in our country. Agreeably to these views, an extensive cabinet has already been formed which is rapidly increasing.

28. Literary and Philosophical Society. *Charleston, South Carolina.* Instituted ——. This society has a choice cabinet, but has hitherto, we believe, published no transactions. The distinguished Mr. Elliot is the President.

29. Lyceum of Natural History. *New Orleans, Louisiana.* Instituted 1825. Recent information respecting this society represents it as already in a flourishing state.

The above is as complete a list as I have been enabled to make out, and perhaps many others are still omitted. For these omissions I am not responsible, as it is extremely difficult, if not impracticable, to obtain information respecting our societies in the interior. On the spot where I am now writing, it is much easier to obtain information from Petersburgh or Pavia, than from Cincinnati, Pittsburg, or Natchez. I trust to your superior means of information, for supplying all deficiencies, and remain, Respectfully yours, &c.

New York, Dec. 12, 1825. S. E. D.

As the preceding list, is probably incomplete, it is requested that the deficiencies may be supplied by appropriate communications.

It will be observed that Historical, Literary, Antiquarian, and other Societies, not cultivating natural knowledge, and also academies for the fine arts, are designedly omitted. Our correspondent promises to supply this deficiency, in part, in another article; but in the mean time, communications are solicited from others. Editor.

March 1, 1826.

INTELLIGENCE.

I. FOREIGN.

[Foreign Literature and Science. Extracted and translated by J. Griscom.]

1. *Subterranean Sounds.*—At the village of Babino-poglie in the centre of a valley in the Island of Meleda, in the Adriatic Sea, remarkable sounds were heard for the first time on the 20th March, 1822. They resembled the reports of cannon, and were loud enough to produce a shaking in the doors and windows of the village. They were at first attributed to the guns of some ships of war, at a distance, in the open sea, and then to the exercise of Turkish artillery, on the Ottoman frontiers. These discharges were repeated four, ten, and even a hundred times in a day, at all hours and in all weathers, and continued to prevail until the month of February, 1824, from which time there was an intermission of seven months. In September of the same year, the detonations recommenced, and continued, but more feeble and rare, to the middle of March, 1825, when they again ceased.

These noises have been accompanied by no luminous phenomena or meteors of any kind. Dr. Stulli; who furnishes the statement, conjectures that these remarkable detonations arise from sudden emissions of gas, elaborated in cavities beneath the islands, and which issuing through subterranean passages, strike the air with such force as to produce loud detonations.—*Bib. Univ. Aug.* 1825.

2. *Helvetic Society.*—The annual meeting of this Society was held with the usual feeling of national gratulation, and characteristic hospitality, on the 27th, 28th, and 29th of July last, at the town of Soleure presided by M. Pfluger, apothecary of that place. In his opening discourse, the president has to lament the decease, within the preceding year, of

several of their most worthy members, among whom was professor Pictet, of Geneva, who had presided at the session of 1820, has attended all the meetings since the commencement of the Institution, and contributed richly to its useful labours. The meetings were attended by 76 members, exclusive of those of the Canton, in which they were assembled.

Among the memoirs read on the first day of the session, was one by Professor De Candolle, of Geneva, on the properties of a reddish matter, from the surface of the lake of Morat, where it appeared during the spring; after a season of calms, disposed in zones, along the borders of the lake, and especially among the reeds. In this substance were found two distinct matters. 1st. A greenish and fetid sediment, which left the supernatant water of a fine red colour. 2d. A lamellar substance, in irregular shreds, of a soft and spongy consistence. The first of these matters, submitted to a powerful microscope, presented to De Candolle, Dr. Prevost, and Vaucher, all the characters of an oscillatoria, the motions of the zoophytes being distinctly perceptible. It was named by De Candolle, *oscillatoria purpurea.* A chemical examination of this substance proved that it consisted of, 1st. A red colouring matter, partly soluble in alcohol. 2d. Of chlorophylla. 3d. Of gelatine in large proportion. 4th. Of albumen. 5th. Of some earthy and alkaline salts, and a little oxide of iron. These results confirm the opinion of some naturalists, with respect to the animal nature of productions which are met with in a great number of mineral waters, and lend support to the observations of Vauquelin, on the green substance of the waters of Vichy, in which he met with a substance which had a close analogy to albumen. —*Ibid.*

3. *Rectification of Alcohol without heat.*—As a means of obtaining strong and pure alcohol, without the aid of heat, or of an alembic, it is recommended by M. E. Pajot-Descharme, to place the spirituous material, whether low wine or Holland proof, in a deep vase with a flat bottom, and within this vase, supported by feet resting on its bottom, place a broad dish, containing dry muriate of lime; cover the whole very closely, by pasting paper around the edges of the vase.

In four or five days the salt will have deliquesced by the attraction of moisture. Replace the apparatus, after replenishing the dish with dry muriate. By continuing the operation, alcohol (whisky or spirits) may be changed from ten to fifteen degrees of Baumé, to forty or forty two degrees.

Ann. de Chimie et de Physique Juil. 1825.

4. *Fumigation.*—In consequence of the prevalence of an obstinate fever in the Milbank prison, in London, it was deemed expedient to purify the apartments and galleries of that extensive building by fumigation. This was performed under the direction of M. Faraday, professor in the Royal Institution. Equal parts of salt and oxide of manganese were placed in earthen dishes, each holding about a gallon, and to two parts of the mixture were added two parts of sulphuric acid, previously mixed with one part of water, and cooled. No heat was applied. The mixture continued to give out chlorine during four days. All the passages and openings were carefully stopped with mats, &c. Each vessel received about three and a third pounds of the mixture of salt and manganese, and it was estimated that this quantity yielded five and a half cubic feet of chlorine. The whole quantity used was 700 pounds of common salt, 700 pounds of manganese, and 1400 pounds of sulphuric acid. The space fumigated was about 2,000,000 of cubic feet, and the surface of the walls, floors, and platforms, about 1,200,000 square feet, mostly in stone and brick, and chiefly plastered with lime.—*Quarterly Journal of Science*, No. 35.

5. The *Polytechnic Institute of Vienna* was founded in 1815 by the munificence of the emperor, who endowed it with a capital of nearly a million of francs. This useful establishment is at once an *academy*, in which a numerous corps of pupils receive the best instruction, in all the branches of arts, trades, and commerce, in order to practise their knowledge afterwards in workshops and manufactories; a *conservatory*, in which are assembled instruments, machines, and productions of all the arts; and a *society for the encouragement of national industry*, which proposes and distributes prizes and rewards, and maintains with the government systematic relations on all the subjects of manufacturing industry.

The Institute has opened in a vast and superb building, which the emperor had constructed, not only for elementary instruction, but for practical courses on mechanics, architecture, civil and hydraulic, drawing of machines, chemistry applied to the arts, natural philosophy, &c. Examinations and public theses are annually held, and the more distinguished pupils are employed in the public service, or engaged in the manufactories. These pupils are not maintained at the public expense; their instruction only is gratuitous: their number, which in 1816 was only 300, amounted in 1822 to 720. Workshops have been erected, in which models of machines, and mathematical and philosophical apparatus are manufactured. Courses of instruction have been opened also on *Sundays*, for the benefit of the workmen, which are well supported. The museum, or conservatory, contains a numerous collection of the products of industry, and is enriched by the legacies and donations of individuals, and successive acquisitions. It contains, besides, a choice library of near 9000 vols. a chemical laboratory, general and special, with more than 500 pieces of apparatus, a philosophical cabinet, enriched with 700 instruments, made by the ablest artists, a collection of 8000 specimens of minerals, another of 300 instruments of precision and observation, formed by *Reichenbach;* a cabinet of 300 models, more than half of which relate to civil and hydraulic architecture; a collection of drugs and merchandise, and more than 20,000 objects accruing from the national fabrics, furnished by 800 artists, or manufacturers, and about 1000 objects from foreign countries, by way of comparison. The design of this interesting collection is to present an assemblage of all the fabricated products of the Austrian monarchy, and of their successive progress. They are arranged in methodical order, on a plan which may serve as a model for similar collections. Metallic products, glass, porcelain, and potteries, occupy the first rank; then the tissues of linen, silk, cotton, and wool; bonnet stuffs, lacing, paper, leather, &c. A detailed description of this collection is contained in the 4th vol. of the *Annals of the Polytechnic Institute*, a work worthy of attention for the importance of its memoirs on various portions of science and arts, drawn up mostly by the learned professors of the establishment.

Independently of the above mentioned collections, the Instite possesses a cabinet of more than 3000 utensils and instruments, employed in the arts and trades, among which is a complete assortment of the instruments of the bookbinder, containing, besides presses, &c., punches, fillets, rollers, &c. exceedingly well executed. To their national instruments are joined the same kind of English and French workmanship. The various utensils, also, of the joiner and cabinetmaker; screw-cutter and worker in metals; of clock-making, watch-cases, wire-drawing, gilding, &c., are in the collection; and, what is particularly interesting to an amateur in the arts, there are two complete assortments of turning instruments, one made by British workmen, and the other by artists in Vienna. The apparatus of the brass founder, goldsmith, and a crowd of others. are also included. This collection is not only useful in the lectures on technology, but as they consist chiefly of foreign instruments, especially English, little known in the country, they afford to German workmen the most favourable opportunity of profiting by the knowledge of foreign skill.

As a society of encouragement, the establishment has not yet fulfilled the design of its institution. It appears that the professors and their adjuncts, occupied with their courses of instruction, and with the classification of the objects of the museum, have not yet decided, or even proposed, any premiums; at least the annals make no mention of any. They have, however, been very useful as a committee of consultation, and have given their advice on 400 or 500 questions, which the government has submitted annually to their enlightened decision. They have proposed important alterations in the law of patents, in the operation of which there is now much less abuse. Accordingly the number of patents, which had been only fifty-eight from 1815 to 1820, rose in 1821 to one hundred and eight, and in 1822 to one hundred and sixty-eight. At the expiration of their respective periods, they will be rendered public through the medium of the printer and engraver, in the Annals of the Institute. One thing is worthy of remark, and that is, that the first attempt at gas illumination on the continent of Europe was made in 1817, by the direction of the polytechnic institute. The halls of this vast establishment have been lighted, since that period, by the new process, and with the most complete success; and from this example other public edifices, and even many streets, and places in Vienna, are now lighted in the same manner. The edifice of the institute is heated by steam, which circulates in tubes which pass through all parts of the building; the coak arising from the distillation of the coal is consumed in the workshops of the establishments. Navigation by steam, which is now regularly established on the Danube, and on the Adriatic between Trieste and Venice, is also indebted to this institution.

Such is the polytechnic institute of Vienna, an establishment eminently useful, and worthy of the protection and encouragement of the sovereign. One thing which distinguishes it essentially from the polytechnic school of France, is that the latter is exclusively occupied with arts, manufactures, and industry, and mathematics are cultivated only to form surveyors and engineers, while in that of Vienna this science forms the basis of all the instruction.—*Bulletin de la Societé D'Encouragement*, *Juin* 1825.

6. *Animal Heat.*—The following is stated by *Despretz* to be the temperature of the bodies of the animals named, when the temperature of the air was 15.15. The scale is doubtless that of the centigrade thermometer.

	Mean temp.
Nine men, aged 30 years,	37.14
Four men " 68 years,	37.13
Four young men, 18 years,	36 99
Three male children, 1 to 2 days,	35.06
Two adult ravens,	42.91
Four owls,	40.91
An adult screech-owl,	41.47
An adult tarsel,	41.47
Three pigeons,	42.98
Three sparrows, well feathered,	39.08
A full grown sparrow,	41.67
Two rooks, just beginning to eat,	41.17
Dog, 3 months old,	39.48
Adult male cat,	39.78
Adult Guinea pig,	35.76
Two carps,	11.69
Two tenches,	11.54
Water in which the fish were swimming,	10.83

Annales de Chimie. Août, 1825.

7. *Heat by Combustion.*—The same chemist found, during his researches on respiration, that hydrogen melts, in burning, 315.2 times its weight of ice, and carbon 104.2. It is remarkable that the numbers 315.2 and 104.2 are almost rigorously proportional to the weight of oxygen absorbed by hydrogen and carbon. For, according to the chemical proportions of Berzelius, supposing the first number 315.2, the

second would be 104.066. This observation is favourable to the conjecture of WELTER; "that the quantities of heat disengaged in combustion are in definite proportions.—*Ibid. Octob.* 1824.

8. ROYAL LEARNING. *The Seven Seas; or Dictionary and Grammar of the Persian Language. By his majesty the king of Oude. Lucknow.* 1822. *In* 7 *volumes folio*, 15 *inches in height by* 11 *in breadth. Printed at his majesty's press.*—This magnificent work is the fruit of the labours and researches of the sultan of Oude, *Ubulmasaffir Muiseddin Schahi Seman Ghiatiddin Haider Padischah;* that is to say, the father of the brave, the adorer of the faith, the Schah of the age, the conqueror of the faith, the lion, and the padischah. His majesty has sent several copies to the *East India Company*, to be distributed in Europe. The first six volumes contain the dictionary; the seventh is devoted to the grammar. Upon each leaf, and above the page, are engraved the arms of the sultan: two lions, holding each a standard, two fishes, a throne, a crown, a star, and the waves of the sea. Since the time of Abulfeda, the learned prince of Hamah, of the dynasty Ejub, who died in 1332, and is well known in Europe as a historian and geographer, no Asiatic prince has done such an essential service to science as that to which it will be indebted to the sultan of Oude, by the composition and publication of this dictionary, the most complete of all that have hitherto appeared.—*Revue Encyc. Sept.* 1825.

9. *Philology.*—According to a work published in Germany by the learned philologist Adelung, there exist on the earth 3,064 languages: 587 in Europe; 937 in Asia; 276 in Africa; 1,264 in America. The author doubtless comprehends in this enumeration the various idioms and patois in use in the different provinces of the same country.—*Ibid.*

10. GENEVA. *Mutual Instruction.*—This method introduced into our country by the Society of *Catechumens* acquires, every year, an increasing influence. In the month of July, 1822, the schools of St. Gervais and la Grenette contained together 345 children; that of St. Anthony was opened in the month of November of the same year, and in the beginning of 1824 it contained 174 children. This rapid progression in the number of pupils is an indubitable proof of the success of

this mode of instruction, and of the advantage which it affords to families. The methods practised in foreign countries have not been exactly followed in Geneva, but modified to suit our national habits and manners.

Mutual instruction has been introduced with much success in music; and marches, with religious, moral, and patriotic hymns, calculated to impress noble and pious sentiments, have been admitted as a recreation. We may well felicitate ourselves on the effects which result from these foundations for the moral instruction of children. An increased degree of obedience, order, neatness, and decency of language is already observable. A generation educated upon principles which are based upon religion and morality, cannot fail to supply the country with good citizens.

The schools of the new territory, placed under the direction of the committee of public instruction, have continued to prosper; their number amounts to 18, comprising that of Puplinge, recently founded, and they present altogether the interesting assemblage of 855 pupils. The method of mutual instruction established in all these schools (that of *Aire la Ville* excepted, where the number of scholars is very limited,) obtains a success which we had scarcely dared to hope for. The various regents of these schools unite at Geneva, to attend a course on the method itself, given by a skilful teacher, who has studied it with care, and who applies it with great success. The effect of this will be to excite emulation among the regents, and uniformity in the schools, which will much facilitate the management of them. Prizes have been distributed in the present as well as the last year, and the happy effects of them are every day manifest.—*Revue Encyc. Nov.* 1824.

11. *Compound of various Metals.*—M. Dittmer has shown in the Hanoverian Magazine that the following mixture, compounded by the privy counsellor Doctor Hermstadt, may be substituted for gold, not only with respect to colour, but also to specific gravity, density, and ductility:—16 loth (less than 8 French ounces) of virgin platina, 7 loth of copper, and 1 loth of zinc, equally pure: place these metals together in a crucible, cover them with powdered charcoal, and melt them completely into a single mass.—*Rev. Encyc. Sept.* 1825.

12. *Successful treatment of Hydrophobia.*—On the 28th of October last, a young apothecary was bitten in the left hand by a cat, which died two days after with confirmed madness. He satisfied himself with washing the wound, and pressing out the blood. Twenty-four hours after, he cauterized the part superficially. Recommended by his physician to M. Rossi of Turin, the latter discovered in the wound marks of the peculiar virus, and prescribed a drink of pure vinegar every morning, and two glasses of a decoction of juniper (genista lateotinctora) during the day. It was deemed necessary particularly to examine the small glands under the tongue.

In the early part of December, unfavourable symptoms began to appear. The patient lost his vivacity, became taciturn, seeking retired places, and weeping abundantly. His sleep was short and restless, his complexion livid, and his eye fiery. His physician then perceived that the left gland was swollen and inflamed. He immediately ordered a deep cauterization upon the two glands, by means of a red hot iron. This painful but necessary operation was followed by a violent access of fever, which gradually declined, and finally disappeared on the third day. From that time the patient has been perfectly restored, and has not experienced the least sensation from his wound.—*Ibid.*

13. *New method of Lighting large Apartments.*—M. Locatelli, a mechanician of Venice, distinguished by many important discoveries, has invented a new process for lighting public halls. It is well known that Rumford and others endeavoured in vain to discover the means of dispensing with chandeliers, so inconvenient in theatres and other halls of audience. The new process employed at Venice has completely succeeded, and leaves nothing to be desired. Instead of parabolic mirrors, the light of several lanterns is concentrated on an opening in the middle of the hall, (probably the ceiling,) and falls upon a system of lenses, plano-concave, which fill the opening, (a foot in diameter,) and distribute through the apartment rays, which, falling parallel on the lenses, issue divergingly. From the centre, or pit, nothing is perceived but the lenses, which resemble a chaffing-dish of burning coals, illuminating the whole house, without dazzling or fatiguing the eye. Besides the advantage of being more equal and soft, the light is more intense than that of the chan-

delier: there is not a spot in the hall where one cannot see to read with the greatest facility.—*Ibid.*

14. Ghent. There is about to be established in this town a *School of Arts and Trades*, in which workmen of all professions, and apprentices will be admitted. The city of Ghent designs, it would appear, to prepare the building at its own expense. The lectures will be given gratuitously.—*Ibid.*

15. Paris. According to a statement, made by authority, there were 371 suicides in this city during the year 1824; namely, 239 men and 132 women. This is 19 less than in the preceding year; but the number of these melancholy events is a heavy charge against our civilization, of which we are so proud, and which still preserves so many traces of barbarity. Gambling-houses, lotteries, brothels, openly authorized, are so many perfidious snares laid for cupidity, misery, weakness, and all the corrupt passions: and these schools of immorality pay a tribute to enjoy a shameful privilege, and obtain a legal existence in the bosom of a social order which they dishonour.—*Ibid.*

16. *Sulphate of Quinine.*—The high price of this valuable medicine, has tempted the cupidity of counterfeiters, and what is more remarkable, one of them had the audacity to request M. Pelletier, of whom he purchased this article, to prepare for him some sulphate of lime,(which, as is well known, crystallizes in silky fibres,) in order to mix it with sulphate of quinine. This then is one method of adulteration. Others have substituted carbonate of magnesia. These frauds are easily discovered; for it is sufficient to treat the sulphate of quinine with alcohol which dissolves it entirely, whilst the two other salts remain insoluble, and washed with cold water are insipid.—*Bul. de Sciences Août*, 1825.

17. *Chloruret of Lime.*—M. Virey communicated to the Academy of Sciences at Paris on the 14th of May, a statement of the diseases which afflicted the army of Spain in 1812, by Dr. Estienne, by which it appears that chloruret of lime, spread among the beds of those affected with typhus, produced in the most infected hospitals very advantageous effects. M. Lisfranc stated that he had used the same substance successfully for a considerable time in the treatment of atonic ulcers:

and M. Girard added that he had employed it with advantage in the carbuncled affections which had accompanied the disease recently prevalent among horses. M. Labarraque said that this substance was employed in Spain, merely for the disengagement of the chlorine in a manner less objectionable than that of Guyton de Morveau, while he employed the chloruret of lime or of soda, in substance, so as to apply it to the infected matters, and thus to destroy at once the putrefaction.—*Ibid.*

18. *Paper.*—The brothers Cappueino, paper-makers at Turin, have found the means of supplying the want of rags, by the fabrication of a new kind of paper from the thin bark of the poplar, willow, and other kinds of wood. The academy of sciences having examined the specimens thus produced of writing, printing, and wrapping paper, acknowledge the goodness of them, and praise the invention, so that his majesty has granted to the brothers, an exclusive privilege for ten years, for the manufacture of paper from ligneous materials.—*Journal de Turin.*

19. *Hygrometry.*—Professor De La Rive of Geneva finds that if the naked ball of a thermometer be dipped in sulphuric acid and then suspended in the air, the moisture attracted by the acid, in combining with it, causes an elevation of temperature in the mercury, which, by its extent in a given time, affords a good indication of the relative quantity of moisture in the air. For this purpose it is necessary to use the same thermometer, (or one of several in which the effect is found to be uniformly the same,) and an acid of uniform strength.—*Biblioth. Univ. Avril* 1825.

20. *Method of procuring good Yeast.*—Put four or five handfuls of hops in a linen bag, place it in a large pot, and pour on it boiling water, or make it boil for some time. Divide the decoction into equal parts. The first half is poured while hot into a kneading trough in which is a little sour paste or dough. Add to it a little sugar, a few whites of eggs well beaten, and a sufficient quantity of wheat flour to form a paste of ordinary consistency. Knead it well and cover it over. When the mass is well risen, it may be used for the purpose of fermenting the finest wheat paste or dough, without any fear that the bread, after baking, will retain the least sourness, because the acetic acid of the leaven has been com-

pletely decomposed in the course of the fermentation. It is probable that this would not have been the case without the sugar and the eggs. To obtain a leaven which will answer for future batches, reserve a portion of the dough, pour on it the second half of the decoction of hops, previously heated, and add the same quantity of sugar, white of eggs, and flour as before; knead the whole with a bit of the former leaven and let it rise in the trough. Nothing but flour need afterwards be added.—*Bul. de Sciences, Sept.* 1825.

21. *Method of making Soup of bones, as practiced in the Hospital of Montpellier.*—The various means of extracting gelatine, hitherto published, require no inconsiderable attention and expense. The managers of the hospital of Montpellier, have succeeded in a more economical method; namely—

The bones are broken with a hatchet into pieces from an inch to an inch and a half long, with which an earthen pot is made two-thirds full. Water is then added, an earthen cover is adjusted, and the pot is placed in an oven immediately after the batch is withdrawn. After remaining four hours, the pot is found to contain very fat and gelatinous soup. This being poured off, the pot is again filled with water, placed again in a hot oven, and affords, after an exposure of six hours, broth less rich than before, but still of good quality. It is filled a third time with water, and being heated seven or eight hours yields a fresh supply. These three portions are then mixed together, and being properly seasoned with vegetables, the whole affords a very nutricious and valuable article of diet. Six kilogrammes of bones extracted from coarse meat, produce twenty-one killogrammes of broth, which is a sufficient quantity for dealing out to four hundred and forty of the hospital poor.

There is no process which requires less skill and is more economical, for it saves even the expense of fuel.—*Bulletin Univ. Nov.* 1824.

22. *Printing upon Zinc.*—At the bookstore of Leake, at Darmstadt, has appeared the first great work whose prints are taken from plates of zinc. It is a collection of architectural monuments which will consist of twenty numbers. The drawings are made upon zinc as upon stone, and the expense of engraving is thus avoided. The editor is in consequence able to sell each number containing twelve folio

plates, at five francs upon common paper. In an economical point of view this process deserves to be recommended. —*Ibid.*

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[Other extracts from Foreign Journals.]

23. *Medicinal Leeches.**—A report has lately been laid before the French Academy of Sciences, by MM. Duméril and Latreille, on a memoir by MM. Pelletier and Huzard, jun., containing researches upon leeches.

The authors of this memoir had been commissioned to obtain information for the civil authorities relative to the means of putting an end to the complaints which are often made to them respecting the bad quality of the leeches employed in medicine. The two chief points which they proposed to examine, are, 1st, To ascertain the causes which in certain cases render the little wounds made by these animals difficult to cure. 2dly, To examine the circumstances under which certain leeches do not penetrate the skin to which they are applied. On the first point authors agree with physicians in acknowledging that the inconveniences ascribed to leeches ought most frequently to be attributed either to the temperament of the patient, or to the nature of the malady, or the means employed to detach them from the wound, or to the foreign substances employed for staunching the blood and closing the wound. With regard to the second point, MM. Huzard and Pelletier have found that there are offered for sale species of leeches that at first sight entirely resemble medicinal leeches, but which differ from them completely; 1st, in their want of the serrated instrument proper to make the incisions in the skin, from which issues the blood that the animal sucks; 2dly, in the conformation of their stomach and the intestinal canal. The experiments of the authors have proved to them that the spurious leeches cannot be employ-

* This article, and the next succeeding, are copied from the London Philosophical Magazine and Journal.

ed in medicine, because they do not bite.—*Rev. Ency. Feb.* 1825.

24. *Influence of the nerves on Animal Heat.*—Mr. Earle has published an interesting paper, to prove that, when a limb is deprived of its due share of vitality, it is incapable of supporting any fixed temperature, and is peculiarly liable to partake of the heat of surrounding media. The cases which are adduced prove also that a member so circumstanced cannot without material injury sustain a degree of heat which would be perfectly harmless, or even agreeable to a healthy part: thus, the arm of a person became paralytic, in consequence of an injury of the axillary plexus of nerves, from a fracture of the collar-bone. Upon keeping the limb for nearly half an hour in a tub of warm grains, which were previously ascertained by the other hand not to be too hot, the whole hand became blistered in a most alarming manner, and sloughs formed at the extremities of the fingers. In the second case the ulnar nerve had been wounded by the surgeon for the cure of a painful affection of the arm; the consequence of which operation was that the patient was incapable of washing in water at a temperature that was quite harmless to every duly vitalized part, without suffering from vesication and sloughs.

25. *Notes of Birds.*—The London Philosophical Magazine and Journal for July 1825, contains a paper by Mr. John Blackwall, the object of which is to prove, that, contrary to the commonly received opinion of the Hon. Daines Barrington, *the notes of birds are perfectly innate*, and not the result of imitation.

"In the summer of 1822," says Mr. Blackwall, "I procured three young green grosbeaks—a cock, and two hens; which, as they did not see till the fourth day after they were taken from the nest, must then have been only two days old.* These birds were reared by hand, in a house situated in the town of Manchester where they had no opportunity of hearing the notes of any birds, except perhaps, the occasional chirping of sparrows: nevertheless, they had all their appropriate calls, and the cock bird had the song peculiar to its species."

* From numerous observations Mr Blackwall concludes that birds usually begin to see about six days after they are hatched.

As it might be objected that these birds remembered the notes of their parents, "I placed the eggs of a redbreast in the nest of a chaffinch, and removed the eggs of the chaffinch to that of the redbreast; conceiving that if I was fortunate in rearing the young, I should by this exchange insure an unexceptionable experiment, the result of which must be deemed perfectly conclusive by all parties. In process of time these eggs were hatched, and I had the satisfaction to find that the young birds had their appropriate chirps.* When ten days old they were taken from their nests, and were brought up by hand, immediately under my own inspection, especial care being taken to remove them to a distance from whatever was likely to influence their notes. At this period, an unfortunate circumstance which it is needless to relate, destroyed all these birds, except two—a fine cock redbreast, and a hen chaffinch; which, at the expiration of twenty-one days from the time they were hatched, commenced the calls peculiar to their species. This was an important point gained, as it evidently proved that the calls of birds, at least, are innate; and that, at this early age, ten days are not sufficient to enable nestlings to acquire even the calls of those under whieh they are bred; thus clearly establishing the validity of the first experiment made with the young grosbeaks. Shortly after, the redbreast began to record,† but in so low a tone, that it was scarcely possible to trace the rudiments of its future song in these early attempts: as it gained strength and confidence, however, its native notes became very apparent, and they continued to improve in tone till the termination of July, when it commenced moulting, which did not as was expected, put a stop to its recording. About the middle of August it was in a deep moult, and by the beginning of October had acquired most of its new feathers. It now began to execute its song in a manner calculated to remove every doubt as to its being that of the redbreast, had any such previously existed: its habits also were as decidedly characteristic as its notes; and I am the more particular in noticing this latter circumstance, because the peculiar habits of birds are quite as difficult to account for as the origin of their songs."

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* A term defined by Mr. Barrington to be the first sound a young bird utters as a cry for food.

† The first endeavours of a young bird to sing are called *recording*.

26. *Civilized Nation in Central Africa.**—We have received accounts of a recent discovery in Central Africa, which will soon be laid before the public in greater detail, but of which the following outline is sufficiently curious: Major Clapperton and Captain Denham, in the course of their late expedition in that quarter of the world, arrived in the territory, and subsequently resided for some weeks, in the capital of a nation, whose manners and history seem likely to occupy, to no trivial extent, the attention of the public of this country—we might safely say of the whole civilized world. They found a nation jet black in colour, but not in our sense of the term *negroes*, having long hair and fine high features. This people was found to be in a state of very high civivization; and, above all, the British travellers witnessed a review of seven thousand cavalry, divided into regular regiments, and all clothed in complete armour. Six thousand wore the perfect hauberk mail of the early Norman knights: most strange by far of all, one thousand appeared in perfect *Roman* armour. The conjectures to which this has given rise are various. We confess for ourselves that looking to the polished and voluptuous manners ascribed to this people, the elegance of their houses, &c., &c.; in a word, the total difference between them and any other race yet discovered in the interior of "Africa, the mother of monsters," our own opinion is strongly that here we have a remnant of the old Numidian population—a specimen of the tribes, who after long contending and long co-operating with imperial Rome, were at last fain to seek safety in the central Desert, upon the dissolution of the empire. In these squadrons Messrs. Clapperton and Denham probably beheld the liveliest image that ever has been witnessed by modern eyes, of the legions of *Jugurtha*—may we not say of *Hannibal?* The armour, we understand, is fabricated in the most perfect style of the art; and the Roman suits may be taken for so many Herculanean or Pompeian discoveries, if it were possible for us to imagine the existence of genuine antiques, possessing all the glossy finish of yesterday's workmanship.

One of these travellers has already set off on his return to this sable court.—*New Times, Sept.* 27.

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* Copied from the London Philosophical Magazine and Journal for September 1825.

II. DOMESTIC.

1. *Chlorophœite.*

[From Professor Edward Hitchcock.]

I found a mineral several months ago, in the trap rocks about Turner's Falls, in Gill, Massachusetts, which Professor J. W. Webster of Harvard University pronounced to be the chlorophœite of Macculloch; and he has announced it as such in the Boston Journal of Philosophy and the Arts. The following is a short account of the mineral, as it exists at that locality.

It occurs for the most part in radiated masses, from the size of a pea to that of an ounce bullet. Several of these masses are frequently united, filling a cavity sometimes two inches in diameter. Sometimes the cavity is partly filled with calcareous spar, and more rarely the chlorophœite completely invests the spar. When newly broken in the interior of the rock, it is of a yellow green, or dark bottle green, and in some instances it is semi-transparent in small pieces. But on exposure to the air it turns darker: the change becomes obvious in half an hour, when the mineral is exposed to the direct rays of the sun; and in a few hours it is nearly black. As this change is going on, the radiated structure becomes less and less distinct, and in some specimens of a jet black colour it is scarcely to be discerned. All the nodules that appear at the surface of the rock have undergone this change of colour, and become black, dark green, or the dull muddy green of steatite; and the specimens are affected in the same manner to the depth of an inch, sometimes more, in the rock; although the rock is extremely tough and impervious. Some specimens, however, both on the surface and within the rock, are of a dark cinnamon colour; others, long exposed, become covered with rusty powder. It is so soft as easily to be scratched by the finger nail.

The chlorophœite exists abundantly at this locality, which is a projecting bed of greenstone in sandstone, about eighty rods below the principal cataract of Turner's Falls, on the north shore, twenty or thirty rods above the mouth of Fall river. Indurated clay, however, seems in this rock to have taken the place of the hornblende, and numerous small plates of feldspar are scattered through this base, constituting what has been denominated porphyritic greenstone. Prehnite, pyritous copper, and green earth, exist in the same rock.

The chlorophœite must be carefully distinguished from the radiated chlorite, which occurs in the same rock, in the same region. The chlorite consists of folia, disposed in a radiating manner: but the chlorophœite exists in minute acicular prisms, and may thus be distinguished. It is not always so easy to distinguish between the rusty powder of this mineral and the green earth.

I take the liberty of mentioning, through the medium of your Journal, that I feel anxious to obtain a series of specimens illustrative of the English rock formations, along with their characteristic fossils, as described in Conybeare and Phillips's late work on the Geology of England and Wales; and also a similar series of the rocks around Paris, as described by Cuvier and Brongniart. Should any gentlemen in this country, or Europe, be willing and able to furnish me with these geological specimens, I could return as many specimens as he should desire, of most of the following minerals: chlorophœite, siliceous oxide of manganese, spodumene, cleavelandite, green tourmaline, rubellite, argentine, chlorophane, sahlite, and the topaz described above. A line directed to me at Amherst, Massachusetts, on this subject, will meet with attention.

2. *Andalusite.*—I picked up a few specimens of this mineral in a stone wall, in the town of Westford, Mass. near the bottom of the hill, east of the village, on the road leading to Chelmsford. Not knowing the mineral at the time, I made little search beyond the piece of quartz containing it. It is in four-sided prisms, of a flesh-red colour, and is associated with a radiated talcose mineral, as described in the first edition of Cleaveland's Mineralogy. I write this notice from recollection, or I should be able to be more particular in giving the characters.

3. *Suggestion as to the Origin of Fountains.*

[In a letter to the Editor, dated Oxford, Ohio, Nov. 12, 1825.]

The singular fact that, if we bore down to a sufficient depth, water will rise to the surface and continue to flow from the cavity, has not, so far as my knowledge extends, yet been accounted for. I would not have presumed to address you, had I been acquainted with even a plausible hypothetical explanation. Certainty cannot, perhaps, be attained; and I hope, if I accomplish nothing more, to direct the attention of yourself and learned correspondents to the subject,—so very peculiar, but yet I believe pretty well established by experiment. The water which flows from fountains we suppose to have been mingled with the atmosphere in a state of vapour, and to have fallen from thence in the form of rain; and that thus a perpetual circulation is kept up. This in many cases may be, and no doubt is, the true explanation of the origin of springs; but I apprehend that such springs should depend in a greater or less degree upon the quantity of rain which falls in that particular region where they are situated; and though it is true that, during periods of great drought, the dew is very abundant, I believe that very nearly all that is not consumed in the support of vegetation is re-evaporated by the sun. Would it be fanciful, sir, to suppose it possible that, as many springs receive their support from the exterior of the earth, others may be supplied from the interior? It is pretty certain that our globe is intersected in various directions by caverns. The shock of an earthquake will in a few moments pass over a continent; which is scarcely possible, were the earth an uninterrupted solid. May not such fissures be filled with water? I think it at least possible, perhaps probable, that water preserves a communication throughout our globe, at different distances from the surface, according to the formation of the earth at any particular place. Now, if a passage be once opened for this subterraneous water, being specifically lighter than earth, the centrifugal force of our planet, revolving on its axis, would raise it to the surface, and cause it to overflow; and the supply being inexhaustible, and not affected by the moisture or dryness of the weather, the fountain would be perennial. It is certain there are never-failing springs in situations where any explanation which I have seen cannot be entertained for a moment. If you think my communication worthy of notice, I should be pleased to see your thoughts on the subject in your very valuable Journal.

Very respectfully, your humble servant, Z.

4. *Tails of Comets.*—A correspondent inquires whether "the tails of Comets may be accounted for from the peculiar

form of their orbits," and adds: "supposing them to be encircled with an atmosphere, like the planets, would not the incidence of the sun's rays upon them, in their very elliptical orbits, produce some such effect?"

The following extract from the Edinburgh Encyclopædia, article Comet, is probably as much to the purpose as any thing which can be said on a subject respecting which we can have no precise knowledge.

"Various opinions have been entertained by astronomers, respecting the tails of comets. They were supposed by Appian, Cardan, and Tycho Brahe, to be the light of the sun transmitted through the nucleus of the comet, which they believed to be transparent like a lens. Kepler thought that the impulsion of the solar rays drove away the denser parts of the comet's atmosphere, and thus formed the tail. Descartes ascribes the tail to the refraction of light by the nucleus. Newton maintained that it is a thin vapour, raised by the heat of the sun from the comet. Euler asserts that the tail is occasioned by the impulsion of the solar rays driving off the atmosphere of the comet; and that the curvature observed in the tail, is the joint effect of this impulsive force, and the gravitation of the atmospheric particles to the solid nucleus. Mairan imagines that comets' tails are portions of the sun's atmosphere. Dr. Hamilton, of Dublin, supposes them to be streams of electric matter; and Biot supposes, with Newton, that the tails are vapours produced by the excessive heat of the sun; and also that the comets are solid bodies before they reach their perihelion; but that they are afterwards either partly or totally converted into vapour by the intensity of the solar heat.

"Of all the theories, that of Euler seems to be the most philosophical. Since the comets are composed chiefly of nebulous matter, and have very large atmospheres, the external atmospheric strata must be drawn towards the comet by very slight powers of attraction, and will therefore yield to the smallest impulse. From the great density of the planets, on the contrary, and the small size of their atmospheres, the external strata are attracted towards them with a very great force, and therefore cannot yield, like those of the comets, to a slight impulse. Here we see the reason why the comets have tails, while none of the planetary bodies exhibit such a phenomenon. Whatever opinion may be entertained of this explanation, it must, at least, be admitted that, if light is a material substance, the atmospheric particles of a comet may have their gravity diminished to such a degree, either by their distance from its centre, or by the rarity of the nucleus, as to yield to the impulse of the solar rays, and be forced behind the nucleus, in the same manner as smoke yields to the impulse of the gentlest breeze.

" If this theory is well-founded, may we not form an opinion of the density of comets, by comparing their magnitude with the length of their tails; and may we not suppose that those comets which have no tails are more dense than others, and exercise over the particles of their atmosphere an attractive force, which enables them to resist the impulse of the solar rays."

5. *Lyceum of Natural History of New York.*—The first volume of the Transactions of this Society is completed, and forms a valuable addition to our collection of documents relating to American Science.

6. *Cutting of Steel, &c. by Iron*

[Extract of a letter to the Editor from Mr. Isaac Doolittle, dated Bennington Iron Works, Jan. 24, 1826.]

Having occasion, a short time since, to cut a plate of cast iron, three-eighths of an inch thick, it was thought that the plan recommended for cutting steel by iron might succeed in this case. Accordingly a disc of sheet iron was placed on an axis, and adapted to a water-lathe, in a manner to revolve with great rapidity. This disc would cut hardened or soft steel, or wrought iron, with much facility, but produced not the slightest effect on the cast iron, though the latter was very gray and soft. I confess I am quite at a loss to explain this difference in the action of the disc.

7. *Herpetology.*—Mr. Samuel F. Barker, of Andover, states that, being employed with others in making a stone bridge in the north parish of Andover, they discovered on taking up a large flat stone, (about three feet by five) a great body of living snakes, which had probably taken shelter there for the winter. They were stiff at first from the cold, but exhibited various signs of life when exposed to the sun. On being

counted there were found to be *one hundred and sixteen;* and what renders the circumstance more singular, there were various species, viz: black, striped, and green snakes, and house and brown adders, numbers of each. They were of different sizes, varying from six inches to two feet.—*Salem* (*Massachusetts*) *Gazette.*

8. *Population of New York.*—According to an enumeration recently made, the city of New York contains 162,391 inhabitants.

9. *Erie Canal.*—It is mentioned on good authority, that the tolls on the New York canals for this season, will amount to at least $500,000. This will be $100,000 more than was estimated by the commissioners of the canal fund. Last year the amount of tolls was $289,320.58; thus giving an increase to this year of at least $210,000!

10. *Lead Mines of the United States.*—The total quantity of lead received from mines belonging to the U. S. is 192,113 pounds—108,855 from Fever river. 83,255 from Missouri. The busines is yet in an incipient state, and the product of the next year it is estimated will yield the U. S. about 350,000 pounds. The mines are leased at the low rate of ten per cent. on the lead produced.

11. *Education of the Indians.*—From the report of the Indian agent, it appears there are no less than thirty-eight schools established in the Indian country by different societies, to aid in supporting which the U. States pay $13.550. The whole number of scholars are 1,159; number of teachers 281, including their families.

12. *Effects of Temperance.*—We find from the Registers of the Society of Friends, or Quakers, that as a consequence of their temperance, one half of those that are born live to the age of forty years, whereas Dr. Price tells us, that of the general population of London, half that are born live only two and three-quarter years!—Among the Quakers one in ten arrives to eighty years of age; of the population of London, only one to 40. Never did a more powerful argument support the practice of temperance and virtue.—*Rhode Island American.*

13. *Cold weather of the present winter*, (1825—6) *from the newspapers.*—The Portland (Maine) Argus states that the last day of January and first day of February were the coldest days experienced within the memory of the present generation. The mercury fell to 24 degrees below zero. At Bath on the same days the mercury was at 27, and at Brunswick 29 degrees below zero. The harbour of Portland was completely closed with ice, and the sleighing was good.

The Virginia papers state that the present winter has been the coldest for several seasons. On the 1st of February, at Petersburgh, the mercury ranged several degrees below the freezing point. There had been three falls of snow of considerable magnitude.

A man froze to death in Montreal on the night of the 31st ult. which was the coldest day experienced for years. Many persons had their faces frozen while walking through the streets. Thermometer 32 degrees below the freezing point.

A man was lately found frozen to death in Courtlandt town. —He was a stranger, and has not been recognised. A young man, supposed to be John Bare, was frozen to death on the 31st ult. in Greensburg. Both these towns are in Westchester county, New York.

At Goshen, Orange county, New York, on the 1st inst. the thermometer stood 11 degrees below 0.

In Boston, Roxbury, Salem, &c. from 12 to 17 degrees below 0. The Boston papers state, that a woman was frozen to death in Southac-street on Tuesday night; and a stage coach man on the line between Groton and Concord, was found frozen stiff upon his box on the road, holding the reins in his hand. He was dead, and the reins were clenched so fast, that they were obliged to be cut, before they could be extricated from his grasp.

At Montreal, Lower Canada, on the 31st of January, the mercury fell to 38 degrees before 0.

At Catskill, New York, on the 1st of January, to 14, and at Newburgh to 11 degress below zero.

At Keene, New Hampshire, it was 28 degress below zero.

The newspapers from every quarter, make mention of the severity of the cold on the night of the 31st January and morning of the 1st February.

	31st. Jan. & 1st Feb. below zero.
Salem, Mass.,	17
Gloucester, Mass.,	14
Chelmsford, Mass.,	17
Concord, N. H.,	26
Brattleborough, Vt.,	27
Hallowell, Me.	30
Plymouth, Mass.,	13
New Bedford, Mass.,	35
Springfield, Mass.,	18
Stockbridge, Mass.,	16
Portsmouth, N. H.,	19
Wiscasset, Me.,	24
Amherst, Mass.,	24
Dorchester, Mass.,	17
Danvers, Mass.,	16
Hartford, Conn.,	14
Wilmington, Del.,	26
Hamilton, Ohio, 24th Jan.	4

On the 5th of February, the thermometer,* Fahrenheit's scale, was forty and a half degrees below zero, at the telegraph, on cape Diamond, Quebec. This telegraphic station is near 400 feet above the level of the St. Lawrence.

14. *Officers of the Lyceum of Natural History of the Berkshire Medical Institution, elected September* 14, 1825.

CHESTER DEWEY, A. A. S., *President.*

DAVID HUNT, M. D.,
JOHN P. BATCHELDER, M. D. } *Vice Presidents.*
Rev. EDWARD HITCHCOCK,

HENRY K. STRONG, *Corresponding and Recording Secretary and Treasurer.*

JACOB PORTER,
HENRY H. CHILDS, M. D.
ORRIN WRIGHT, } *Curators.*
CHARLES A. LEE,
GARDINER DORRANCE,

15. *Mineralogy.*—A Manual of Mineralogy, in which the Science is illustrated by cuts in the text, and a considerable number of coloured engravings is preparing for the press, by J. L. Comstock, M. D. of Hartford.

* As mercury would have been frozen by this degree of cold, of course we presume that the observation was made with a thermometer filled with alcohol. EDITOR.

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Plate. 2.


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Vol X. p.

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C. oligocarpa
var Van Vleckii

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Schw.
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A. Do...

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C. Michauxii

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Fig. 22.

C. floridana. Schw

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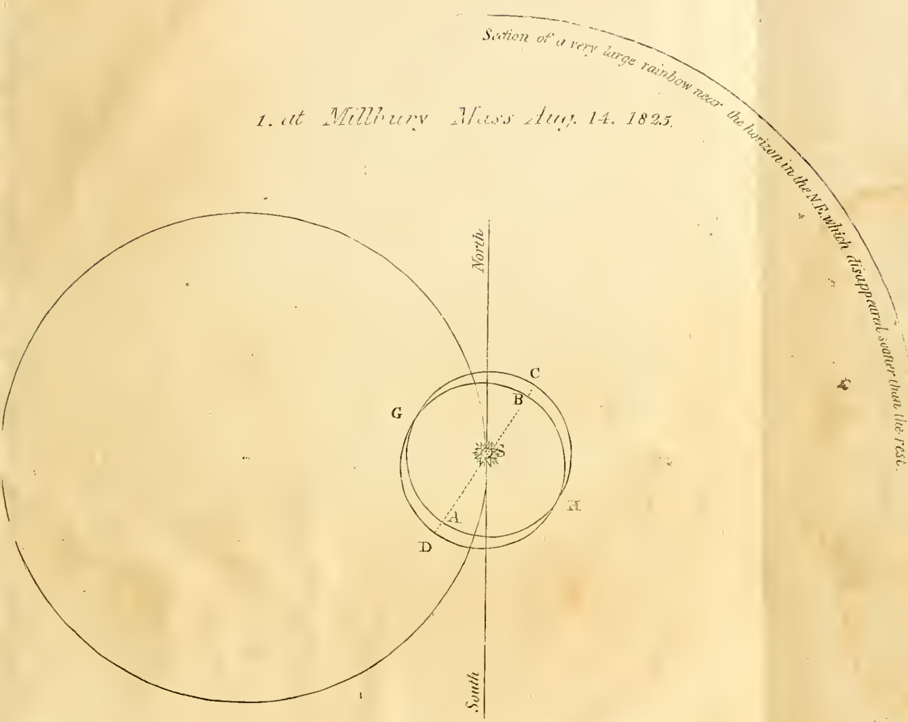
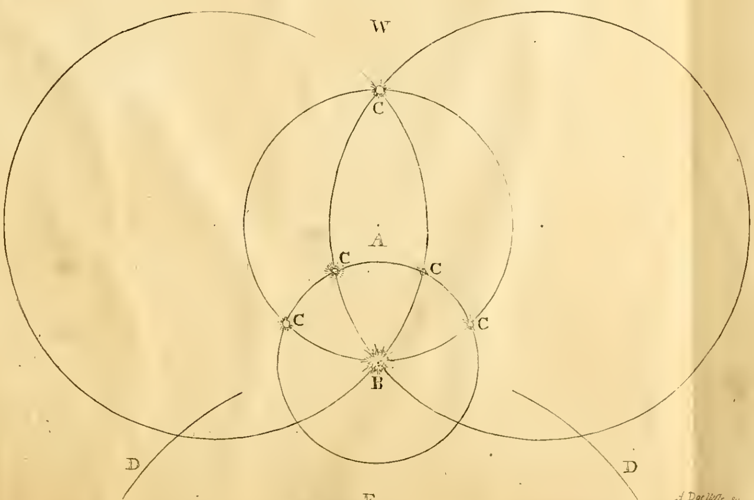
Fig. 23.

Diagram of luminous circles about the Sun.

1. at Millbury Mass Aug. 14. 1825.



2. at Jackson. Tennessee Aug. 19. 1825.



A. Doolittle sc