PL. 1.

FOSSIL JAW OF
RHINOCEROIDES ALLEGHANIENSIS.

From Childs & Inmans Press.

THE

MONTHLY AMERICAN JOURNAL

OF

GEOLOGY*

AND NATURAL SCIENCE.

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PROSPECTUS.

NATURAL HISTORY, at this time, engrosses a conspicuous portion of the literature of Europe. In our own country, at no period of its history, has a growing inclination for the study of nature manifested itself so decidedly as at this moment. We perceive this, in the favour with which numerous European republications are received here; in the general solicitude for an accurate exposition of the geology of this continent, and the impatience of our naturalists, restrained as they are from bringing forward, fairly and intelligently, the phenomena of American nature, and comparing them with those of trans-atlantic countries.

In Europe, naturalists form an extensive community, governed by the pure love of the science of nature. There is not a branch of natural knowledge that is not under investigation there, by men eminent in science. The study of the structure of our planet, and of the causes of those frequent renewals of its ancient surfaces; the dawnings of vegetable and animal organization, and their subsequent progress in functionary importance through those ancient surfaces, to the last order of creation, where man appears; the relation in which organized bodies have at all times stood to each other, both in respect to structure and subsistence; and their general manifestation of the benevolence and power of God: in all these branches of natural knowledge, the European philosophers have deeply engaged themselves, drawing their illustrations indifferently from every part of their continent.

Amidst these general contributions to science, it is painful to

* At the suggestion of numerous friends we have added the word *Geology* to our title.

perceive what conspicuous blanks are yet left for America to fill up, and especially in those important branches, American geology and American organic remains. This feeling is greatly increased by the occasional taunts and sneers we see directed against us, in foreign scientific works. They are aimed, it is true, against individuals insignificant enough to elude them, and therefore the larger body, the nation, is hit and wounded by them. Neither is there any defence open to us. We send abroad gigantic stories of huge antediluvian lizards, "larger than the largest size;" and we ourselves are kept upon the stare at our own wonders, from Georgia to Maine, until we find out we have been exulting over the stranded remains of a common spermaceti whale. At this present moment, a huge animal, dug out of the Big-bone-lick, sixty feet long, and twenty-five feet high, is parading through the columns of the European newspapers, after making its progress through our own. This is, what every naturalist supposed it to be, also a great imposition. Within these few days, too, a piece of one of our common coal plants, has been, with great note of preparation, conjured into a petrified rattle-snake. All these jibes and reproaches we ought to have been spared. There ought to have been the ready means amongst us, together with the independence and intelligence, to put down these impostures and puerilities as they arose.

It is for this object, as well as for the diffusion of the love of science at home, that this monthly journal is about to be established. Without any previous promise of patronage, it is offered to a numerous and intelligent community, and will seek to win its way to favour, by the industry, accuracy, and fair dealing of its editor, and by the enlightened philosophic spirit, unacquainted with pedantry, of the minds that will preside over it. If it should fail of success, the editor will always be able to make an honourable retreat, and not before he will have done some good. But of this he is not afraid. Sustained by the gifted friends who will come to his aid, both from Europe and from this country, the proofs of which he soon hopes to submit to the public, he enters upon the undertaking with cheerful confidence. He sees in the now restrained talents and knowledge around him, and in the ample domain of American nature, materials, that only wait to be touched, to start into life: and it is upon those talents he will call, and upon the public at large, to assist him to vindicate the natural history of America, and the reputation of American naturalists.

It is proposed to issue one number of this work monthly; each number to consist of fifty pages, with appropriate figures and illustrations, got up in an instructive and artist like manner.

Each number will contain a continuous *Essay on Geology* as a science, treated in an elementary manner, divested of all technicalities; so that the great principles, from which philosophical views of the arrangements and operations of nature are drawn, may be lucidly brought forward.

The various branches of Natural History, *Zoology*, *Botany*, *Mineralogy*, *Meteorology*, and the nature and forces of all *physical natural agents*, will be treated of and illustrated in a familiar and instructive manner.

Comparative Anatomy, together with the habits and propensities of animals; also the phenomena attending vegetable nature, especially American nature, whether fossil or recent, will be liberally discussed in the pages of this journal.

It is the intention of the editor to insert occasional papers on the aboriginal antiquities of this country, and on the structure of the Indian languages. All communications which aim at illustrating the physical and moral progress of our own species, will be favourably received.

The state of trans-atlantic natural science will be reviewed in each number. All new discoveries, and able examinations of their bearing upon natural science, will be noticed. *Chemistry* will be included as applied to all changes in nature.

Critical reviews and examinations of works on natural history will occasionally appear. Upon all these important subjects, approved original papers from correspondents, bearing the stamp of good sense, will be published on convenient occasions, leaving the writer responsible for facts and opinions.

It being intended to make this work accessible to the greatest number of readers, with a view to the most extensive diffusion of the knowledge of nature, it will be issued at an expense to the public, as low as the experiment can possibly be made with reasonable hopes of continuing the work.—The price, therefore, for about six hundred pages annually, with at least twelve octavo plates, illustrating a great variety of objects, is limited to $3 50 yearly.

As it is indispensable to the support and continuance of this work, that the proprietor be not exposed to the losses and delays attending the collection of so small a sum, it will be required to be paid on subscription, and will not be furnished without.

All scientific communications, post-paid, to be addressed, "*To the Editor of the Monthly American Journal of Geology and Natural Science, Philadelphia.*"

Communications on business to be addressed to "*Henry H. Porter*, proprietor of the *Literary Rooms, &c.* 121 Chesnut street, *Philadelphia.*"

The work will be conducted by G. W. Featherstonhaugh, Esq. Fellow of the Geological Society of London, Member of the American Philosophical Society, &c. &c.

John Mardon, Bookseller, No. 30, Jewin Crescent, Jewin street, Aldersgate, London, England, Agent.

Philadelphia, May 20th, 1831.

INTRODUCTION.

We are pledged in the Prospectus, to give in each number "a continuous *Essay on Geology* as a science, treated in an elementary manner, divested of all technicalities: so that the great principles, from which philosophical views of the arrangements and operations of nature are drawn, may be lucidly brought forward."

A series of such Essays, carried on, as we love to hope it will be, for a long period of time to come, will comprehend particulars of the highest importance, and form, at length, a work of some magnitude. Moved, therefore, by a desire to open the most ample field for the instruction and amusement of our readers, we propose to begin to redeem that pledge, by drawing up an epitome of the progress of Natural Science. But first we would remark, that there are many persons who have not yet turned their attention to Natural History, and who are still deterred from doing it, by the apparently insurmountable difficulties presented by the multifarious objects in nature, and the technicalities and names, so far apart from the ordinary terms of language. Such persons are agreeably disappointed, when they come to discover how gentle the gradations are between each step in the order of nature. A nomenclature raised upon artificial systems, and which has not for its basis the general harmony which connects all the parts of creation, is as repulsive, as it is unprofitable; for it disconnects the student from nature, the sole object of his pursuit. Such nomenclatures are becoming unpopular, natural systems are taking their place. The progress of science is uncertain and unsatisfactory, when it is attempted by any other means than practical observations of the affinities of the parts of nature. This is the true basis of all classification. Direct agreements between any two natural objects, form a true nucleus for natural families, which we increase by the accession of other individuals existing under the same conditions. The division of animated nature into two great groupes, vertebral and invertebral, affords great facilities to the student in zoology. Thus, all animals having backbones and skulls, are separated from all those without them, and which are protected by shells, and other external coverings. Here there is an apparent gap in the order of nature. Although we can profitably avail ourselves of the advantage this zoological division affords us in the study of nature, yet it by no means authorizes us to say, that nature has here made a jump from one scheme of structure to another, but rather it becomes us modestly to suppose, that our own observation is at fault, and that this apparent gap will ere long be filled up by the industry and genius of man. Liberal and active minds rejoice most in the contemplation of difficulties of this character; and certainly it is wiser, instead of being astounded at this specious transition, and proceeding to raise systems upon it, to take comfort in it, as hiatus non deflendus. Each of these great divisions contains innumerable objects, and by subdividing them, and classing those together, which have the most marked affinities for each other, we at length come to know all the individuals in nature, by designations drawn from features, which not only separate them from the rest, but which at the same time reflect their true place in nature; as the prismatic rays do for the beam into which they naturally blend themselves. In this manner the Conchologist, the Entomologist, the Botanist, the Mineralogist, acquire without effort the knowledge of several hundreds of thousands of objects in nature. We advise our readers, then, not to be deterred by difficulties which are more apparent than real; and not, on this account, to avert themselves from the great object of existence, the study of the Creator through his works. In the conduct of this periodical, we hope to give proofs that our intention is to make ourselves understood: to treat our subjects in an elementary and perspicuous manner. In short, we propose being useful to our readers, and not to occupy ourselves with making a specious parade of attainments, far short of what it becomes us to possess.

There is another, and a very numerous class of persons, that has been deterred from entering upon the study of natural history, by prejudices conceived against Geology, a science, which has not at all times been fairly treated either by its friends or enemies. Geology, in its most comprehensive sense, denotes the history of nature; for its various phenomena present themselves to the consideration of the naturalist, in relation with all the physical sciences. When geology, therefore, became obnoxious to the suspicion, that it was hostile to revealed religion, the study of its branches, to a certain extent, was looked upon with distrust, as disposing the mind to scepticism, and to the belief, that the parts of nature were independent of their Creator, because they partook of the perfection of all his works. The modern leaders of geology, have, by their industry, learning, and prudence, almost eradicated these groundless opinions.

In the by-gone days of theological zeal, when the majority of zealots almost amounted to unanimity, every writer on geology was supposed bound to confront all the physical phenomena with the *construction* given in a not very enlightened age, to that brief account of the origin of the world, contained in a venerable record devoted to the moral instruction of men. The Theologian said to the Naturalist, "You will find it recorded in the Bible, that the world was created out of nothing, about six thousand years ago, in the space of six days of our modern computed time; and that about four thousand years ago, it was overwhelmed by a deluge of water, which destroyed all living things that did not enter into the ark of Noah. The curious petrifactions you say you find, are the remains of the animals and plants, which lived from the creation to the deluge. This is what you must believe, if you will not run the risk of being driven from society as irreligious and anti-social."

In using the terms "brief account of the origin of the world," in reference to the Mosaic account, it is the *construction* given to a short passage in that Record, which it is mean to impugn, and not the record itself, in the reverence of which the writer of these pages has been educated. In the ancient patriarchal times, men believed the sun went round the earth, in consequence of the apparent motion of that luminary. It is stated in the Bible, that Joshua commanded the sun to stand still, when he encompassed Gibeon; and that "it stood still, and hasted not to go down a whole day." In recording events of a miraculous character, it is evident the historian spoke in such figures only as could be understood. Had the sacred writer said, that Joshua had commanded the earth to stand still, he would not have been comprehended. The assertion perhaps would have been deemed blasphemous, as contrary to God's laws. Connected with this natural prejudice, the force of education had given an ancient construction to the account in Genesis of the creation of the world, the effect of which has been to put physical and moral truths, apparently at variance with each other. But as truth cannot conflict with itself, we must look for the cause of this discrepancy in human errors.

It is not with a view to state how utterly hopeless it is to look for explanations of physical phenomena in pages consecrated to moral instruction; or how equally hopeless, and reprehensible too, it would be, to rashly look into revelation by the light of geology, that a recurrence to this passage in Genesis, will here be made; but rather to reconcile the theologian to a very simple construction of the passage alluded to, and which is found in the very opening of the Bible. "In the beginning God created the heavens and the earth." Now let the rule of the theologian be applied to this passage, and let it receive a literal construction. We here find the first notice of creation. We do not find it stated that the heavens and the earth were created six thousand years ago, or at any other definite period of past time. It is simply said, "In the beginning," a term, in the contemplation of which, the human mind is lost, amidst feelings of conscious weakness, and inexpressible humility. What that beginning is coeval with, we cannot conceive; we cannot come so near to that Being, to whom all time is but one present existence: but we can conceive painfully, after our human mode of thinking, of the solitary existence to which those would assign the universal Creator during the immeasurable period that preceded the six thousand years, at the commencement of which they choose to suppose the heavens and the earth were first created. These words, then, cannot mean the beginning of eternity, which has no beginning, nor are they placed there to assert that creation had a beginning, which would be superfluous, since we cannot conceive of an act without a beginning. Without reference, then, to any time whatever, we must regard it as a declaration, that the heavens and the earth were created, and by God, leaving room for no inference that they existed without a maker.

The next verse is still more explicit—"and the earth *was* without form and void." Here is a declaration that the earth *was;* that its creation had been effected, antecedently to that period of time usually called the six days of creation. Such we may suppose to have been the geological state of the earth, *void of all living forms*, at the period immediately preceding the establishment of the present order of nature, and which is stated to have been effected in the distribution of the six days' work mentioned in Genesis. Now we find no allusion in the Bible to the geological periods which preceded the restoration of the surface, or to the mineral and organic evidences which we now find, under such various circumstances, in the crust of the earth, and many of which lie at vast depths from the present surface. The inspired historian, had he been competent to the disclosure, would probably have deemed it foreign to the moral purpose he had in view, and would have preferred leaving such discoveries to the restless inquiries of man, always seeking to enlarge the boundaries of knowledge, and destined to construct, out of geological phenomena, one of the strongest bulwarks of natural theology.

It is evident, that it was not a principal object in the narrative of the Jewish cosmogony, to make such allusions, or to treat the physical subjects spoken of with any particular accuracy. The evenings and the mornings of the first, second, and third days are enumerated, before the creation of the sun is mentioned; and yet *evening and morning* can correspond to no portions of time, save those fixed by the setting and rising of the sun. It is on the fourth day only, the creation of the sun is mentioned. From these considerations, it may be reasonably maintained, that the account of the creation, in Genesis, concerns only the present order of nature, and is by no means involved with the ancient geological periods that precede all records. Under the influence of a spirit of mutual candour, we see here a common ground for the Theologian and Geologist to stand comfortably upon. One which brings prejudice neither to religion nor science, and which admits of our mutually co-operating to eradicate entirely the ancient errors, that our small planet was the sole motive of universal creation, that it is the centre of the universe, that the sun rolls round it, and that no part of it existed more than six thousand years ago. The greater part of this mass of error has indeed been in modern times, isolated and extirpated, but its influence still exists, in that most erroneous opinion which substitutes for the creation of the earth, the renovation of its surface.

It results from this method of considering the subject, that our planet is immeasurably more ancient, than the period assigned for its age, by the chronological constructions that have obtained so long, and that this immense antiquity is by no means at variance with the account in Genesis.

We shall close this first part of the duty we have imposed upon ourselves with these remarks. In our next number we propose entering upon an epitome of the rise and progress of natural science. At our opening of this great subject, we have been anxious to point out, what, in our opinion, have hitherto constituted material objections to the study of natural history. The first objection, connected with nomenclature and technicalities, it will be our duty to obviate; and we shall study to make our various subjects both instructive and agreeable, by explaining nature in such language as may befit the simplicity of her own operations. And in relation to the other point, we have no intention, and think we run no risk, of wounding the tenderest conscience. Our own opinions have long gravitated to a point far short of the extremes of bigotry and scepticism. Experience has made us indifferent to all theories which cannot be sustained by admitted facts, and a steady advance from the known to the unknown.

About to be booked in the mail for a long journey with our readers, over a country we are familiar with, we shall upon all occasions, endeavour to communicate what we know, in an unpretending and friendly manner. We shall not entirely rely upon the ducks, the geese, and the hay-stacks to be seen on the road, for conversation. And when we part, and our readers continue their travels without us, we are not without hopes that some of them will kindly say of us, that we were a useful and pleasant travelling companion. EDITOR.

RHINOCEROIDES ALLEGHANIENSIS.

Extract of a letter addressed to the Rev. Dr. Buckland, Oxford, containing a description of a fossil fragment of the jaw of an extinct animal, forming a new genus of the order Pachydermata, and provisionally named *Rhinoceroides Alleghaniensis.*—Vide Plate I.

"IN a former communication to Roderick J. Murchison, Esq., which was read before the Geological Society, the 2d January, 1829, I observed, that no trace of the Rhinoceros had been yet discovered on this continent.

"About fourteen months ago, I was so fortunate as to come into the possession* of a fossil having some very peculiar characters. I communicated to some friends at the time, that I had strong grounds to believe in the ancient existence here, of an animal approximating to the genus Rhinoceros. The anomalous character of this fossil, which consists of part of a jaw and two teeth, in fine preservation, made me hesitate about the publication of it. After much deliberation, I have at this time great confidence that there is no fallacy to be apprehended, and therefore I transmit a very excellent cast of the fossil to you, requesting you to present it, together with this communication, to the Geological Society, in my name. The cast being a composition of wax and lime, has shrunk in length half an inch, and otherwise in proportion. I shall, as soon as it is finished, transmit an engraving of the fossil, having the proper proportions.

"The mineral composition of this fragment, gives it a very anomalous character, and is a circumstance entitled to the particular consideration of geologists. There is nothing of the nature of bone about it, except the form: the whole substance, the teeth included, being constituted of an aggregate of small quartzose particles; and presenting the appearance, not of a gradual substitution by mineral infiltration, to osseous matter, but of a cast of part of a jaw and teeth, formed of small quartzose grit, and giv-

* By the kindness of my friend Benjamin Wright, Esq. He received it from Robert Fulton, Esq., who has obligingly furnished me the details of the locality where he obtained it.

ing a semi-translucency to the teeth, which is wanting to the more opaque jaw. These circumstances are somewhat imitated in the cast.

"It was found about three feet from the surface, lying immediately beneath the roots of an oak tree, 24 inches in diameter, which had been blown down, and was entirely rotten. The soil from which it was dug, was the common superficial soil, or diluvium of the country, as it is represented to me. I hope to visit the place this summer, and shall then have an opportunity of ascertaining whether the soil is alluvial or diluvial. Being found on the Castleman river, it may probably be the first—for I am not yet in possession of authentic evidence, that any organic remains of terrestrial quadrupeds, have been found in this country, in that deposit we are accustomed to call diluvium. The locality is in Somerset county, Pennsylvania, on Castleman's river, about 13 miles above the village of Turkey-foot. The superficial soil reposes on the mill-stone grit and shale, which is there superincumbent on the carboniferous lime-stone. There is much bituminous coal in that region.

"Dr. Harlan, of this city, an experienced comparative anatomist, was kind enough to take the comparative dimensions between this fossil, and the corresponding jaw of a rhinoceros indicus; a skeleton of which animal, lately imported from India, has been admirably set up by him, in the hall of the Academy of Natural Sciences, in this city. Those dimensions, which I now add, have been since verified by myself.

DESCRIPTION OF A FOSSIL FRAGMENT OF A JAW, WITH TWO INCISORS.

Comparative dimensions between it and the corresponding Jaw of the Rhinoceros Indicus, of Cuvier.

	RHINOCEROS INDICUS, CUVIER.		FOSSIL FRAGMENT.	
	Inch.	10ths.	Inch.	10ths.
Length of the right intermaxillary bone, inferior border, on a level with the alveolar process,	3	0	2	6
Length of the superior border,	4		3	1
Greatest height of intermaxillary bone,	2		2	
Greatest thickness,	1	3	1	3
Distance from the intermaxillary suture, to the place of the first molar,	2	5	5	

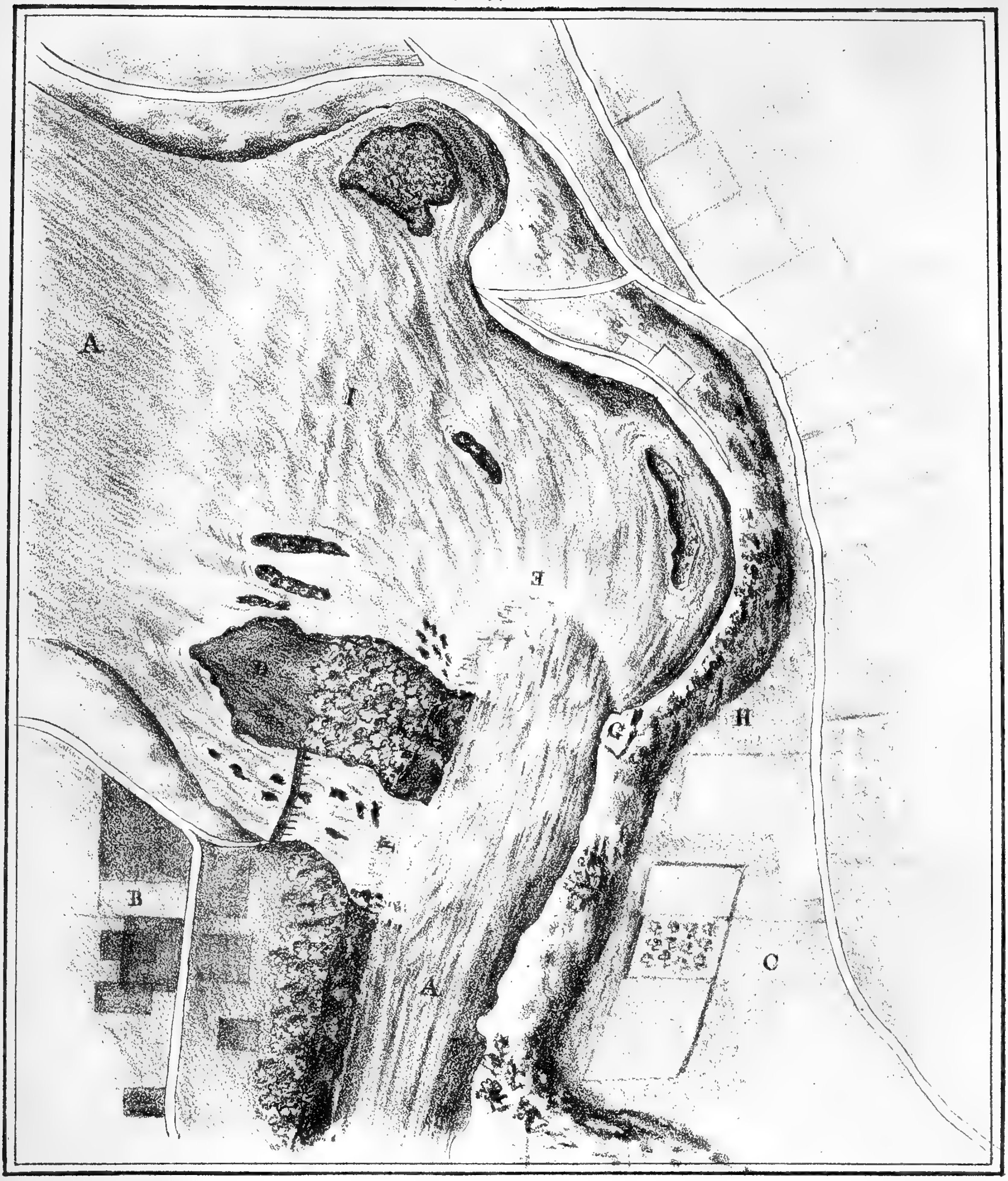
	Inch.	10ths.	Inch.	10ths
Shortest diameter in height of the superior maxillary bone, anterior to the molars,	2		1	7
Length of the single incisor, ...	2	3		
Do. of the 2 incisors, ...			2	3
Height of the same, ...		7		8
Distance from the anterior extremity of bone, to the curve upwards, to form the anterior nares, ...	6		5	5
Length of the cutting edge of the anterior incisor of fossil, ...			1	2
Do. . . . . . . do. of the posterior do. do.			1	1
Total length of the fossil fragment, ...			7	6

"I find nothing in the works of Baron Cuvier, or any other naturalist, which indicates any knowledge of this animal in Europe; and it is, as far as I am apprised, the first specimen of the kind discovered in America. Notwithstanding the affinity, which the agreement of these comparative dimensions appears to establish between it and the genus rhinoceros, still, the great space between the intermaxillary suture, (very distinct in the fossil,) and the place of the first molar, being in the fossil twice as much as in the recent R. Indicus: also the occupation by two incisors in the fossil, of the space allotted to one incisor in the R. Indicus, are conspicuous characters, which establish it as a new genus of the order Pachydermata.

"I forbear to ground any argument for a great antiquity to this fossil, from its mineral structure; and I leave to more experienced naturalists to determine, whether its period ought to be referred nearer to the Palæotherium, than to the elephant; the last of which animals, has left many remains here.

"Unwilling to designate it by any fanciful or philonymic appellation, and thinking that by some naturalists it may be judged to stand in the same relation to the genus rhinoceros, that the elephant does to the mastodon, I have provisionally named it Rhinoceroides Alleghaniensis, by which appellation I have attempted to convey in the simplest terms, its con-generic relation, and its territorial habitat. I remain, my dear sir, most faithfully yours, G. W. Featherstonhaugh.

Philadelphia, April 3, 1831.



A. *River Niagara.*
B. *U.S. Shore.*
C. *Upper Canada Shore.*
D. *Goat Island.*
E. *Horse Shoe Fall*
F. *Schlosser Fall.... 163 Ft. Perpen.r 1072...Wide*
G. *Table Rock. Carboniferous L. 150 Ft. Perpen.r*
H. *Ridge of Diluvium 130 Ft. above Table Rock and overlying it.*
I. *The Rapids on the Cherty Beds of ye Carb: L*
J. *West Brow of Goat Island 158 Ft. Perpen.r*
K. *Width of Brow 1287 Ft.*

From Goat Island to Table Rock..... 1221 Ft.
Curvature of Horse Shoe Fall.......... 2376 ..
Width of the River Niagara from the East End of Goat Island.........}... 5940 ..

FLAT VIEW OF THE
CATARACT OF NIAGARA.

ON THE ANCIENT DRAINAGE OF NORTH AMERICA, AND THE ORIGIN OF THE CATARACT OF NIAGARA.

By G. W. Featherstonhaugh.

I SHALL in this paper make some general observations upon the ancient drainage of North America, and then apply the operating principle to the history of the origin of the Cataract of Niagara.

Mr. Ure, in his new system of Geology, when discussing the influence which streams have had upon their beds, observes, (page 356,) "Historical documents all concur to prove, that streams possessing the greatest power that can be ascribed to them, have no appreciable erosive action upon the rocks over which they run." If this passage were limited to the influence they have upon the surface of their beds when covered with water, it could not be so easily disproved; but as it seems to include every possible mode by which streams can act upon their beds,—and these are various;—it deserves some consideration. The beds of many rivers of this continent, remain dry during a great portion of the year. The floors shrink and expand, as the weather alternates from moist to dry. Almost all the shales disintegrate, and indeed it may be said of all rocks laid bare, that they gradually yield to the influence of weather. The returning floods bear away the loosened fragments, and thus, in long periods of time, streams come to have a powerful action over their beds, widening their courses, and wearing their beds to great depths. But there are other circumstances, differing from these again, under which streams are constantly acting, and which prove that they exercise a remarkable erosive influence over their beds. These will be adverted to in treating of the origin of the cataract of Niagara.

There are many persons, among the great number who annually visit this magnificent waterfall, who cannot be made to comprehend, that it is a reasonable matter, to suppose the cataract, in ancient times, went over the Queenstown ridge, now near six miles distant from the present falls; and an engineer* of the state of New York, who appears to have had much experience in the surveys of that State, has published a paper in the proceedings of a learned society,† in which he denies that suppo-

* Mr. Geddes. † The Albany Institute.

sition, and supposes the ravine between Queenstown and the falls, through which the river Niagara flows, to be a natural gorge. I shall in this paper attempt to settle this question upon strict geological principles, and in a manner consistent with those obvious features which the physical geography of the lake country presents.

All our fresh waters are first derived from the atmosphere. If the surface of the earth had been smooth, without any inequalities, rains and floods would have abraded and torn it up. It would have been irregularly furrowed out in the manner we often see fields with a slight inclination. The waters would have been constant to no channel. In the train of consequences involved in such a state of things, we perceive the earth would have been uninhabitable. But it was not ordained so: the earth was intended to be the cheerful home of countless myriads of animals, susceptible of benevolent pleasures. The " dry land" was made to appear. Mountains were raised by subterranean power, and valleys were consequently formed. Instead of some parts of the earth being deluged with rains, and others remaining for years without refreshing showers, we find atmospheric action influenced by those mountains, and the rains drawn down upon their summits and flanks, furrowing out channels down their slopes, to unite themselves hereafter at the lowest levels, where the navigable rivers are found, that have contributed so much to the civilization of man. The accumulation of snow too upon these summits, is an immediate means of the continuity of streams. The inequalities of the earth's surface, form one of the most important features of the economy of nature. The face of the earth is constituted by a series of elevations and depressions. Where the chains of mountains are contiguous, the breadth of the valleys is comparatively small. In many instances, such valleys had their present terminations anciently obstructed, and at such time contained bodies of water. It is an interesting study for young Geologists to detect these ancient lakes, and find out the points where the waters have been able to discharge themselves. Where the chains of mountains lie at great distances from each other, the intervening country is to be considered as a vast valley or basin, the great rivers flowing through the lowest levels, and their tributaries joining them from the more elevated terraces of the basin. It is by this admirable adaptation of causes, that continents are drained, so many great purposes answered, and the whole volume of atmospheric waters finally returned to the ocean, whence it is again drawn up into the atmosphere, to be again and again distributed upon the earth, for its fertilization.

In seeking the lowest levels, the great rivers frequently embrace in their course, depressions or basins that do not conform to their mean breadth. These larger bodies of water, when spreading themselves far beyond such mean breadth, are usually called lakes. Others, from their extent, are well entitled to be called "inland seas." The origin of such lakes is various, and will not be considered at this time. Of the lake of Geneva, however, which forms part of the course of the Rhone, it may be remarked, that there are geological considerations belonging to it, which suggest, that in ancient periods, the vast basin in which its waters now rest, did not exist; and that it is not improbable an inclined solid plane existed between the Alps and the Jura. The small lakes of St. Francois, St. Louis, &c. on the St. Lawrence, are instances of this widening of rivers into basins. Lake Superior, and the great body of water constituting lake Michigan and lake Huron, belong to the class that might be called inland seas.

In that very useful and popular volume, "Darby's view of the United States," the author has had to struggle,—and not very successfully occasionally—through some interesting branches of a subject, he has, upon the whole, treated in an able manner. The language he holds, at page 65, of the mountains of the Appalachian system, being specifically and generally distinct from the hills, would, if not quite satisfactory, have been less obscure, had he, before venturing on a work of such importance, paid proper attention to a science, the value of which does not apparently rank very high in his estimation. Considering that his work was published in 1828, this is very surprising. In the preface we find the following passage. "Geology, as it stands in our books, being a science, (if it deserves the name of a science,) of conjecture, I have rejected, as far as practicable, terms that teach nothing definite." What books are here referred to, Mr. Darby has not stated; but this may be most truly said, that books were extant before 1828, the study of which would have enabled him to define, in a very precise manner, the particulars upon which every branch of physical geography depends, and especially, above all the rest, a system for mountain ranges. No man can reason luminously about the origin of mountains, or concerning their specific or generic character, to use Mr. Darby's terms, who is not a competent practical geologist. This important branch of American geology, remains yet to be judiciously treated of.

In this paper, the leading features only of this branch will be adverted to. A great portion of this continent is occupied by a central basin, the walls of which are constituted by ranges of mountains lying at great distances from each other. Long's Peak, is 15,000 feet high; this is the greatest known elevation of the Chippewayan or Rocky mountains. From thence the country slopes eastward. The plains on its east flanks, are about 3000 feet high, being near the medium elevation of the Alleghany mountains, which may be considered the Eastern wall of the basin. At the mouth of the Platte river, we have a reduced elevation of 680 feet above tide water, corresponding to the elevation at Pittsburgh on the west flank of the Alleghanies. At the mouth of the Ohio, where it joins the Mississippi, the depression of the basin, is only equal to 300 feet above tide water. The central line of drainage of this great basin, is occupied by the Mississippi, which receives from its northern and eastern slopes, the Wisconsan, the Illinois, the Ohio, &c. The longest line of drainage is occupied by the Missouri, north and west of the Mississippi, and receives from its western slope, until it joins the Mississippi, the Muddy, the Yellow Stone, and the Platte rivers, and afterwards the Arkansa and its tributaries, the Red river, &c. In about 50° N. lat. another chain of high lands,* connected with the Chippewayan mountains, begins, and runs N. E. between lake Winnipec, and the great Slave lake, of which region it is the water shed. South of this chain, the mean elevation of its table land is about 1200 feet. This chain, which is probably connected with the highlands running north of lakes Superior, Huron, &c. may be regarded as the ancient northern wall of the great basin now described. The table land is full of lakes, many of which have no connection with each other, except in the rainy season, when the Assinaboin and Red river of Hudson's bay, which run north, are said to mingle their waters occasionally with those of St. Peters, which flow southward

* Accurate details of this region are much wanted.

into the Mississippi. The south-east slope of this table land, furnishes the great eastern line of drainage of this continent. At some remote geological period, it is evident all the parts of this basin have been under water, which has subsequently retreated to the ocean; leaving behind those subordinate basins or inland seas now called lake Superior, lake Michigan, lake Huron, lake Erie, and lake Ontario, which are the true heads of the line of drainage by the St. Lawrence. Lake Superior is 595 feet above tide water. Lakes Michigan and Huron, which constitute one body of water, are 571 feet above tide water; whilst lake Erie is 565 feet, and lake Ontario only 231 feet. Thus whilst in the distance between Rainy lake, and lake Superior, consisting of 150 miles, we have a superficial depression of 505 feet, in the short distance of 25 miles between lake Erie and lake Ontario, we have a depression of 334 feet.

West of this depression, the conformity of level is such, that part of the waters of the great eastern line of drainage before spoken of, pass, in the rainy seasons, from their proper line, into the tributaries that feed the Mississippi. Boats have occasionally passed from South Michigan into the Illinois river: the difference of level between lake Huron and lake Erie may be rated as not exceeding 10 feet.

Such are the principal lines of drainage of this continent, all of which are well illustrated in Mr. Tanner's recent maps. But we are yet in want of many levels and projections of chains of mountains, to assist us in detecting the various basins where the waters have been held up, and the slopes and gorges by which they have issued. The immense boulders of primitive rocks, so profusely scattered over the face of this continent, attest alike the partial destruction of their ancient barriers, and the violence of the torrents which have borne them to such great distances. There is not one of the inland lakes, all of which may be considered as subordinate basins to the great American basin before spoken of, but furnishes the proof of a gradual subsidence of level. The ridges south of lake Erie, and from which the lake is now distant more than five miles, clearly attest that the lake at some period has washed their base, and discharged its waters into the tributaries of the Mississippi. In like manner we find evidences of a change of level in the waters of lake Ontario, in the existence of the ridge on the south shore, now several miles distant from the water; the corresponding banks of which are found on the north side of the lake, at great distances from the water, and extending far eastward into Canada. It was only when the waters began to contract themselves into lower levels, and when Ontario found an outlet by the St. Lawrence, that its ancient banks were abandoned, and the waters of Erie began to flow over the ridge which was continuous between Queenstown and the opposite shore of Lewistown.

In ancient times, when the whole country was under water, and Ontario and Erie were on a level, the cataract of Niagara did not exist: but when the general subsidence of waters took place, when Erie fell below the level of the Illinois, and Ontario below the level of the Queenstown ridge, the waters of Erie would of course take a direction to join the great eastern line of drainage. This we see they have done, and the following details will show the exact difference of level now existing between Erie and Ontario. It will be remembered that lake Erie is 565 feet above the level of tide water, and lake Ontario 231 feet. Although the levels heretofore enumerated in this paper, are to be considered as approximations made by intelligent travellers, and only in a few instances—from the necessities of the case—the result of accurate admeasurement; yet those hereafter to be spoken of, are accurate admeasurements, and entitled to confidence. Those explanatory of the cataract of Niagara and its environs, were carefully made by Mr. George Catlin, a very ingenious artist, for the purpose of constructing a model of the falls of Niagara upon scale, which was executed in a very admirable manner; and from which the flat view of the cataract, appended to this paper, was taken.

The distance from lake Erie to lake Ontario, is about $36\frac{1}{2}$ miles. The particulars of the fall of water in this distance, are shown in the following table:

	Feet.	Miles.
Fall from lake Erie to the rapids of the cataract of Niagara, - - - - - - -	15	23
Fall in the rapids to the edge of the cataract, -	51	$\frac{1}{2}$
The Horse-shoe fall, - - - - - -	150	
From the Horse-shoe fall to Lewistown, - -	104	13
From Lewistown to lake Ontario - - -	2	
	322	$36\frac{1}{2}$

The Queenstown ridge, which crosses the line of the Niagara river about six miles south of lake Ontario, is a little to the west of Queenstown, about 347 feet above the level of lake Ontario, and consists of the lower limestone shale of British geologists; having the carboniferous limestone superincumbent upon it, and the common diluvium or superficial soil of the country resting upon this last. In travelling up the gorge from Queenstown to the cataract, where the bed of the Niagara flows, this geological arrangement is constant, and at the cataract we find the shale 80 feet thick, and the carboniferous limestone lying upon it, 70 feet thick to the edge of the cataract. Higher up the stream, other beds of the carboniferous limestone appear, containing seams and patches of dark-coloured chert, which have furnished the name of Black Rock to a village at the mouth of lake Erie. This formation constitutes the floor of that lake, and may be said to extend through the whole western country.

At the general subsidence of the waters, before spoken of, it is evident that when the level of Ontario fell below the summit of the Queenstown ridge, the western waters would follow them, seeking the great east line of drainage. Here then we find the origin of the falls of Niagara, which would have their perpendicular height increased with the progressive subsidence of the waters of Ontario. These waters would soon clear themselves a passage through the superficial diluvium, and the manner in which the whole gorge has been excavated from Queenstown, to the point now occupied by the cataract, is attested by what we observe going on in our own day. The loose friable shale is loosened and washed out by the re-action of the fallen waters, and the superincumbent limestone losing its only support, yields to the weight of the water, and falls into the gorge. The well known Table Rock is an instance of this. The shale has been completely washed out from beneath it, and great portions of it have fallen, as other parts belonging to the edge of the cataract are constantly doing. It is also particularly deserving of notice, that the limestone beds immediately above the shale, are much thinner at the opening of the gorge, and the rock less capable of resisting attrition, than the superior beds which are so well compacted with the chert, and which the cataract is only now approaching. That the greatest portion of the rock which has hitherto fallen, has been comminuted, and washed away by the stream, as the whole of the shale has been, appears not unreasonable, and may account for the absence of a great portion of the fragments. There is scarce a single circumstance connected with this majestic cataract, which does not assist in the explanation of its retrocession.

As to the period which has elapsed since the waters first began to open the gorge, it is difficult to open a plausible ground upon which a reasonable calculation could be made; but there is one circumstance connected with them, which marks a difference of progress, at certain points of their retrocession. The distance from Queenstown to the falls, is between six and seven miles by the line of the gorge, the average breadth of which on approaching the falls, is about 1200 feet. By a reference to the plan,* it will appear, that up to the period when the waters which fall on the American side, first divided Goat Island from the main land, the whole force of the river Niagara, was exerted in one volume, upon a surface of 1200 feet in extent, forming the width of the gorge. Since that time the operative power of the water, has spread itself over a greater surface; for the stream on the American side, is 1072 feet wide, and the curvature of the great Horse Shoe fall 2376 feet wide, making a surface of 3448 feet long, being near three times the extent of the line it previously exerted itself upon.

This diminished exertion would necessarily be attended by a retardation in the retrocession of the cataract. There is also another circumstance which at present adds to this cause of retardation. The Horse Shoe fall has reached a point, where the limestone beds begin to thicken, and the foam of the rapids,† marks the presence of the terraces of cherty layers, which are here found superincumbent, and giving additional strength and durability to the limestone strata. I might offer as evidence of the very prolonged projection of the waters at this point, the deep basin in the bed of the river, immediately at the foot of the falls, which does not occur in the narrower parts of the gorge, and which has been hitherto unaccounted for.

It has often been proposed to mark in some well regulated manner, the future disintegration of the bed of this cataract,

* Vide plate 2d.

† On the British side where the current is most rapid, the bed of the river is 13 feet lower than on the American side.

with a view to compute the period of its age.* If I have not misconceived the operation of this river, it will now be seen that the elements of this problem are too complicated and vague, to offer any hopes of a satisfactory solution. Under the view I have taken of it, its future retrocession will be very slow. Time, however, will last longer than the carboniferous limestone can probably resist such influences as it has already yielded to. When the cataract shall reach lake Erie, geology will possess one great monument of the power of water to excavate gorges of great length and height.

THE DIARY OF A NATURALIST.

Or Memoranda of the weather; arrival of birds; flowering of plants, &c. for the spring of the year 1830. Kept at the "Bartram Botanic Garden," on the right bank of the river Schuylkill, below the city of Philadelphia. By John B. Carr.

TO THE EDITOR OF THE MONTHLY AMERICAN JOURNAL.

Dear Sir—I send you for publication "The Diary of a Naturalist," kept at my particular request, during the spring of 1830. If the *observations* are not so complete as the interest of the subject might imply, it must be recollected that the author seldom extended them beyond the immediate sphere of his daily occupations.—Having the most perfect reliance on the ability and talents of Mr. Carr for pursuits of this nature, I have perused the "*Diary*" with much satisfaction, and cannot doubt that the subject which it embraces will be viewed with similar interest by yourself and readers.—I have the honour to be most respectfully, &c. R. HARLAN.

March 1. Wind, a strong north-east, with snow and rain. Large flights of robins, (TURDUS *migratorius*,) feeding on the red-

* Mr. Lyell, in his principles of Geology, (Vol. I. p. 181,) has,—supposing that the disintegrating power of the volume of the Niagara river, will at all times be equal, at every point of its course—ventured on a computation, that, at the rate of fifty yards in forty years, lake Erie will be reached in the course of thirty thousand years. That the recession of these falls is effected as Mr. Lyell supposes, we have never doubted; but a long and familiar acquaintance with the cataract, has induced us to adopt the opinion we have just seen announced by the Rev. W. D. Conybeare, (Annals of Philosophy, No. 52. April, 1831. Page 267,) that in forming the first estimates of this computation "some partial degradation of the strata has here been mistaken for the general retrogradation."

cedar berries, (JUNIPERUS *virginiana*,) in the vicinity of the garden. —A small flock of cow-birds, (EMBERIZA *pecoris*,) were observed feeding in the woods, with many blue-birds, (MOTACILLA *sialis*,) which have probably been deceived by the mild weather of the last week of February.—Spring, or winter aconite, (ERANTHIS *hyemalis*, *vel* HELEBORUS *hyemalis*,) snow-drop, (GALANTHUS *nivalis*,) hearts'-ease, (VIOLA *tricolor*,) and skunk cabbage, (POTHOS *fœtida*,) in flower. In the hot-house we have a fine AMARYLLIS in flower, from Rio de Janeiro. This afternoon two vessels sailed up the Schuylkill, the first this season.

2. Snow has fallen all night, and this morning is three inches deep—continuing to snow all day, and at sunset is eight or ten inches deep—wind NE. moderate—at 8. P. M. clear and freezing.

3. Fine sleighing in the morning, but commencing to thaw in the middle of the day—in the evening the sleighs were going through the mud—wind NE.—at sunset clear and cold, wind SW.

4. A fine March morning; the winter wren, (MOTACILLA *troglodytes*,) crested titmouse, (PARUS *bicolor*,) and black capped titmouse, (PARUS *atricapillus*,) are singing about the house as merry as crickets. The flowers are several inches under the snow yet —wind NE., and freezing.

5. A fine thawing day. Wind SW.—Thermometer 54° at 3 P. M. During the morning the jay-birds, (CORVUS *cristatus*,) kildeer plover, (CHARADRIUS *vociferus*,) and flicker, (PICUS *auratus*,) were observed—snow beginning to disappear.

6. Rained until noon—3 P. M. thermometer at 50°—in the afternoon very foggy—blue-jays and large flocks of meadow larks, (ALAUDA *magna*,) are flying about—wind SW.

7. Morning warm and drizzling—very foggy—blue-jays, winter wrens, blue-birds, kildeers, crested titmouse, &c. about the house. In the morning there was a shower of rain from the W. with thunder in the distance. Lightning in the SSE.—wind brisk from the SSW.

8. A clear warm morning: about 10 A. M. wind changed to NW.—weather colder—saw a flock of wild pigeons (COLUMBA *migratoria*,) and cow-buntings. Began freezing about 5 P. M.

9. Ice this morning an inch in thickness. Clear and cool, wind NW., moderate. In the middle of the day thawing in the sun— crow blackbirds, (GRACULA *quiscala*,) are seen about the house, very tame—freezing in the evening—wind WSW.

10. Fine moderate day—wind SW.—at 3 P. M. thermometer 44° in the shade. Robins are observed flying about. This morning commenced work in the garden.

11. Warm and hazy—8 A. M. thermometer 40°—wind SSW. rather brisk—clouded at 11 o'clock with every appearance of rain—evening foggy, wind N. and cool—large flocks of red-winged black-birds, (STURNUS *predatorius*,) passing to the north, and large numbers of ducks in the Schuylkill. The snow has not entirely disappeared, but I have observed the beautiful early veronica ——— in flower; (this lovely blue flower has puzzled our botanists;) common mouse-ear chick-weed, (CERASTIUM *vulgatum*,) appears as if it had flowered all winter, as there are ripe and half ripe seeds, and flowers on the same plant at present.

12. Warm and clear—wind SW.—thermometer at noon 47°.

13. Morning cloudy—thermometer 38°—at 10 A. M. cleared up warm—wind SW., very strong.—Frost flower, (DRABA *verna vel* EROPHILA *vulgaris*,) in bloom—wild geese, (ANAS *canadensis*,) passing to the north—evening cloudy.

14. Fine spring morning—large flocks of red-winged black-birds and crow black-birds flying toward the north—wind brisk from NW.—thermometer at noon 48°.

15. Warm and clear, wind NW.—planted peas, potatoes, &c. this day.

16. Cloudy and cool—wind NE.—thermometer in the morning 34°—at noon 40°—primroses, (PRIMULA *vulgaris*,) in flower in the open border.

17. Rain, and strong NE. wind in the morning—SW. in the afternoon—NW. in the evening. Rained all day—the pewits, (MUSCICAPA *nunciola*,) have arrived.

18. Rain continues—wind SW.—about 10 A. M. shifted to NW.—Filberts and hazlenuts, (CORYLUS,) in flower.

19. A fine lively morning—a little ice and frost—wind NE.—thermometer at 10 A. M. 45°—3 P. M. 54°—wind NNW. Last evening the spring frogs, (RANA *flavi-viridis*,) were heard for the first time this season. In the evening a fine light breeze from the west.

20. Fine morning—wind SW.—thermometer at 9 o'clock A.M. 45°—at 3 P. M. 54°—evening 50°.— Flickers singing.

21. Drizzling in the morning—wind SW.—thermometer at 9, 3, and 5 o'clock, 53°, 60°, and 54°. Shad frogs, (RANA *halecina*,)

and leopard frogs, (RANA *palustris,*) have made their appearance —a pair of winter wrens are building their nest in one of the green houses—song sparrows, (FRINGILLA *melodia,*) cheer us with their music to-day.

22. Morning clear and warm—large flocks of wild geese flying towards the NE.—11 A. M. distant thunder towards WSW.—commenced raining at 4 P. M.—cleared at sunset.

23. Last night experienced a heavy thunder storm, accompanied with heavy driving rain from WNW.—morning fine—robins singing—wind NW.—afternoon blustering and cool.

24. A slight skim of ice this morning—weather clear and fine —wind NE.

25. Fine day until evening—robins continue their song—commenced snowing toward evening—wind NE.

26. Rain—stormy wind from NE.—large flights of wild pigeons flying toward the south—the whole township up in arms shooting at them.

27. A fine moderate day—wind SW. Henbit or archangel, (LAMIUM *amplexicaule,*) in flower.

28. Morning clear, with a blustering wind from the NW.—afternoon fine weather—thermometer at 3 P. M. 54°.

29. Warm and slightly hazy—wind NE.—kingfisher (ALCEDO *alcyon,*) flying about—red owl, (STRIX *asio,*) hooting—blue-flowered houstonia, (HOUSTONIA *cœrulea,*) in flower.

30. Weather fine and warm—*Claytonia Virginica,* and speedwell, (VERONICA *arvensis,*) in flower.

31. Raining nearly all day—wind NE.—in the afternoon changed to NW. and cleared about sunset.

April 1. A fine day—wind SW.—apricots in bloom—peaches nearly open—shad fishing has commenced in Schuylkill—at 8 P. M. raining.

2. Continued raining all day—martens, (HIRUNDO *purpurea,*) have arrived from the south.

3. Weather fine and clear—wind SW.—Dutchman's breeches, (CORYDALIS *cucullaria, vel* DICLYTRA *cucullaria,*) in flower—pewits beginning to build their nests.

4. Fine weather continues—wind SW. Colts-foot, (TUSSILAGO *ptasites,*) witch hazle, (HAMMAMELIS *virginica,*) weeping willow, (SALIX *babylonica,*) and cornelian cherry, (CORNUS *mascula,*) in flower.

5 & 6. Clear and warm—wind SW.

7. Clear and cool—wind N.—red-headed wood-peckers, (PICUS *erythrocephalus,*) are seen about the garden.

8. Clear and pleasant—wind SW.—apricots, peaches, red maple, (ACER *rubrum,*) hazlenut, primroses, narcissus, jonquils, &c. in flower.

9. Morning cloudy, with every appearance of rain—wind NE. —clear at noon—ground ivy, (GLECHOMA *hederacea,*) and puccoon, or Indian paint, (SANGUINARIA *canadensis,*) in flower

10. A NE. drizzling wind has continued all day.

11. A fine clear day—wind ESE. and S.—spice wood, (LAURUS *benzoin,*) Lombardy poplar, (POPULUS *dilatata,*) and skunk cabbage in flower—the little sparrows (FRINGILLA *socialis,*) are plenty now.

12. Clear and warm—wind SW.

13. Fine weather continues—wind NE. Barn swallows, (HIRUNDO *americanus,*) and purple martins are now plenty.

14. A cold, disagreeable day—wind NE.—afternoon showery.

15. The finest day we have enjoyed this spring—CALTHA *palustris,* TRILLIUM *sessile,* TRILLIUM *grandiflorum,* JEFFERSONIA *diphylla,* ANDROMEDA *calyculata,* and service-tree, (PYRUS *botryapium,*) in flower.

16. Fine weather continues—wind NE.

17. Warm and pleasant—in the afternoon wind SW.

18. Warm and cloudy—wind NE.—at 10 A. M. cleared up.

19. Morning and part of the afternoon clear and fine—in the evening cloudy, with the wind NW.

20. Morning disagreeably cool, with white frost—afternoon fine weather—hyacinths in full bloom.

21. Clear and warm—goldfinches, (FRINGILLA *tristis,*) have arrived.

22. Fine weather continues—chimney birds (HIRUNDO *pelasgia,*) and house wren, (MOTACILLA *domestica,*) have arrived—cow buntings are pairing.

23. Very warm—the plants suffer much from the prevailing drought—wind SW.—red bud, (CERCIS *canadensis,*) and European horse chestnut, (ÆSCULUS *hippocastanum,*) in flower—wood-robin, (TURDUS *melodius,*) chewink, or tohee-bunting, (EMBERIZA *erythropthalma,*) and summer yellow-bird, (SYLVIA *citronella,*) have arrived.

24. Clear and dry—wind SW. and W.

25. Very foggy and warm—wind E. and ENE. and variable.

26. A very acceptable rain which terminates the 11 days drought.

27. A smart frost last night—ice was formed from the condensed vapours of the green house—wind NW.

28. Clear and warm—wind SW.—CERASTIUM *tenuifolium*, STELLARIA *pubera*, tulips, horse-chestnuts, magnolias, double-flowering cherries, sweet scented shrubs, (CALYCANTHUS *floridus*,) and lilac, (SYRINGA *vulgaris*,) in full bloom.

29. Morning cool and cloudy—afternoon fine and warm—wind SW. Made a visit to New Jersey—observed the SILENE *pennsylvanica*, EUPHORBIA *ipecacuanha*, ARABIS *lyrata*, ANTIRRHINUM *canadense*, HELONIAS *latifolia*, &c. in flower. The night-hawk, (CAPRIMULGUS *americanus*,) was noticed.

30. Clear—pleasant SW. wind. The whole garden appears animated with birds—orioles, sparrows, fly-catchers, warblers, thrushes, humming birds, (TROCHILUS *colubris*,) &c. are seen in every direction.

May 1. Clear and fine—wind SW. The shad fishing recommenced this morning, having been suppressed since Monday, April 26, on account of the freshet.—Birds as plenty as yesterday—garden overrun with visiters.

2. Fine weather continues—wind SW.

3. Morning warm, with showers—afternoon steady rain—wind SE. and NE.

4. Clear and warm—wind SW.—seeds of the white maple (ACER *dasycarpum*,) ripe and shedding.

5. Clear and warm—reed birds (EMBERIZA *oryzevora*, now ICTERUS *agripennis*,) have made their appearance—night-hawks are observed flying about, and the whip-poor-will (CAPRIMULGUS *vociferus*,) was heard during the evening.

6. Fine and warm—removed the plants from the green house to-day—STELLARIA *pubera*, SPIREAS, and VIBURNUMS in bloom.

7. Morning cool—slight frost—wind NW.

8. Clear and warm—wind SW.

9. Weather pleasant—wind NE. and SW.

10. Fine weather continues—yellow breasted chat, (GARRULUS *australis*,) singing.

11. Warm and dry—wind SW.—night-hawks setting.

12. Morning cool—a few humming birds were shot to-day. These birds are not so plenty this year, as they were last season.

13. Morning drizzling—wind NE. light—afternoon cloudy but no rain.

14. Light rain in the morning—afternoon clear.

15. Clear and warm—wind SW.

16. Clear and warm—rode up to the gulf mills, about 17 miles NW. of Philadelphia, and observed some plants of ginseng, (PANAX *quinquefolia,*) and GERARDIA *quercifolia* growing near the road. Caught a rare species of *scarabœus.*

17. Morning foggy—remainder of the day clear and warm.

18—21. Warm and clear—southerly winds prevail.

22. Warm and clear—evening cloudy, with every appearance of rain—wind SE.

23. Cloudy—commenced raining at 2 P. M. and continued until evening.

24. Clear and warm—occupied in preparing plants, rare flowers, fruits, &c. for the *Horticultural* exhibition, to be held by the society in Philadelphia, on the 25th and 26th.

25. Cool and cloudy in the morning—wind NE. brisk.

26. Warm and clear.

27. Clear and warm—brought the plants home from the exhibition uninjured.

28. Fine weather continues—the humming birds are building their nests.

29. Very warm—wind SW.

30. Drizzling all day—wind ESE.

31. Clear and warm—wind SW.

June 1. Morning cloudy, and drizzling—the *humming birds* have commenced incubation.

2 and 3. Clear and warm—wind SW.

4. Rain—wind NE.

5. Clear and pleasant—a few of the periodical or 17 years locust (CICADA) singing.

6. Rain—wind NE.

7. Clear and warm.—Summer has commenced.

ON NOMENCLATURE.

We are glad when French naturalists attack the false nomenclatures that spring up on this side the Atlantic. This has been done in the March number, for 1829, of the Bulletin des Sciences Naturelles et de Geologie. No doubt they have had some reason to amuse themselves at our expense; we are not the less afraid on that account, of their giving us credit for some sober views of Natural Science. With few exceptions, the naturalists of this country appear decidedly opposed to conjectural and fantastical speculations, and are averse to seeing science trifled with, in any quarter whatever. But they cannot shut their eyes to the innovations of some of the more conspicuous French writers. It is admitted that natural history is under the deepest obligations to the labours and genius of Cuvier. Every man in France, however, does not possess the sound judgment of that great naturalist. Science is occasionally tricked out in that quarter, with a frippery that disguises it.

The invention of the terms ophiolite, euphotide, phyllade, &c. &c. as substitutes for serpentine, saussurite, slate, &c. &c. is likely to be a failure, as far as it concerns us on this side of the Atlantic. We venture to predict as much for the extraordinary nomenclature proposed in the article "Theorie" in the 54th Vol. of the Dictionnaire des Sciences Naturelles: an article replete with geological learning and acumen, but so endimanché, that we are really ashamed to go into such company with hammers and chissels about us. In this article, all geological phenomena are divided into two periods. The Saturnian, comprehending every thing that occurred before *the last revolution*, (*???*) and the Jovian, comprehending what has occurred since. The superficial soil, or deposits of *diluvium*, as we have been in the habit of calling them, we are now asked to call "*Terrains Clysmiens.*" The upper fresh water, "*Terrains Epilymniques.*" The upper marine "*Terrains Proteiques.*" The London clay "*Terrains Tritoniens.*" The gravel beds of the plastic clay "*Terrains Clastiques.*" The chalk "*Pelagique Cretacés.*"

The old Saxon weald clay is to be again subdued by the Norman French, and to be called "*Mons argile veldienne.*" Kimmeridge clay is christened over again, and is called "*marne argileuse havrienne:*" there being a handful of it at Havre, and a world of it in England, where it was first recognized and named. Then come the "*Terrains Yzemiens Abyssiens*," the "*Pœcilien*," the "*Psammite*," the "*Hemilysiens*," the "*Agalysiens*," all of which are our old friends in fancy ball-dresses; the *Lias*, the *gypseus red sandstone*, the *old red*, the *transition limestone*, and the *primitive rocks*. The *trap rocks* are "*Terrains Typhoniens*," because the giant Typhon is buried in the earth, and is constantly endeavouring to heave up the crust!!! We give the following passage, as a specimen of this new geological language, and will endeavour to translate it.

"I will content myself then, with saying, that I will place in the *clastic groupe* of the *Tritonian Thalassic beds*, the deposits composed of rounded pebbles, which, by their superior position to the cretaceous beds, cannot be placed in the *clastic* beds of the *pelagic* deposits: and by their position below *palæotherian thalassic* beds, cannot be associated with the *gompholites of the proteique groupe*."

This is the solemn determination come to, in favour of some puddingstone beds, below the London clay of Morlage and other places. We know of nothing equal to it, out of Pinkerton's Petralogy; where *Sidereous*, *Diamictomic*, *Transilient*, *Hyponomes*, *Micronomes*, and heaven knows what nomes beside, dance the mazes.

We see where the shoe pinches. The English language, especially in geological matters, is overshadowing the langue universelle. Point de reméde! The English blood and tongue are doing wonders, physically and morally, all over the world. What unborn millions have to succeed us here, when we shall all be quietly stowed away in the Terrains Clysmiens! It animates us to think what great things will be achieved here, when the love and knowledge of nature will be diffused through this vast continent. G. W. F.

ADJUDICATION OF THE WOLLASTON MEDAL TO WILLIAM SMITH.

We were surprised to see in Dr. Brewster's "Edinburgh Journal of Science," for April 1831, some observations in article XIII. on the late adjudication of the Wollaston medal to William Smith, which would dispose persons at a distance from England, to believe, not only that "English science was in a degraded and declining condition," but that "the few rewards which genius can command, are not judiciously conferred."

The late Dr. Wollaston left the Geological society £1000, and directed the interest to be applied in "promoting researches concerning the mineral structure of the earth, or in rewarding those by whom such researches might hereafter be made; or in such manner as should appear to the council of the said society for the time being, conducive to the interest of the society in particular, or the science of geology in general." He also enjoined the society "not to hoard the dividends parsimoniously, but to expend them liberally, and, as far as might be, annually, in furthering the objects of the trust."

On the 18th of February, 1831, the first award of this valuable and most honourable medal, was made to Mr. W. Smith, "in consideration of his being a great original discoverer in English geology; and especially for his having been *the first in this country, to discover and to teach the identification of strata, and to determine their succession, by means of their embedded fossils.*"

William Smith, a mineral surveyor by profession, drew up his tabular view of the strata exhibited in the district of Bath, in 1790. Upon this he subsequently raised the great geological truth of the regular succession of the formations. In 1815 his geological map of England appeared. This astonishing performance of an unassisted individual drew praises from all Europe. D'Aubuisson said of him, "That which the most distinguished mineralogists have effected for a small portion of Germany, in half a century, William Smith has undertaken and done for all England." What Newton did for our knowledge of the universe, by announcing the law of gravity, William Smith has done for our knowledge of the systematic structure of the crust of the earth, by making us acquainted with the unerring language of embedded fossils. To one mind only, belongs the glory of opening the eyes of mankind, to each of these great truths. That glory is indivisible in its nature. No human being, whilst time and civilization shall endure, can, from the nature of the case, ever dispute Mr. Smith's claims to this distinction.

We put it to the candour of Dr. Brewster himself, a distinguished benefactor to science, whether, upon the first distribution of Wollaston's honour, it was not justly and nobly done by the members of the Geological society, who owe so much to his labours and genius, to draw Mr. Smith from his retirement, and confer upon him, by common consent, what he could so justly claim to receive; instead of practising the more calculating policy of opening a door to it for themselves, by his exclusion. Our private letters, from various friends present at the delivery of this medal, speak of the occasion as both impressive and affecting. It was a tribute publicly paid, by some of the most enlightened minds in Europe, to a pre-eminent leader in their science, in his old age. The act itself was, to us, a sufficient proof that English science was not in "*a degraded and declining condition.*" Looking at the wonderful progress geology has of late years made, and assigning their proper share of the merit of advancing this most liberal and attractive pursuit, to the English geologists; we should be inclined to hold up the progress of science in England to the admiration of the world.

We congratulate Mr. Smith most cordially upon the distinction conferred on him. Of a respectable, yet unpretending origin, he has been raised by some generous minds, to the rank of a prince of the order of nature. The thing has been well done. We know and honour the men who have done it, and many a happy day have we geologized with the venerable and amiable man they have delighted to honour.

In the admirable address of the Rev. Adam Sedgewick, president of the geological society of London, on the delivery of the Wollaston prize, after recapitulating the interesting history of Mr. Smith's discoveries, we find the following passage touching the difficulty he found in attracting the public attention to his labours. "He suffered, as many men of genius have done before him, in his peace and his fortune, from what, in our estimation, constitutes his chief honour—from outstripping the men of his own time in the progress of discovery."

We also quote with pleasure, the following eloquent passages.

"I for one can speak with gratitude of the practical lessons I have received from Mr. Smith: it was by tracking his footsteps, with his maps in my hand, through Wiltshire and the neighbouring counties, where he had trodden nearly thirty years before, that I first learned the subdivisions of our oolite series, and apprehended the meaning of those arbitrary and somewhat uncouth terms, which we derive from him as our master, which have long become engrafted into the conventional language of English geologists, and through their influence, in part, also adopted by the naturalists of the continent.

"After such a statement, gentlemen, I have a right to speak boldly, and to demand your approbation of the council's award. I could almost dare to wish, that stern lover of truth, to whose bounty we owe the "donation fund"—that dark eye, before the glance of which all false pretensions withered, were once more amongst us. And if it be denied us to hope, that a spirit like that of Wollaston should often be embodied on the earth, I would appeal to those intelligent men who form the strength and ornament of this society, whether there was any place for doubt or hesitation? Whether we were not compelled, by every motive which the judgment can approve, and the heart can sanction, to perform this act of filial duty, before we thought of the claims of any other man, and to place our first honour on the brow of the father of English geology.

"If, in the pride of our present strength, we were disposed to forget our origin, our very speech would bewray us; for we use the language which he taught us in the infancy of our science. If we, by our united efforts, are chisseling the ornaments, and slowly raising up the pinnacles of one of the temples of nature, it was he that gave the plan, and laid the foundations, and erected a portion of the solid walls, by the unassisted labour of his hands.

"The men who have led the way in useful discoveries, have ever held the first place of honour in the estimation of all, who, in aftertimes, have understood their works, or trodden in their steps. It is upon this abiding principle that we have acted; and in awarding our first prize to Mr. Smith, we believe that we have done honour to our own body, and are sanctioned by the highest feelings which bind societies together."

We now quote the following passage from article XIII. of the Edinburgh Journal of Science, as furnishing the complete refutation of the general censure intended by it. "When a philosopher, however, carries on his inquiries by the sacrifice of a half, or even a third of his whole professional income, and when this loss is increased by the purchase of expensive apparatus; the acquisition of a pecuniary reward cannot be unwelcome, independent of the honour with which it is accompanied. Upon this principle, prizes should always be adjudged to the person who really deserves them," &c. &c.

This is Mr. Smith's case exactly; he has devoted the whole of his fortune towards the illustration of the geology of his native country: and this noble prize, founded by one of the ornaments of our race, has been adjudged to him, because he, more than any man alive, really deserved it. F.

THE EARL OF BRIDGEWATER'S BEQUEST.

The unjust censure which has been lately passed upon the Geological Society of London, for using the discretionary powers vested in them, in awarding the first Wollaston Medal to Mr. William Smith, will eventually lead to an inquiry into the manner in which all similar trusts have been executed both in Europe and this country. We therefore present our readers with the following very interesting statement. We ourselves consider Mr. Davies Gilbert to have acted with great judgment upon this occasion. Had he announced this splendid prize for the thousand and one writers, ever ready to enter the field, and to cabal with their friends for the preference, he would effectually have excluded the eminent persons he has appointed. They are not men to devote their time to objects of uncertain attainment. At present the world may be sure the important trust will be worthily executed, being confided to individuals who have every motive that can urge men to distinguish themselves, comprehending their own and their country's reputation, *and being well paid for their labours.* EDITOR.

"Statement respecting the Legacy left by the late Earl of Bridgewater, for rewarding the authors of works, to be published in pursuance of his Will, and demonstrative of the Divine attributes, as manifested in the Creation." By Davies Gilbert, M. P. V. P. R. S.

TO THE EDITORS OF THE PHILOSOPHICAL MAGAZINE AND ANNALS.

Gentlemen,—The following short statement respecting the late Earl of Bridgewater's legacy of eight thousand pounds, and of the final arrangements made in consequence of it, may possibly be thought not unworthy of a place in your Journal.

The Rev. and Right Honourable Thomas Henry Egerton, Earl of Bridgewater, died in the month of February, 1829, at Paris, leaving his last will and testament, bearing date on the 25th February, 1825, in which he desired and directed his trustees to lay out and invest in their own names, in some one of the public stocks or funds of Great Britain, the sum of eight thousand pounds sterling; the said sum, with all accruing dividends thereon, to be held at the disposal of the President, for the time being, of the Royal Society of London, to be transferred, paid, and applied, according to the order and direction of the said President of the Royal Society, in full, and without any diminution whatsoever, in such proportions, and at such times, according to his direction and judgment, and without being subject to any control or responsibility whatever, to such person or persons as the said President, for the time being, of the aforesaid Royal Society, should or might nominate, or appoint, and employ. And he thereby declared his will and particular request to be, that some person or persons should be nominated and appointed by the said President, to write, print, publish, and expose to public sale, one thousand copies of a work on the power, wisdom, and goodness of God, as manifested in the Creation; illustrating such work by all reasonable arguments; as, for instance, the variety and formation of God's creatures in the animal, vegetable, and mineral kingdoms; the effect of digestion, and thereby of conversion; the construction of the hand of man, and an infinite variety of other arguments; as also, by discoveries, ancient and modern, in arts, sciences, and the whole extent of literature. And he desired that the profits arising from and out of the sale of the aforesaid work, should be paid by the said President of the Royal Society, as of right, as a further remuneration and reward, to such person or persons as the said President of the Royal Society should so nominate, appoint, and employ; with a further power to advance the sums of £300, and of £500, during the writing and printing of the said work.

The testator appointed John Charles Clarmont, Thomas Phillips, and Eugene Auguste Barbier, Esquires, executors and trustees of his will. And these gentlemen, on the 14th July, 1830, invested the devised sum of £8000, in the purchase of 3 per cent. consolidated Bank Annuities, which now stand in their names for the above specified purposes.

The late President of the Royal Society having ascertained from a noble Lord immediately connected with the deceased, that his family were desirous of having the objects of the bequest executed, proceeded as follows:—

He was fully aware of the duty imposed on him to select persons amply qualified for discharging in an adequate manner the task they would have to perform; and he was also impressed with the conviction, that, however carefully a selection might be made, several gentlemen must be omitted, possessing the requisite qualifications, equally, perhaps, with those who received the appointment.

For the purpose, therefore, of acquiring the most able assistance, and placing the whole transaction above even the suspicion of favouritism, or partiality, the late President was induced to request the aid of two individuals, as highly distinguished by their abilities and by their learning, as by the eminent stations which they hold in the hierarchy of this country, where able and intrepid champions have never been wanting to vindicate the natural and moral attributes of the Divinity against the equally dangerous attacks of infidelity, fanaticism, and imposture.

The two distinguished prelates, the Archbishop of Canterbury and the Bishop of London, most readily condescended to afford their assistance; and after much deliberation, and with the concurrence of the noble Lord above alluded to, the work has been placed in the hands of the following eight gentlemen.

The Rev. William Whewell, M. A. F. R. S. Fellow of Trinity College, and Professor of Mineralogy in the University of Cambridge.

The Rev. John Thomas Chalmers, Professor of Divinity at Edinburgh.

John Kidd, Esq. M. D. F. R. S. Regius Professor of Medicine in the University of Oxford.

The Rev. William Buckland, D. D. F. R. S. Canon of Christ Church, and Professor of Geology in the University of Oxford.

Peter Mark Roget, Esq. M. D. Sec. R. S.

Charles Bell, Esq. F. R. S. Surgeon.

The Rev. William Kirby, M. A. F. R. S.

William Prout, M. D. F. R. S.

Each being pledged to take a part, as designated by the testator, most adapted to his acquirements and to his pursuits: and thus it is confidently hoped and expected, that a work entrusted to such individuals, will appear, as a whole, worthy of the age and of the country about to give it birth.

INFLUENCE OF CLIMATE ON THE FRUITFULNESS OF PLANTS.

By a Correspondent.

The cultivated plants yield the greatest products near the northernmost limit in which they will grow.

I have been forcibly impressed with this fact, from observing the productions of the various plants, which are cultivated for food and clothing in the United States. The following instances will go far to establish the principle, viz:

The cotton, which is a tropical plant, yields the best staple, and surest product, in the temperate latitudes. The southern parts of the United States have taken the cotton market from the East and West Indies, both as regards quantity and quality. This is partly owing to the prevalence of insects within the tropics, but principally to the forcing nature of a vertical sun. Such a degree of heat developes the plant too rapidly—runs it into wood and foliage, which become injuriously luxuriant; the consequence is, there are but few seed pods, and these covered with a thin harsh coat of wool. The cotton wool, like the fur of animals, is, perhaps, designed for protection; and will be thick and fine in proportion as the climate is warm or cool. Another reason is to be found in the providence of the Deity, who aims to preserve races rather than individuals, and multiplies the seeds and eyes of plants, exactly as there is danger of their being destroyed by the severity of the climate, or other causes. When, therefore, the cares and labours of man counteract the destructive tendency of the climate, and guarantee their preservation, they are, of course, more available and abundant.

The lint plants, flax, hemp, &c. are cultivated through a great extent of latitude; but their bark, in the southern climates, is harsh and brittle. A warm climate forces these plants so rapidly into maturity, that the lint does not acquire either consistency or tenacity. We must go far north in Europe, even to the Baltic, to find these plants in perfection, and their products very merchantable. Ireland is rather an exception as to latitude; but the influence of the sun is so effectually counteracted there by moisture, and exposure to the sea air, that it is always cool: hence, the flax and potatoe arrive at such perfection in that region.

It holds equally true in the farinaceous plants. Rice is a tropical plant; yet Carolina and Georgia grow the finest in the world; heavier grained, better filled, and more merchantable, than any imported into Europe from the Indies. The inhabitants of the East Indies derive their subsistence almost exclusively from rice; they must be supposed, therefore, to cultivate it with all skill and care, and the best contrivances for irrigation. Such is, however, the forcing nature of their climate, that the plant grows too rapidly, and dries away before the grain be properly filled. Indian corn, or maize, if not a tropical plant, was originally found near the tropics; and although it now occupies a wide range, it produces the heaviest crops near the northern limit of its range. In the West Indies it rises 30 feet in height; but with all that gigantic size, it produces only a few grains on the bottom of a spungy cob, and is counted on only as rough provender. In the southern part of the United States, it reaches a height of 15 feet, and will produce 30 bushels to the acre; in the rich lands of Kentucky and the middle states it produces 50 or 60 bushels to the acre; but in New York and New England, agricultural societies have actually awarded premiums for 150 bushels to the acre, collected from stalks only seven feet high. The heats of a southern sun develope the juices of this plant too quickly. They run into culm and blade, to the neglect of the seed, and dry away before fructification becomes complete.

Wheat is a more certain crop in New York, the northern part of Pennsylvania and Ohio, and in the Baltic regions of Europe, than in the south either of Europe or America. In the north, snows accumulate, and not only protect it from the winter colds, but from the weavil, Hessian fly, and other insects that invade it; and in the spring it is not forced too rapidly into head, without time to mature fully, and concoct its farina.

A cold climate also aids the manufacturing of flour, preserving it from acidity, and enables us to keep it long, either for a good market, or to meet scarcities and emergencies. Oats grow in almost every country; but it is in northern regions only, or very moist or elevated tracts, that they fill with farina suitable for human sustenance. Rye, barley, buckwheat, millet, and other culmiferous plants, might be adduced to illustrate the above principle; for all their habits require a more northern latitude than is necessary to their mere growth.

The grasses are proverbially in perfection only in northern and cool regions, although they will grow every where. It is in the north alone that we raise animals from meadows, and are enabled to keep them fat, and in good condition, from hay and grass alone, without grain. It is there the grasses acquire a succulence, and consistency enough, not only to mature animals, but to make the richest butter and cheese, that contribute so much to the tables of the luxurious. The grasses which do, often, in the south, grow large enough, are without richness and nutriment; in hay, they have no substance; and when green, are too washy to fatten animals; the consequence is, most animals in those latitudes browse from necessity, and are poor, and without size or beauty. It is the same hot sun which forces them to a rapid fructification, before they have had time to concoct their juices. The sugar cane produces, perhaps, better where it never seeds, than in the tropics; for the juices will never ripen so as to granulate, until checked by frost or fructification. In the tropics, the cane grows twenty months before the juices ripen; and then the culm has contracted a woody, fibrous quality, to such a degree as to resist the pressure of the mills, and yields but little juice, and that to an increased effort. In Louisiana we succeed well with the sugar culture; because, whilst the culm is succulent and tender, a white frost checks the growth, ripens the juices, and in five months gives us a culm, tender, full of juice, easy to press, and yielding much grain of sugar. When Louisiana, therefore, acquires all the necessary skill, she will most probably grow this article cheaper than the West Indies.

Tobacco is a southern plant, but there it is always light and chaffy; and although often well-flavoured, it never gains that strong narcotic quality, (which is its only peculiar property,) unless you grow it as far north as Virginia. In the south, the heat unfolds its bud or gem too soon, forces into full expansion the leaf, and drives it to seed before the narcotic quality can be properly elaborated. We may assert a general rule applicable to all annual plants, that neither the root, nor the leaf, acquires any further size or substance after fructification.

The tuberose, bulbous, and other roots, cultivated for human and animal subsistence, are similarly affected by climate, and manifest habits in corroboration of the above principle. The Irish potatoe, although from or near the tropics, will not come to perfection but in northern or cool countries, or in moist, insular situations, as Ireland. It is in such climates alone, that its roots acquire a farinaceous consistence, and have size, flavour, and nutriment enough to support, in the eminent way in which they are susceptible, animal life. In the south, a forcing sun brings the potatoe to fructification before the roots have had time to attain their proper size, or ripen into the proper qualities for nourishment. In Ireland the plant grows slow, through a long and cool season, giving time for its juices to be elaborated, and properly digested; hence that fine farina and flavour which characterizes them. The sweet potatoe produces larger, better flavoured, and more numerous roots in Carolina, where it never flowers, than in the West Indies. In the latter place this plant runs wild, covers the whole face of the earth with its vines, and is so taken up in making foliage, that the root becomes neglected, and is small and woody.—In order to have the onion in perfection, it must grow through two years, swelling all the time its bulbs. In the south, however, it seeds in one year, and before it has made much bulb. Beets, carrots, parsnips, turnips, radishes, and other roots, are equally affected by a hot sun, and scarcely worth cultivating far to the south. They all fructify before they have formed perfect roots, and make foliage at the expense of their bulbs; hence they will always be articles of commerce; the south will have to depend upon the north for them.

The sallad plants are in like manner affected by climate, and give further proofs of our assumption. Cabbages, lettuces, endive, cellery, spinage, plants whose leaves only are eat, to protect their germs from cold, (through a kind of instinct,) wrap them up in leaves, which form heads, and render many of their other parts tender and crisp for use. These leaves, thus protected, are not only tender, but more nutritious, because their growth has been slow, and their juices well digested. In the south, a relaxing sun lays open the very buds of such plants, gives a toughness and thinness to the leaves, and they are too unsubstantial for animal support, because of such quick and rapid developement.

The delicious and pulpy fruits are, in a still more striking way, illustrative of our principle. The peach, nectarine, plumb, apple, cherry, currant, gooseberry, apricot, and many other such families, are not in perfection in the south. It is in Pennsylvania, Virginia, Maryland, Jersey, and in the north of Europe, that we enjoy them, although, originally, they came from places near the tropics. The peach of the Carolinas is full of larvae, gum, and knots, and too stringy and forced to be juicy and flavoured. The apple of the south is too acerb to be either eaten or preserved. The plumbs, apricots, cherries, currants, gooseberries, &c. will not even mature until we go far north. All the trees which bear these delicious fruits will grow luxuriantly in the south, make much foliage and wood, with but little pulp, and that unsavory. The kernel in the one-seeded fruit, seems to be the first object of nature in southern climes: that becomes strong, oily, and enlarged; and one of the peach family has so entirely neglected the pulp, that it has only a husky matter around the kernel, as the almond. The changeableness of the weather in the south, in the spring season, throws plants off their guard; the frosts attendant on those changes, destroy the young fruit; and it is only one year in three that the crop hits at all. The desiccated or dried state of these fruits enables us to enjoy them through the year; but in the south their acidity carries them into fermentation or decomposition before they can be divested of their aqueous parts. The climate of the south is equally against converting them into cider, or any other fermented liquor, because the heat forces their compressed juice so rapidly into an active fermentation, that it cannot easily be checked until it passes into vinegar. For the same reason distillation goes on badly in hot climates, and cannot be checked long enough at the proper point to give much alcohol; and whether we aim to enjoy the delicious freshness of these fruits themselves, sip the nectarin of their juices, refresh ourselves with their fermented beverage, stimulate our hearts with their brandies and cordials, or feast through the winter upon the dried or preserved stores of their fruits, we are continually baulked by the severity of a southern climate, and for such enjoyment must look to the north.

The melons are always affected by too great a degree of heat, even though their vines flourish so much in southern latitudes. The forcing sun hurries them on to maturity before they have attained much size, or acquired that rich saccharine and aromatic flavour for which they are so much esteemed. The cantelope melon will rot, or have its sides baked by a hot sun, before it is fully formed; and the water-melon is always woody, dry, and devoid of its peculiar sweetness and richness in the south. Vines have been known to run 100 feet, and bear no melon. It is in Philadelphia, and its neighbourhood, and in similar latitudes, that the markets are loaded with delicious melons of all sorts, whose flavour so much refresh and delight us. It is there, near their northern limit, that we cultivate them with such uniform success.

The orange, strictly a tropical plant, is more juicy, large, and delicious, at St. Augustine, (Florida,) than at Havana; and fruiterers, in order to recommend an orange, will say that it is from some place out of the tropics. In the West Indies, the pulp of the orange is spungy, badly filled with juice, and has too much of a forced flavour to be pleasant. The hot-house forcers of Europe, or at Rome, anciently at first produced bad fruit; too dry, too small, and without flavour; because they overacted. They have lately found out that fact, and now the productions of the hot houses of London, Paris, &c. astonish and delight us with the quantity and excellence of the fruit. They have found out that gradual and uniform heat is the desideratum; countervailing the cold, rather than imparting much heat. Fruit thus produced, is pronounced better than any grown in the natural way, however perfect the climate.

The juices of the grape are best matured for wine near the northern limit of their growth. On the Rhine, in Hungary, the sides of the Alps, and in other elevated or northern situations, the wine is strongest, richest, and most esteemed. The French wines rank before the Spanish and Italian; and in no southern country of Europe or Africa, except Madeira, where elevation makes the difference, is the wine in much repute. The grapes of France are more delicious for the table than those of Spain or Madeira. In the southern part of the United States, the excess of heat and moisture blights the grape to such an extent, that all attempts have failed in its cultivation. The grape vine, however, whether wild or cultivated, grows there very luxuriantly. The vinous fermentation can also be best conducted in a climate comparatively cool; and all the pressing, fermenting, and distillation of the juice of this delicate fruit, can be safer and more profitably managed in a mild region.

The olive, and other oleaginous plants, yield more fruit, of a richer flavour, and can be better pressed, and the oil preserved, in a mild climate. In France the tree is healthier, and the fruit and oil better than in Spain or Italy; and the Barbary States are known to import their oil from France and Italy.

Many other plants might be named, whose habits would equally support our position. It is presumed, however, that enough have been cited to call the attention of philosophy to this curious subject, and enable us to give proper attention to it, in all the practical operations of agricultural pursuit. Much time and expense might be saved, and profits realized, if this were more generally understood.

We have already observed, that the heat of the sun in southern climes forces plants to a false maturity, runs them on too rapidly to fructification, and renders dry and woody the culms, stalks, and leaves of the plants, where these parts are used. Hence the chaffiness of the leaf, the dryness of the culm, the lightness of the grain, and the unsavory spungy quality of the pulp of the plants in those latitudes. Hence the difficulty of fermenting their juices, distilling their essences, and preserving for use the fruit, juice, or blades of such plants. The prevalence of insects is another bar to the productiveness of southern plants: swarms of them invade and strip the leaves, bore the fruit, and lead to blight and decomposition; and just in proportion as the labours of man have rendered plants succulent, and their fruits and seeds sweet and pleasant, do these insects multiply on them, devour their crops, and defeat the objects of husbandry.

The labour of man too is more conservative in northern climates, because his arm is better nerved for exercise, his health and spirits more buoyant; and instead of saying, "go and work," he says, "come and work;" treads with a cheerful heart upon his own soil, and assists in the cultivation, collection, and preservation of his own productions. It is in temperate climates that man can be most familiar with nature; it is there he has the best opportunities of observing the guarantees which nature has for the preservation of her animals and plants against the devastation of the elements; he sees an occasional apparent neglect of individuals, but a constant parental care of races. In every thing he sees the wisdom and benevolence of God. W.

SCIENTIFIC MEMORANDA.

We are indebted to our friends of the Lyceum of natural history at New York, for the following report. We announce for our next number a general paper on the osteological remains of extinct animals found at Big Bone lick, in which the bones noticed in this report will be examined in detail. The able friend to whose pen the scientific public will be indebted on this occasion, is a perfect master of the subject, and has personally examined that remarkable Kentucky deposit. EDITOR.

REPORT of Messrs. Cooper, J. A. Smith, and Dekay, to the Lyceum of Natural History, on a collection of fossil bones disinterred at Big Bone Lick, Kentucky, in September, 1830, and recently brought to this city, (New York.)—Read May 30, 1831.

The Committee beg leave respectfully to report, that these bones, having been landed only within a very few days, sufficient time has not been afforded them, for the accurate determination of every imperfect, or mutilated fragment. The greater part, however, belonging to well known animals, were immediately recognized, and it is not believed that anything of much importance will be hereafter observed. They therefore submit, this evening, a general account of this collection, reserving, for a future occasion, such further particulars as may be deemed of sufficient interest.

The remains of the great Mastodon compose more than one half the entire quantity of which this collection consists. Among them is a head, which, though not entire, is in better preservation than any of this animal heretofore discovered. It enables us to form a better idea of the figure of this important part, than could hitherto be obtained. It is found to have the cranium much depressed, in which it deviates remarkably from the elephant. Both the tusks are preserved, one having been found still in the socket, and the other lying at a short distance off.

Of other large tusks, there are besides, five that measure from six and a half to twelve feet in length, and many more large fragments of others.

Six portions of upper jaws, all containing teeth.

Fifteen portions of lower jaws, twelve of which contain from one to three grinders each.

Besides these, there are seventy-three detached molar teeth of all sizes, some of them as large as any yet discovered.

Of the large bones of the anterior extremity, there are five scapulæ, seven humeri, three ulnæ, and one radius, more or less perfect.

Of the posterior extremity, six ossa innominata, ten femora, and five tibiæ. Some of these are almost entire; others are much mutilated.

It is necessary to observe, that although these large bones, as well as the detached tusks, have all been provisionally referred to the Mastodon, yet it is not improbable that on a further comparison, a part may be found to belong to the fossil elephant. The mutilated condition of some, renders it extremely difficult to pronounce with certainty upon a slight examination.

The remains of the fossil elephant comprised in this collection, are next in interest and number, to those of the mastodon.

The first that we shall notice, is the head of a young individual, more complete than any known to your committee to have been, as yet, obtained in North America. It consists of the upper and lower maxillary bones, with six molar teeth in good preservation. Isolated grinders of the elephant have been discovered in the United States in numerous instances, but generally without any portion of bone adhering to them. There are also of the elephant in this collection, several other large fragments of jaws, and twenty separate molar teeth.

Of the horse, there are perfect teeth, and other portions, found under circumstances that favour the belief of their being of equal antiquity with the extinct animals whose remains are associated with them in the collection. The teeth are remarkably large and sound.

Of ruminating animals, there are skulls and other parts of the Buffalo, *Bos Americanus;* of the extinct species named by Dr. Harlan, *Bos bombifrons;* and of a large species of *Cervus*, resembling *C. alces.*

Finally, we have also discovered among these interesting relics, some considerable portions of the *megalonyx*, whose osteology is still so imperfectly known. The most important of these is a right lower maxillary bone, with four teeth in the socket, and another detached tooth which appears to have come from the upper jaw. There is also a tibia of the right leg, and perhaps some other bones which may prove to belong to the same animal.

Mr. Cooper's Denial.—Mr. Cooper has requested us to state, that he never expressed the opinion attributed to him in the American Journal of Science and Arts, for April, 1831, respecting a fossil supposed by Mr. Eaton to be a petrified crolalus. On the contrary, he told Mr. E., that he thought it a plant, and in writing to Dr. Torrey shortly after, mentioned that it was a plant of the family Lycopo diaceæ. It never entered into his mind to refer it to Arundo, which belongs to a very different tribe of plants.

This public denial has been rendered necessary by the following passage of Silliman's Journal, at page 173, in the number above alluded to.

" One of our most accurate devotees to the study of recent organic relics, William Cooper, Esq. of the New York Lyceum, has examined it. He is in doubt, but is inclined to believe it an arundo, or some plant of that family. EDITOR."

Megalonyx Laqueatus.—Dr. Harlan read a paper, March 8, 1831, before the Academy of Natural Sciences of Philadelphia, descriptive of the fossil bones of a new species of the megalonyx, discovered in White cave, Kentucky.

The bones of the megalonyx Jeffersonei, were discovered in 1796, buried two or three feet beneath the surface of a cave in Green Briar county, Virginia. Those of the megalonyx laqueatus, now described, were found on the surface of the floor of White cave. They consist of two claws of the fore feet; a radius, humerus, scapula, one rib, and several fragments; the oscalcis, tibia, a portion of the femur; four dorsal, and one lumbar vertebra; a portion of a molar tooth, from the fluted appearance of which the specific appellation, (laqueatus,) is derived. Dr. Harlan has illustrated his paper with three lithographic engravings.

On the same evening, Dr. Harlan read a paper descriptive of an extinct species of fossil vegetable of the family Fucoides. This paper, with a lithographic engraving, is published with the preceding one in the Transactions of the Academy of Natural Sciences of Philadelphia. The fossil appears to have been imbedded in the millstone-grit formation: is singularly beautiful, and has been named by Dr. Harlan, " Fucoides Alleghaniensis."

Biennial Election of President of the Geological Society of London.—At a meeting held at the Society's Rooms, Somerset house, on the 18th February, 1831, Roderick Impey Murchison, Esq. F. R. S., &c. &c. &c., was elected President for the next two years, in the place of the Rev. Adam Sedgewick, whose term of office expired on this day.

Death of Capt. Foster, of the Chanticleer.—We had the pleasure of knowing this distinguished navigator, and can feel the extent of the loss science has sustained by his premature death. He was one of those untiring and judicious minds appointed to accompany Sir Edward Parry in his adventurous expeditions into the Arctic Circle; and, had he lived, would have ranked as one of the most distinguished individuals of this very scientific age.

At the close of the year 1827, the Royal Society's Copley Medal was awarded to him for his observations at Port Bowen. In presenting the medal, the President expressed a hope, that so distinguished a mark of the approbation of the Royal Society might induce the government to bring forward a man of such bright promise as Lieut. Foster. *On the very same evening he received a letter from the Admiralty, with his brevet,* appointing him commander of the Chanticleer, with instructions to explore the high southern latitudes, and with liberty to sail round the world, without restraint as to time. He had been out about three years at the time of his death. This event will occasion a great sensation amongst his numerous friends, who were looking for his return with much anxiety.

The accessions to physical knowledge, that the scientific world will owe to the energy and genius of this lamented commander, will be perused with a melancholy interest by all who had the satisfaction of knowing him. EDITOR.

From the Literary Gazette, April 1831.

"It is with much regret we learn, by letters received on Thursday, the untimely fate of Capt. Foster, of his majesty's ship Chanticleer, who had been employed the last three years on a scientific expedition, in various parts of the globe, and was about to return to this country. Capt. F. had left his ship for the purpose of making a series of rocket observations on the Isthmus of Panama, and on his return down a small and shallow river in a canoe, he is said to have fallen overboard, and to have been drowned. But strong suspicions exist for believing, that this young, gifted and meritorous officer was most treacherously murdered."

Bone Caves in New Holland.—An interesting discovery has been made of osseous breccia and caves, about 210 miles west from Sydney. Major Mitchell, Surveyor General of New South Wales, has transmitted specimens and drawings of them to the Geological Society of London. The caves are in a limestone formation, in Wellington Valley, and the bones were discovered in an inferior chamber of one of the caves. The breccia is found in the fissures of the limestone, consisting of bones imbedded in an ochreous cement. A few of the bones belong to the dasyurus, the rest to the kangaroo, wombat, koala, phalangista. All the bones, with the exception of one, which appears to belong to some large marine quadruped, are of the present races of animals found in New Holland.

From a consideration of all the circumstances connected with this discovery, the following conclusions present themselves:—

1st. That the caves are of that class first brought into notice by the Rev. Dr. Buckland.

2. That the osseous breccias of Gibraltar, Antibes, Nice, Naples, Dalmatia, the island of Cerigo, &c. containing the remains of animals of the same kind, are probably of the same age, and an effect of the same cause, with the breccias of New Holland.

3. That this unexpected agreement strengthens the diluvial theory consequent upon elevation from below, and is opposed to that which attempts to account for the modification of the earth's surface by local causes.

4. That the present order of nature in New Holland, is of a great antiquity, and perhaps coeval with the insular position of the territory.

EDITOR.

NEW PUBLICATIONS.

WE take this opportunity of stating the conduct we shall observe respecting new publications. Any blandishments laid in our way to procure praise for works which do not deserve it, will be thrown away upon us, as we shall never insert puffs of any kind. To be upon the most friendly terms with Booksellers, is our interest, as well as our inclination; but it is to the public at large we look for efficient patronage, and we are bound by every consideration to deal intelligently and fairly with it. On the other hand, we shall be most happy, upon all occasions, to notice in a favourable manner, works connected with the Study of Nature, which we have good reason to believe are of sterling value; and in announcing the following, which are about to appear, we cannot but express our satisfaction at such manifest evidences of the increasing demand for works on the Natural Sciences.

EDITOR.

IN THE PRESS.

THE ANIMAL KINGDOM, arranged in conformity with its organization: by Baron Cuvier, perpetual secretary to the Royal Academy of Sciences, &c. &c. &c. The CRUSTACEA, ARACHNIDES, and INSECTA, by P. A. Latreille, Member of the Royal Academy of Sciences, &c. &c. &c. Translated from the French, with notes and additions, by H. M'Murtrie, M. D. &c. &c. In four volumes 8vo., with plates. New York. G. & C. & H. Carville.

Dr. M'Murtrie's translation of this great work is upon the eve of being published. We intend, in a future number, after its publication, to speak of its great merits, to which, having seen the book, we now bear a willing testimony. The translator has given evidence, in this work, to the American public, that he possesses the requisite qualifications of a scholar and a naturalist. It is printed by James Kay, jun. & Co. in their usual beautiful manner.

NEW PERIODICAL.

Dr. Troost, and Mr. Le Sueur, now residing at Nashville, Tennessee, are about to commence the publication of a periodical work, in which they intend to describe the natural productions of that state. They propose to describe its Geology and Mineralogy, and particularly its fossil organic remains; also its animals of various classes, accompanied with coloured engravings. The known qualifications of these gentlemen, encourage us to look for very interesting contributions to natural science.

AMERICAN EDITIONS OF ENGLISH WORKS.

IN THE PRESS.

"A Preliminary Discourse on the Study of Natural Philosophy, by J. F. W. Herschell, Esq. A. M. late Fellow of St. John's College, Cambridge," &c. &c. &c. Carey and Lea.

We can most truly say of this work, that it is one of the noblest productions of the human mind. On rising from the perusal of it, the first thought is always to read it over again; not because it is not comprehended, but because of the dignity, the beauty, and the vast extent of knowledge, which the gifted author has imbued it with. If ever there was a work capable of teaching men how to think correctly, it is this highly philosophical production.

The "Journal of a Naturalist," is also about to appear from the press of Carey and Lea. In this pleasing work the author has been true throughout to his attractive motto:

> "——Plants, trees, and stones, we note;
> Birds, insects, beasts, and rural things."

Messrs. Carvilles, of New York, have in the press "*Lindley's New Elementary Work on the Natural Orders of Plants*, with notes and additions by Professor Torrey.

We think this work will be popular here; we know of no book that can supply its place with those who are desirous of obtaining a knowledge of the philosophy of plants. Dr. Torrey's name is a guarantee for science and fair dealing; we therefore do not doubt that his notes and additions will add to the intrinsic value of the publication. Hitherto empirical note makers have too often been successful in bringing important British productions into discredit here; and we know of an instance where a celebrated English writer, cordially attached to this country, has been, by such means, taught to dread the republication of his works in the United States, where he was particularly solicitous to appear to advantage. We intend to keep an eye on these parasitical scribblers, and if any conspicuous individual of that genus shall in future come within the length of our Caduceus, we shall certainly give him a rap on the knowledge-box that will "make the empty dome resound."

"Ornithological Biography; or an Account of the Habits of the Birds of the United States." By J. J. Audubon, F. R. S. E. & L. &c.—one vol. royal 8vo.

This book is a worthy companion to Mr. Audubon's great work, the "Birds of America," which Cuvier has pronounced to be "the most magnificent monument which has until now been raised to Ornithology."

We shall give our readers an extract from it in our next number.

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A work on *Baths and Mineral Waters*, by John Bell, M. D., will soon be published at the office of the Journal of Health. It will be the object of the author to exhibit clearly and succinctly the benefits to be derived, in the preservation of health and the cure of disease, from the use of cold, warm, sea, and vapour baths; and to indicate the circumstances under which the use of each, respectively, would be prejudicial. In the second part of the work, the author will introduce all the material facts and experience, as far as they can be collected, respecting the most noted Mineral Springs of the United States; and compare them with those of a similar nature in Europe. The precautions in respect to the diet and exercise to be adopted by invalids who have recourse to bathing and drinking mineral waters, will be laid down with suitable precision.—The work will form about 300 pages duodecimo.

From the known talents of the author, and the attention he has paid to the subjects embraced in this work, we have every reason to believe it will be one of standard merit.

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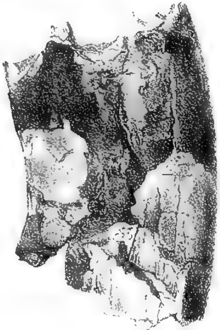

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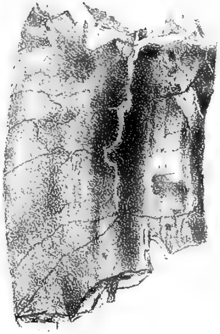

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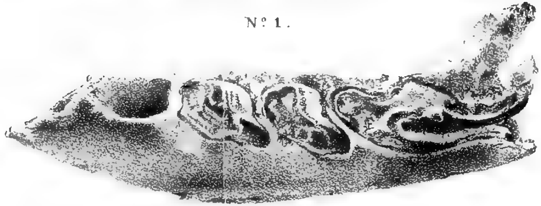

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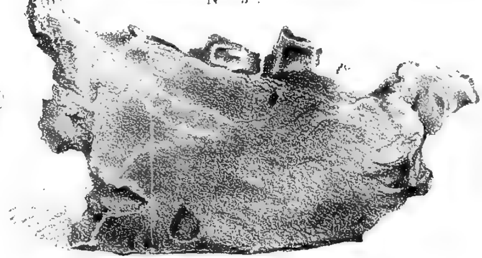

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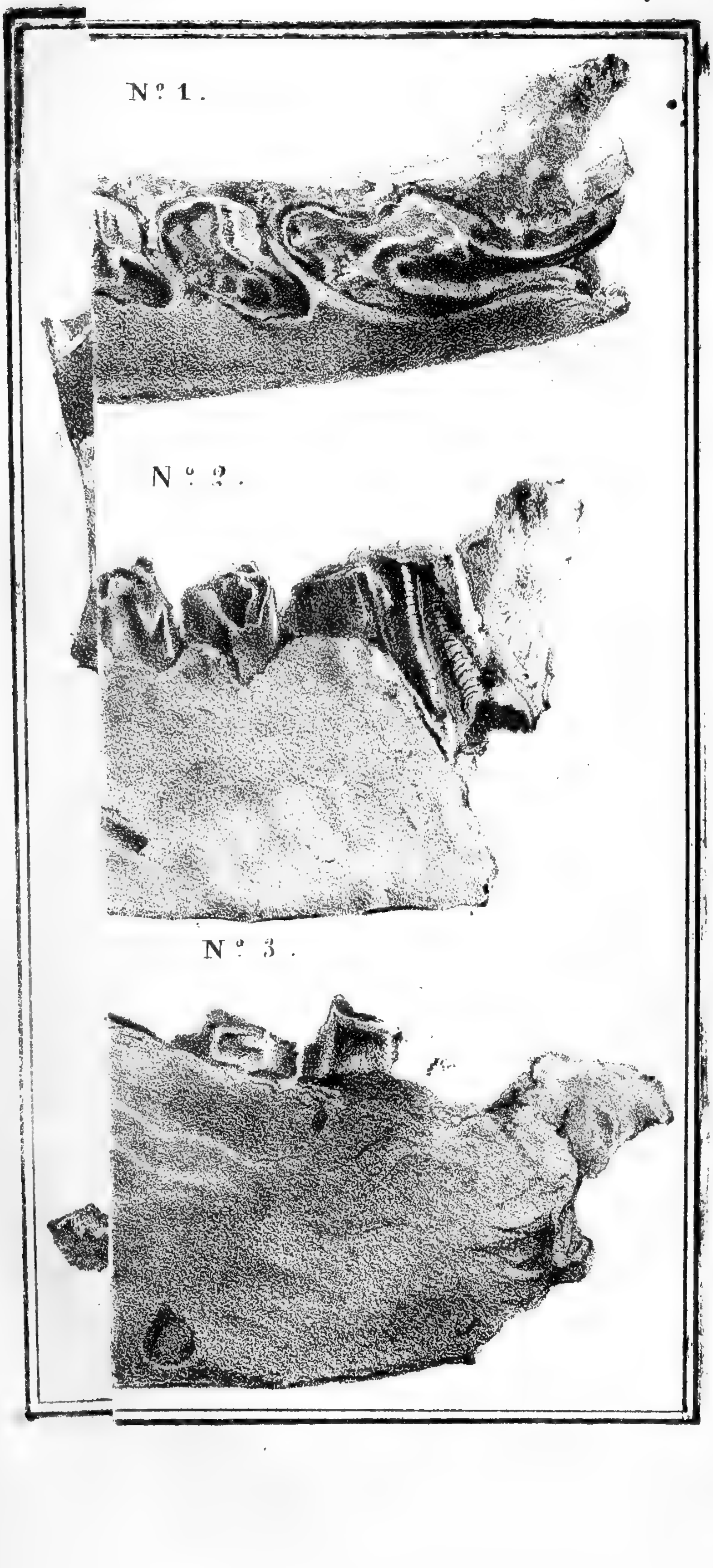
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THE

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GEOLOGY

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AN EPITOME OF THE PROGRESS OF NATURAL SCIENCE.*

IF, on opening the great subject to which we are about to draw the attention of our readers, we begin with periods scarcely within the historical records of our race, it is not with a view to enter upon any controverted points in the history of mankind, but in order to revive some recollections of the progress of the human mind, that our readers may pursue with us, in a more satisfactory manner, the history of the progress of natural science, and more especially of Geology.

Geological information, is very important to the study of the antiquity of human society; for opinions, which to a certain extent have been established, would by many be considered vague and transitory, did not geology by its own monuments, which may claim to be called indestructible, give substance to the traditions of our earliest periods, and confirm the great event from which they spring, and which we even find recorded in a volume, which has been consecrated by the veneration of so many generations.

The exaggerated accounts of the great antiquity of the Chinese and Egyptians, which at one time were put forth with so much confidence, and which were so much at variance with chronology, have been reduced to insignificance, by the penetration and assiduity of minds more learned and faithful than those which preceded them. The zodiacs, painted on the walls of the

* It will not be expected that this rapid and imperfect sketch should contain references to authorities. It would look pedantic to refer to ancient authorities, when so many popular modern works are at hand, to enable the reader either to pursue the events of these ancient periods more in detail, or to verify them. The writer has mainly adopted the reasonings of Cuvier, and in many instances has made them the basis of his paper.

temples of Egypt, and which, it was asserted, contained proofs of a refined cultivation of astronomical science by the Egyptians, at periods that mock our chronologies, have been stripped of their romance. The most authentic notices we have of the existence of astronomical knowledge, do not date beyond the eighth century before Christ. The occultation of the heavenly bodies, we may of course expect to find recorded to some extent, by ancient nations sufficiently advanced in civilization, to have invented the means of transmitting the memory of great events. The geographical situation of some of those nations was favourable to the introduction of astronomical observation, and some secular periods had been ascertained with sufficient precision, to have in some manner justified the inferences which have been drawn, of a supposed high state of astronomical knowledge. But in those early stages of society, this could have been accomplished only by miraculous interference, for the appropriate means of measuring time and space, were not alone wanting; the application of terrestrial mechanics to celestial motions, by such means, was equally essential. A vicious and hypothetical system of celestial dynamics, independent of physical laws, had, until the period of Pythagoras, limited the astronomical knowledge of the ancients, to observations unconnected with philosophical theory: and indeed, it was not until the time of Bacon, that the real foundations of natural science were laid. He first taught mankind how to trace nature through all her laws, in order to use our knowledge of her power, for the highest purposes.

We shall now proceed to speak of four great nations, of whose existence we have historical proof fifteen hundred years before Christ. The Indians, the Chinese, the Babylonians, and the Egyptians. The Chinese, in whose favour such extravagant pretensions were set up, appear to possess no authentic observation of a greater antiquity, than an eclipse observed in the eighth century before Christ. Neither does any astronomical observation made by the Chaldeans at Babylon, date farther back. Thus, although we have satisfactory evidences that those people existed as powerful and independent nations, seven hundred years before the date of these astronomical records, yet we cannot safely date the origin of science, before the eighth century preceding the christian era. Having thus reduced within reasonable bounds, the period of the first dawning of astronomy, the most obvious of the sciences, we naturally inquire how far that period is consistent with the most ancient historical notices of the origin of society. And here we observe a remarkable agreement in the records of two of those nations. The Hebrew text in Genesis, according to the most received chronology, giving 2349 years B. C., as the period of a great deluge which almost extirpated every living thing from the face of the earth, and the Chinese records assigning the period of 2384 years B. C., to the same event. It was about that period Confucius, their philosopher, represents their first king Yao, as occupied in draining the waters which had ascended to the tops of the mountains. So that if we consider this as the last period when the earth submitted to the mastery of the waters, we find a period of about fifteen hundred years, to assign to the renovation of the human race, before man became sufficiently civilized to note the occultation of the heavenly bodies. It is to be remarked, that the earliest notices we have of the great nations that have been mentioned, represent them as settled on extensive plains of great fertility, capable of affording them abundant subsistence, and intersected, as they were, by navigable streams, of exchanging their commodities with distant settlements, and thus laying a foundation for commercial habits. Such has at all times been the discriminating providence of man; congregating upon the fertile alluvial soils of the great drainages of the country, and rejecting his surplus population, upon the less productive lands of greater elevation. The Indians were thus settled on the rich plains of the Ganges; the Babylonians on the Delta of the Euphrates; the Egyptians along the banks of the Nile. But the elevated sandy plains, to the flanks of which these alluvial soils extended, were the homes of an unquiet pastoral people, whose continual irruptions were fatal to the arts of peace. We find the early history of China agitated by the invasions of the Tartar hordes; that of India by the Mongols; of Babylonia by the Assyrians, and of Egypt by the people of the Shepherd Kings, from whose dominion she was redeemed by Sesostris. When we remember how effectually science and literature were oppressed, by the irruption of the same barbarous nations into Europe, towards the close of the Roman empire, we can imagine how fatal the effects of similar movements must have been, upon the first dawnings of social improvement. We find here a sufficient cause for the protracted advancement of science, the influence of which will be still more apparent, when we come to observe how steadily the light of natural knowledge burnt, when it was removed beyond the current of these adverse circumstances. Strong as was this current, and unfriendly to historical accuracy, we still find the antiquity of society asserted, in various records of a remarkable character; such as the sacred books of the Hebrews; the Vedas, or sacred books of the Brahmins; the U King, or five books of the Chinese; and the Institutes of Menu, the sacred volume of the Hindoos. The Indians have not, properly speaking, any historical book. The Vedas contain an exposition of the religious philosophy of the Brahmins, written in the Sanscrit tongue, now a dead language. It appears to have been the policy of the Brahminical caste, to have kept back the knowledge of historical truths, and to have substituted in their place, metaphysical speculations. In all times, the people of India seem to have submitted to that caste, as the sole depository of all knowledge, sacred and profane. It was so in the most ancient times, and their religion, laws, and customs, are at this day, such as Alexander of Macedon found them.* Their mythology, their metaphysics, they imparted to other nations, but the Indians never had an advanced astronomy, nor a regular geometry.

In estimating the relative antiquity of the nations we have spoken of, there are four circumstances worthy of attention.

1. The remarkable agreement between all the known written languages, and the Sanscrit.

2. The great height of the Himmaleh mountains, the loftiest on the face of the earth. Javaher in Thibet, rises to an elevation of 25,745 feet, which is 500 feet more than Sorata, in the Andes of Quito. Mr. Gerard found the Tartars living on the table lands between the peaks of the Himmaleh, with their horses, dogs, and domestic animals, at a height of near 16,000 feet. Herds of yaks and goats browse in the still more elevated acclivities, where theorists have supposed eternal snows to reign, the limit of which was found not to be under 20,000 feet. A legitimate inference to be drawn from these facts, is, that the human family might have found a safe refuge here, when the plains of Babylon and Egypt were under water.

3. The tenderness among those ancient people, of animal life,

* 324 years B. C.

and aversion to dead bodies, even to skins of animals, at this day: as though their ancestors had known a period, when the very scarcity of animal life, had made it impious in their eyes to destroy it.

4. The evidence we have that the religion of Egypt was derived from Ethiopia, or upper Nubia; and that civilization originally came into Nubia, from India.

The fanciful cosmogonies which are found in many of those ancient records, appear to have sprung from the theologico-metaphysical studies, common to those ancient people. In all of them we find a surprising coincidence, as to the occurrence of a great deluge. In the institutes of Menu, which date, according to Sir William Jones, about nine hundred years B. C., the account of the creation of the world by an omnipotent being, is made—in a passage bearing a close resemblance to the analogous passage in Genesis—to occupy a period of six days; but the construction given to the word *day*, makes it equivalent to a period of several thousand years. These coincidences show, that the human mind, in those distant ages, and in regions so far apart, by thus cherishing the memory of traditions with scarce a difference of character, has done much to give to them the weight of historical truths; and the geological phenomena, which coincide so remarkably with those traditions, sustain the assertion we have before made, that geological knowledge is important to the satisfactory study of the antiquity of human society. We are far from seeking to reconcile the Mosaic and Hindoo narrations of creation, by considering the days as so many secular, instead of solar periods; the Hindoo construction is to be rejected as irrational to the judgment of common sense: for whether men choose to consider the sabbatical institution, as ordained for sanctification, or for relaxation from labour, it has one general character in our scriptures, about which we cannot dispute: it is a seventh part of the whole period, and the notion of praying or preaching, or abstaining from all kinds of labour, for a period equal to several thousand years, is an absurd hypothesis. To rest from labour one natural day in seven, is a convenient custom, grateful to the physical condition of man, and sanctioned by all civilized nations.

In relation to the Egyptians, the great antiquity which was once attributed to them, is no longer admitted. The long list of their kings, which Eusebius, the bishop of Cesarea, has preserved in the fragments of Manetho and Berosus, and by means of which it was endeavoured to strike the roots of their history so deep into time, has been reconciled to our established chronologies. Instead of succeeding each other regularly, as it was pretended they had done, it appears that Egypt was divided, as England was in the time of the heptarchy, into independent states, and that the series was a contemporaneous one. The sacred books of Hermes, together with all the Egyptian books, are lost, and all that we know of the science and history of the Egyptians, is from the Greeks: for as the Egyptians had drawn their knowledge from India, through Ethiopia; so, the Greeks, to whom Europe and America owe so much, derived their knowledge from Egypt. It appears, however, that their sacred books, which were carried in procession before the priests, treated of almost every subject they were acquainted with, except their history. In this they resembled the Indians, as well as in the exclusive appropriation, by the priesthood, of all learning, sacred and profane.

In one very important particular, however, the Egyptians differed from the Indians, and this difference was favourable to science. The Ethiopians, from whom the Egyptians derived their religion, whilst they retained the impression the ancient Indian colonies had made upon them, had incorporated with this higher stage of civilization, their ancient usages, such as were peculiar to the hunter state, and which yet distinguish the Indian tribes on this continent. In what precise manner the respect paid to animals, originated in Ethiopia, we know not; nor whether their tribes were named, or not, after particular animals; but it does appear that the Egyptian priests attached a particular animal to each divinity. Thus the crocodile was consecrated to Saturn; the cow to Ibis; the hawk to Osiris; the dog to Anubis &c. The veneration paid to their deities, was extended to the animals associated with them, and which were brought up in the temples in which the deities were worshipped. Many of the emblems of their religion were borrowed from the animal kingdom: with such favourable opportunities of observing the external forms and the habits of animals, a foundation for natural history was insensibly laid. A further obligation appears too, to have devolved upon them, that of embalming these animals when they died; and as it was equally the custom to embalm human bodies after death, opportunities of observing the internal structure of animals and men, were constantly afforded. A foundation was thus laid for comparative anatomy, the which, although it never arose to a science in Egypt, must still, as an art, have been highly advanced; since the Greeks resorted to that country to study anatomy, and Galen himself went thither, for the express purpose of examining a human skeleton, imitated in bronze.*

Herodotus, when he travelled in Egypt, was told by the Egyptian priests, that the Delta, of which lower Egypt is formed, was the gift of the Nile. That river on its annual retreat, deposits a layer of mud; and it results from a geological calculation made upon these principles, that 2000 years before our era, lower Egypt was not in existence. The pyramids themselves, by Manetho's account, were constructed after Sesostris had delivered the country from the dominion of the Shepherd kings; neither did they exist at the time of the Exodus, as we have a right to suppose, since they are not mentioned in the scriptures. As the pyramids were anterior to the columnar architecture of the Egyptians, we have thus evidence, coinciding with the geological proofs, of the low origin of the Delta of Egypt, as well as of the comparative antiquity of the Egyptian nation.

During the dominion of the Shepherd kings, which lasted about two hundred years, the progress of science was necessarily retarded, as the priesthood was overthrown. Subsequent to the re-establishment of the public liberties, by Sesostris, there was a second invasion of the country by the Medes and Persians, under Cambyses, about six hundred years before Christ; but in despite of adverse circumstances, the prosperity of the Egyptians continued to increase, together with their progress in the arts. The annual inundations of the Nile, introduced not only surveying, to distinguish private property, but the digging of canals, which eventually led to a knowledge of hydraulics. The erection of their obelisks on the alluvial formations, shows that their acquaintance with mechanics was very extensive; and the relievos and intaglios upon these monuments, and the precious stones worked by them, evince a perfection in the art of stone cutting, which has never been surpassed. Hence we infer a knowledge of the art of tempering metals. Specimens of bronze and gold have been found in their tombs, sometimes representing with

* 445 years B. C.

great fidelity the animals they were familiar with. Their forms too, are reproduced in a very perfect manner, both in their sculpture and paintings. More than fifty species of animals are represented with such truth, as to be immediately recognized by naturalists. In one painting, representing people fishing, more than twenty species of fish, peculiar to that country, are depicted with similar fidelity. Of their physical and metaphysical theories, enough remains to convince us, that they were a most ingenious and philosophical people. One fiction of their mythology was raised upon the analogy nature presents, in producing organized animals from the egg. This planet was supposed by them to be a mundane egg, brought into life by a metaphysical principle, after the manner of incubation. They believed also in the successive destruction and renovation of the world, and if we are to believe, as we reasonably may, that the Pythagorean doctrines, as we find them sketched in Ovid's metamorphoses, were derived from Egypt, the Egyptians may claim to be considered as having laid the foundation of some of the most important geological truths, which have been worked out in our own times. In enouncing the following truths, Pythagoras is made, by Ovid, to speak in his own person.

"Nothing perishes in this world; things merely vary and change their form.

"Sea has been changed into land; marine shells lie far distant from the deep.

"Valleys have been excavated by running water, and floods have carried the ruins of hills into the sea.

"Islands have become connected with the main land, by the growth of Deltas, as Pharos to Egypt.

"Peninsulas have been divided from the main land, and have become islands; according to tradition, Sicily has thus been separated.

"Plains have been upheaved into hills, by the confined air seeking vent, as at Trœzen, in the Peloponessus.

"The temperature of some springs varies at different periods.

"The waters of others are inflammable.

"Volcanic vents shift their position; there was a time when Etna was not a burning mountain, and the time will come when it will cease to burn: whether it be, that some caverns become closed up, by the movements of the earth, and others opened, or whether the fuel is exhausted."

From the enumeration of these high attainments of the Egyptians, which, it appears from history, were peculiar to that people, we may reasonably expect, that all the vestiges of philosophy, which we find in the early history of barbarous nations, were derived from Egypt. We shall see how true this is, in relation to the Greeks, when we come to consider the period of their connection with Egypt. But we must first advert to the cosmogony of the Jewish people, preserved in so remarkable a manner, in the book of Genesis: a venerable monument of ancient opinions, where the highest propositions of natural philosophy, are occasionally treated in a manner surprisingly consistent with the present received opinions of the order of nature. In conducting our readers along the historical chain of these ancient periods, they will be struck with the proper and natural order, assigned to the details of that cosmogony. It is there stated, that after the surface of the earth was prepared, and exposed to the influence of light and heat, aquatic animals were first created, next plants, then terrestrial animals, and last of all, man, with dominion over them all. This order of succession is consistent with reason, and must have been narrated by a superior mind. Had this cosmogony been an idle invention, like some of the fanciful creations in the Vedas and Puranas, it is probable the order would have had a less natural character, and perhaps the inventor would have created the animals before their food. But here we see things luminously narrated after the true order of nature, and consistent with the most refined discoveries of geology. We must, however, remember, that Moses, to whom these ancient books of the Hebrews are attributed,* had been brought up by the Egyptian priests, and had been probably instructed by them in their arts, and their most recondite philosophy: he appears to have been in every sense fitted for the high station Providence had allotted to him, when he was constituted the deliverer, and the lawgiver of his nation.

About fifteen centuries before our era, the disturbances in Egypt caused various emigrations. Cecrops carried the mysteries of Isis, or Ceres, into Greece, and about sixty years later, Cadmus brought over from Phœnicia, the oriental alphabet, which was

* It will not escape the philologist, that the Hebrew words "Ish," a man, and "Isha," a woman, are contained in the names of the Egyptian deities, Osiris and Isis.

adopted by the Greeks, and of which the letters of the Roman alphabet, and our own, are imitations. Previous to these emigrations, science, which had originated during the Africo-asiatic period of society we have briefly glanced at, had not been able to advance beyond the sacred circle, which the priesthood had drawn around it: the Brahminical and Egyptian priests, were alike the sole depositaries of all knowledge, sacred and profane. This circle being now broken through, the human mind, released from its trammels, soon entered upon the philosophical period of the early stages of society, as contra-distinguished from the sacerdotal period which had preceded it.

(*To be continued*).

TOUR TO THE CAVES IN VIRGINIA.

In a letter from Dr. Richard Harlan to the Editor.

Washington, May 28, 1831.

My dear Sir,—In answer to your request, to have some details of our tour through part of the state of Virginia, I think I can do no better than send you a copy of my Journal; assured that you will make full allowance for the inadvertencies occasioned by the rapidity of our progress, and the very limited time at our disposal.

I left this city, with a friend, on the 17th inst.; the bridge across the Potomac having been destroyed by ice during the winter, we were obliged to cross at Georgetown in a flat boat, and arrived at Fairfax court-house at 9 P. M. on a dark night, and over a very bad road. The principal hotel here, had recently been destroyed by fire; we succeeded, however, in getting tolerable lodgings. I was awoke during the night by the Caprimulgus Vociferus, (Whip-poor-will,) which perched for some time in the vicinity of my window. Thus far, this bird has appeared to us, more common in Virginia and Maryland, than in Pennsylvania: but the notes of the partridge we have not once heard; they appear all to have perished during the severe snow storm of last winter.*

* We are afraid this will be found to have been very generally the case. Our favourite retreat, Brandywine springs, in Delaware, was last year the paradise of partridges; they were abundant, and having been but little disturbed, were very confiding. But we have received sad accounts, this season, from the farmers, of their skeletons being found under the fences.—[*Editor.*

Wednesday 18*th.* Started early, and arrived at Warrington, Fauquier County, to dinner. Dr. W. of this village, presented us with several interesting specimens of minerals and rocks, also a fossil molar tooth of an elephant, found in this vicinity. Warrington is situated on an elevated plain, from whence the views are very beautiful. Nothing could be more kind than our reception here.

Thursday 19*th.* Left Warrington at day-break,—roads mountainous, and in Pennsylvania would be considered very bad. It gave us pain to see so many listless, idle persons, passing their days about the taverns. Men playing at marbles like boys, and exceedingly prone to cursing and swearing. In Pennsylvania, we are not happy without some useful occupation, and our people know how to help themselves. Here the climate, and the sad burden of negro slavery, which oppresses the white man still more, have made him dependant upon others; and if a gate is to be opened, or the slightest thing to be raised from the ground, Sambo, or Governor, or Major, or Colonel, or some pseudo dignitary of the African stock, is called from his work to do it.

In approaching the Blue mountains, the hills appear to be composed of the following strata; at least we crossed them in the following succession, our route lying in a direction south of west. 1. A red sandstone: our course lay for many miles parallel to this stratum; in these parts of Virginia, it constitutes the surface rock, the disintegration of which generally forms the common soil of the country, and gives the red appearance to the newly ploughed lands. The soil bears good grain and clover. 2. Talcose rock. 3. Greenstone. 4. Slate. 5. Decomposed greenstone, or red earth, as it is called. It is of a brick-dust colour, covered with loose fragments of quartz, and is apparently the same earth in which the gold is found in Carolina and Georgia. This extreme point of the gold region displays itself here on the main road, in the vicinity of a blacksmith's shop, ten miles north of Culpepper court house, about twenty miles in a parallel line from the gold region of Spotsylvania. It rained during the short time we could dedicate to this locality, in which some slight traces of the metal were observed. We dug through several feet of this hill, and beneath the loose quartz, we observed several veins of decomposed micacious rock, alternating with veins of quartz, both dipping at an angle of about 65°. The mica, in these glittering sands, is thought to be gold dust, by a great many of the country people.

The specimens we obtained in our researches, demonstrate that the gold region here resembles in every important particular, equivalent formations, both in S. America, and in Russia, on the east side of the Ural mountains. The true mineral structure of our gold formations, I first learned at the geological lectures you delivered in Philadelphia, this last spring.

Much rain fell, and we were exposed to a hurricane, accompanied with thunder, lightning, hail, and rain. The mountain torrents on these occasions, swell the streams, and soon render the fords impracticable. The country people not being accustomed to rely upon bridges, are careless in the directions they give to travellers, and fatal accidents frequently happen. We were upon one occasion of this kind benighted, and compelled to take refuge in the house of a respectable widow, but she received us cheerfully, and entertained us after the best manner she was able. Most of the slaves were poorly clad, whom we noticed in the fields; *some females were ploughing and harrowing;* they looked squalid, and unhappy.

Friday 20. Arrived early in the morning at Orange courthouse, where we breakfasted. We deviated a little from our route, in order to pay a visit to Mr. Madison, at his seat, Montpelier. On presenting a letter of introduction from General P. we were received with true Virginian hospitality, and with a cordiality that charmed us. The farm of Montpelier is under excellent cultivation, and repair. The clover and maize crops are thriving, but the wheat fields, like most of those we have seen, have suffered from the fly. The mansion-house is in a fine position, on an extensive and elevated plain, almost mountain-locked. The distant views are very grand. The venerable patriot, dressed in the garb of by-gone days, was an object of great interest to us; his conversation was that of a very high bred man, dignified and easy, and appearing to seek information, rather than to convey it. The slaves here wore a very different aspect, from those we had before seen. Pursuing our journey, we arrived at Charlottesville, at 7½ P. M., after a fatiguing day's journey of forty-five miles, over bad roads. After tea, we walked about a mile to the university, to pay our respects to some friends; here we met with a very pleasant society, consisting chiefly of the families of the professors.

Saturday, 21. Charlottesville is rather a superior place. It contains good buildings, and its society is refined. Every where we found hospitality. Desiring to make a short excursion on horseback, we discovered that all the Rosinantes were engaged by the students. Our wants, however, were no sooner known than supplied, by the polite and voluntary offers of private gentlemen. Immediately after breakfast we set out on a visit to Monticello, the seat of the late Mr. Jefferson, which is built on the summit of a high mountain, distant from Charlottesville about one mile; but in following the directions of the various windings, to graduate the ascent, it is about three miles; two mountains nearly join each other, the right hand one is called Carter's mountain, that on the left is MONTICELLO; when about two thirds up the mountain, we dismounted in the woods, at the family grave yard, enclosed by an ill-built stone wall, where lies, in obscure repose, the neglected remains of the patriot and philosopher; there are also the graves of several of the family. The whole scenery around this lonely spot, presents a gloomy and a melancholy aspect. We were informed that Mr. Jefferson requested on his death bed, (or left a note to that effect,) that all appearance of pageantry, and useless ceremony and display, should be scrupulously dispensed with, on the occasion of his funeral. He further requested, that no other memorial should be erected to his memory, than a plain, granite column, with a simple inscription, signifying his having been the author of the declaration of independence—founder of the Virginia University, &c. It appears to most strangers who visit this spot, the most unpardonable neglect, that this last request should not have been immediately attended to. We were informed at Charlottesville, that the mechanics in the vicinity, had offered to complete the work gratuitously, but as yet nothing has been effected, notwithstanding five years have elapsed since the death of Mr. J. The whole establishment of Monticello is rapidly verging toward ruin, and this splendid building, which originally cost, as we were informed, upwards of 50,000 dollars, has actually been offered for sale, together with 1,100 acres of land, for the trifling sum of $11,000. In the hall there still stands a column of verdantique, surmounted by a marble bust of Mr. Jefferson by Ceracchi.

From the summit of this isolated eminence, the views are inimitably grand and imposing; the village to the north-west appears at the very foot of the mountain, and the university, which lies about one mile further west, is also plainly distinguishable; the views in these directions are then closed by the Blue mountains, forming a pleasing back ground to the picture: towards the east and south, the horizon is extended to an immense distance, and the eye is at length tired with tracing the faint outlines of the tops of receding hills and mountains. Towards the south, in Bedford county, Va., are observable two pyramids, at least eighty miles distant; they are known as "Otter's Peaks."

On our return to Charlottesville, we again visited the university. The numerous buildings attached to it, are constructed of different orders of architecture, which, whilst they serve as useful specimens of the arts, give variety and interest to the scene. The library, situated in the Rotunda, is constructed on a large scale, and already contains many very rare and valuable works, in the various departments of literature and science, principally selected by Mr. Jefferson. The cabinet contains but few objects in Natural History of much interest, with the exception of a finely preserved head of the *Argali*, or "Big-horn," from the Rocky mountains, brought by Lewis and Clark; also some bones of the Mastodon. The lower jaws of two of these have the remains of the inferior tusks, which characterize several species of this genus; they are precisely similar to those described from an individual skull in possession of Mr. Peale of N. York, and which has been erroneously supposed to have belonged to a distinct genus of extinct fossil quadrupeds.

At 4 P. M. we took leave of our kind friends, and pursued our way to Wyer's Cave, by the road to Port Republic, and slept the same night at Coxe's, a good tavern sixteen miles from Charlottesville, close to the Blue mountain.

Sunday, 22. Recommenced our journey at 7 A. M. and soon reached the base of the Blue mountains, at Rock-fish Gap, and gained the summit on foot, hammer in hand. The eastern slope of this mountain at the above named Gap, developes the following rocks. Red sandstone; green-stone; old red sandstone; slate rock; and granite; some of these rocks run into each other, and occasion many peculiar varieties.

A fine clear view of the Alleghany mountains, is presented from the summit of this ridge. We arrived at Wanesborough at 10 A. M. This place is situated on the south branch of the Shenandoah, at the head of navigation, three miles distant from the CAVES—it was settled by soldiers of the revolution, who received the farms as bounty lands.

Monday, 23. After an early repast, we proceeded to *Wyer's Cave*, situate on the south branch of the Shenandoah, approached by a road of difficult access; there is an iron forge a little below, and a tavern within eight hundred yards of the spot, kept by Mr. Bryant, who rents the farm on which the caves are found. The three slaves whom we had hired at Port Deposit, had preceded us, and awaited us at the entrance of the caves, furnished with tools for digging; the principal object of our visit being to ascertain if the caves contained fossil bones. The frequent descriptions I had read of this cave, had prepared me on the present occasion, to experience disappointment. The entrance is difficult of access, and dirty—the floors are constantly interrupted by precipitous risings and depressions, and by large broken masses of the limestone in which the caves occur. In some of the chambers, the floors are loaded with wet tenacious clay, and the stalactites are for the most part discoloured by the water which percolates the rock from the red sandstone above. We made the slaves dig in two places in the lowest part of two chambers the most likely to contain fossils. The floor is for the most part destitute of stalagmite, but abounds in many places with loose fragments; occasionally, indeed, with large rocks fallen from above. In the first chamber, which is sunk considerably beneath the adjacent rooms, the labourers dug five feet deep, at first through a clay soil, which became moister below, intermixed with numerous fragments of stalactite; they did not reach the bottom rock here. The next digging occurred at the extreme end of the first left branch of the cave, and after excavating three feet deep, they came to solid rock. We now ascended ladders, and crawled and scrambled through several chambers, most of which presented such a monotonous aspect, that we grew fatigued, and proposed to our guide to return. The original or natural entrance, consists of a mere fissure in the rock, of a size only sufficient for the passage of a fox; a circumstance which diminishes the chance of finding fossil bones. It was to Mr. Wyers following a ground-hog (Arctomys Monax) to a hole in this hill, that the discovery of the cave was owing, in February 1806.

The disturbed and confused appearance of the interior of the cave, as well as of the huge masses of mountain rock which are found on the surface, can only be accounted for, by supposing powerful subterranean disturbances. On our return we visited MADISON'S cave, about two hundred yards nearer the hotel. Unlike the other, this cave has no artificial door at its entrance, to prevent the ingress of strangers; the "*old cave*" as it is now called, being considered as beneath notice, since the discovery of the new one. The entrance of both is more than one hundred feet above the level of the river; the ascent to either is very precipitous. The entrance to Madison's cave is capacious, the surface of the floor is less rugged, and is also, for the most part, destitute of stalagmite; salt petre has been obtained from the earth taken from the floor of this cave. From the appearance of things we thought that the occurrence of fossil bones in this locality not improbable, and we set our labourers to digging in two of the lowest positions of the two first chambers. In the deepest room, the floor consists of clay—then at three feet depth, of red earth, or decomposed red sandstone, one foot in thickness, which lies on the original floor of the cave, resembling a compact red sandstone. Whilst the digging was going on, we followed our guide along a narrow high gallery, by a continuous descent of some hundred feet, until further progress was interrupted by a body of crystal water, which is said to be of immeasurable depth, and beyond which no one has yet explored; some terrible tale of silent suction existing in this water, has become prevalent in this neighbourhood, and effectually paralizes the efforts of the exploring *Homo troglodytes.*

Our researches continued actively for five hours, when we returned to the hotel, fatigued, covered with mud, and disappointed in our expectations of obtaining fossil relics. We dined at 2 P. M. and immediately continued our journey, and after a ride of fourteen miles arrived at Harrisonburg, via Port Republic, over a road indescribably bad. The weather has been so cool since our arrival in these mountainous regions, especially subsequent to the thunder storm, which we encountered north of Charlottesville, that fires are kindled at all the hotels at which we halt, and cloaks are an agreeable appendage during the day. Contrary to theory, the season is less advanced on the south-west limestone region of these mountains, or what is known as the great valley of Virginia, than it is on the more northern exposure; the leaves on many of the trees have been destroyed by the frost of the 12th inst. At Harrisonburg, formerly called Rocktown, there resides a French family, emigrants from Strasburg, on the Rhine, who settled here three years ago, with the intention of cultivating the grape vine. Their vineyard has been totally destroyed the present season, by the recent severe frost, just at the moment they expected to reap the fruits of their labours. The sudden vicissitudes of temperature to which this elevated situation, as we are informed, is constantly liable, will at all times render it unfriendly to the cultivation of the vine.

We left this village at half past 7 A. M., and after a ride of ten miles, arrived at the "Big spring," which should rather be called a river, so large is the body of water which rises suddenly from the foot of a limestone hill, and continues in a stream of some yards in breadth, and half a foot deep, with force sufficient to turn two large mills immediately below: this stream of water is exceedingly cool, and does not contain any fish; it is artesian, or ever flowing, and is always very pure, excepting, as a Dutch girl informed me, "just before it was going to rain," when, she said, it became turbid. It has only ceased to flow once, in the memory of the oldest settlers, when it remained dry three days, to the great terror of the farmers who hold mill seats immediately on it.

This stream is situate on the main valley route, Rockingham county, about five miles west of the Massonetto mountain, which ridge is parallel to the Blue mountains, and nearly fifty miles long. Continuing our route, three miles from the "Big spring," on a line with the mountain, we halted to dine at an inn, kept by *Mr. T. K. Fuller*, an emigrant from the State of New York, who says he has resided in Virginia nine years, and detests the slavery system, seeing that the Dunkards who reside in this vicinity, and who abjure slavery, possess farms in every respect superior to those of their neighbours. Mr. F. possesses a taste for natural curiosities, and has his bar room filled with what, in your geological lectures, you styled "N. K's." Mr. Fuller appeared concerned, to think that people will have it that he knows something of the science of mineralogy, of chemistry, &c. &c. but he frequently repeated, "it is all a mistake; *it is all natural.*"

We left this station, after having made an arrangement with Mr. F. for exchange of N. K's, on our return to Philadelphia—he possessed some fine specimens of Ammonites, and a Trilobite, from the Massonetto ridge, in the vicinity, which, under the names of "*fossil toad, and fossil snake,*" he hugged to his bosom with parental fondness; no reasonable sum would induce him to part with them; he at length consented to exchange them for "sea-shells, corals, &c. or any queer thing that comes from the great ocean." Having passed through New-Market, and crossed the north branch of the Shenandoah, at 7 P. M. halted for the night at Pitman's. We have travelled the whole day over roads cut or worn through limestone, uncovered by soil, and in the worst condition; the limestone is quite black, of the variety called Hydraulic, from the water cement which is made of it. This formation continues nearly the whole length of the Massonetto ridge, and has evidently been subjected to violent disturbing powers from below, and subsequently, water worn on its surface: the strata are occasionally a foot or two thick, and dip towards the mountain, SE. to the NE., at an angle of 45°; at other times the strata emerge vertically—again they appear in large irregular masses, sometimes almost comminuted, and frequently resembling slate so strikingly, as to be mistaken for it until more closely inspected, hammer in hand. In one place they form a narrow pass, over which the public road lies, and which is known here by the name of "the narrows:" it is about twenty feet wide, and displays a perpendicular precipice on each side, nearly eighty feet high, with a small river on either side, unconnected at this place. This "*narrow passage*" is four miles south of Woodstock, ten miles north of Mount Jackson. On the great valley road, there is another remarkable display of this curious hydraulic limestone rock; this is a denuded hill, through part of which the public road passes; on the very summit of which there is yet a small sprinkle of red diluvium—but all the slope is naked, and the faces of the projecting strata are water-worn and smooth. The roots of pine trees, which once occupied this slope, are still seen wedged in the crevices of the rock; this denudation was occasioned, as the neighbours assured us, "by the bursting of a cloud," whose awful consequences they witnessed, to their great loss and terror.

I could refer their account to no natural phenomenon, unless it be to the bursting of a water spout. The disturbed strata of this limestone, are here well contrasted with it in its natural state. Arrived at Winchester, at 7 P. M.

Thursday 26. After breakfast set out for *Harper's Ferry*, distant thirty miles; passed through, and dined at Charleston; much rain had lately fallen in this vicinity, and the roads, bad at best, are almost impassable; two miles per hour we found to be rapid travelling, in their present state. The black lime rock continued almost to Harper's Ferry. The view at this gap suddenly burst open before us in all its glory, as we gained the summit of a hill about a mile distant, and richly repaid us for all our fatigue and toil. The rocks which overhang the river, are composed of green slate, somewhat talcose, which disintegrates rather fast in exposed situations, and masses are continually falling. This slate rests on a fine-grained, solid granite, very appropriate for the great rail road, which is to pass here.

Friday 27. We left this enchanting scenery about 10 A. M. lodged the same evening at Leesburg, and arrived at Washington at 1 P. M. on Saturday 28th, one of the hottest days experienced the present season. The last four miles previous to entering Georgetown, the road leads along the Potomac canal, through gneiss and granite rocks: higher up the river, it is said that anthracite has been discovered.

NEW METAL, PROVISIONALLY CALLED VANADIUM.

Extract of a Letter from M. Berzelius to M. Dulong, read before the Academy of Natural Sciences at Paris, Feb. 7, 1831.

"M. Sefström, director of the school of mines at Fahlun, whilst engaged in examining a variety of iron remarkable for its extreme softness, observed the presence of a substance, the properties of which differed from those of all other known bodies; but its quantity was so small as would have rendered it tedious and expensive to collect sufficient for an examination of its properties. This iron was from the mine of Taberg in Smoland; the ore merely contained traces of the substance. Finding that the pig iron contained far more of this principle than the wrought iron, M. Sefström thought that the scoria formed during the conversion of the pig iron into wrought metal, might be a more abundant source—a conjecture confirmed by experience; so that sufficient having been procured, he went to Mr. Berzelius during the Christmas holidays, to complete its examination. For the present the substance is called Vanadium, after a Scandinavian divinity.

"Vanadium combines with oxygen to form an oxide and an acid. The acid is red, pulverulent, fusible, and on solidifying, becomes crystalline. It is slightly soluble in water, reddens litmus, and forms yellow neutral salts, and orange bisalts. Its combinations with acids or bases, have the peculiar property of suddenly losing their colour—they resume it only on becoming solid again, and being then re-dissolved, preserve their colour. This phenomenon appears to have some analogy with the two states of phosphoric acid and of phosphates.

"Hydrogen at a white heat, reduces vanadic acid, leaving a coherent mass, having a feeble metallic lustre, and being a good conductor of electricity, but it is not certain that the reduction is complete. Vanadium, thus obtained, does not combine with sulphur when heated to redness, in its vapour. The oxide of Vanadium is brown, or nearly black, and dissolves readily in acids. The salts are of a deep brown colour; but, by the addition of a little nitric acid, effervesce, and become of a fine blue colour.

"Vanadic acid, combined with another acid, is reduced by sulphuretted hydrogen, and even by nitrous acid, to that blue matter which appears to be a compound of Vanadic acid with the oxide of Vanadium, analogous to those compounds formed by Tungsten, Molybdenum, Iridium, and Osmium. The oxide and acid of this metal together produce other combinations, green, yellow, and red, all soluble in water.

"When the oxide of Vanadium is produced in the humid way, it is soluble both in water and alkalies. The presence of a salt renders it insoluble, and upon this effect may be founded a process for its preparation.

"The Vanadates, when dissolved in water, are decomposed by sulphuretted hydrogen, and converted into sulfa salts, of a fire red colour.

"The chloride of Vanadium is a very volatile, colourless liquid, producing thick red fumes in the air. The fluoride is sometimes colourless, sometimes red, but always fixed. Before the blowpipe Vanadium colours fluxes of a fine green colour, in that respect resembling chrome."*

* On the 28th of February, M. Humboldt stated that the same metal had been discovered in Mexico, by M. Del Rio, in a brown lead ore from Zimapan; who had named it Erythronium, but was induced to suppose it not a simple substance, but an impure chrome: upon a re-analysis of the ore of Zimapan, it is found the metals are identical.

Our attention having been attracted to the preceding letter, we naturally sought to be informed from our venerable and esteemed friend, Professor del Rio, why the merit of a discovery made by him, and announced in 1804, in his translation of Karsten, should be transferred to another chemist, for detecting the same metal in iron, in 1830. We subjoin his answer, not less remarkable for his analytical skill in chemistry, than for his good sense and modesty.

We should under any circumstances expect objections to be made to the term *Vanadium*, derived from an ancient Scandinavian Deity. We dislike the introduction of such puerilities into science. Far better would be the term Zimapanium, since it was first found in the brown lead ore of Zimapan. But upon this occasion, that the complete measure of justice may be done to an eminent and deserving philosopher, we venture to express a hope that in place of the provisional name Vanadium, the more compendious one of Riom or Rionium, may be substituted.

It is very clear that Del Rio was first induced by Humboldt, to doubt of his own discovery, and, subsequently, when M. Descotils—who was familiar with Vauquelin's discovery of the metallic nature of chrome, and whose pupil indeed we believe he was,—threw his weight into the scale of Humboldt, M. Del Rio diffidently forbore to press his own better opinions, against those of the Europeans, whom he supposed possessed of superior opportunities of judging than himself, and likely to unite against him. EDITOR.

TRANSLATION OF A LETTER FROM PROFESSOR DEL RIO.

Philadelphia, July 13, 1831.

SIR,—I have always been of opinion that it is of greater importance to science, that the world should concern itself more with the discoveries that are made, than with those who make them; and I experienced a lively satisfaction in learning through Professor Jameson's Journal, that Mr. Wohler had found Vanadium in the brown lead ore of Zimapan. *I entertained the opinion, twenty-nine years ago*, that it contained a new metal, which, at the time, I called *Pancrome*, on account of its producing the three fundamental colours, blue, yellow, and red. Subsequently I named it, *Erithrome*, having observed a very curious phenomenon connected with it. The colourless salts, e. g. the Vanadiate of ammonia in slender acicular crystals, takes the finest crimson red, as soon as a small drop of concentrated nitric acid is placed on it. The same thing takes place with those of potash, soda and lime. Those of barytes, as far as I remember, not having with me my notes, became by the same method, at first, yellow, and afterwards red. I found also, as may be seen in my translation of the mineralogical tables of Karsten, published at Mexico in 1804, that the acid was fusible into an opaque and brown mass, with very fine stars on the surface, which had a semi-metallic lustre. I perceived that the acid was not red itself, except when distilled to dryness, with nitric acid, or when the acicular crystals of Vanadiate of ammonia, were put under the muffle. I found also, that the acid did not precipitate the nitric solutions of silver, of mercury and of lead, of a red, but of a yellow colour.

I communicated my experiments to Baron Humboldt, when he arrived in Mexico, and he stated to me, that my metal had the strongest resemblance to chrome, especially on account of the fine emerald green it takes when under the blow-pipe: which occasioned me to observe both in my translation of Karsten, in the year 1804, and in the nineteenth number of the Annals of Natural Sciences, which were then published at Madrid, under the direction of the celebrated Cavanilles, that I supposed it to be a sub-chromate of lead. M. Descotils, a year afterwards, expressed the same opinion. I confess, however, I could not suppress my astonishment, that no one took any notice of what I believed to be a blue oxide, nor of the beautiful phenomenon of the colouring of the salts red, by nitric acid, or by heat. I am content, however, with having always sustained that the brown ore of lead was not a phosphate, believing it identical with the brown lead of Schemnitz in Hungary, and of Huelgoet in Brittany.

You will please, Sir, to give these observations a place in your Journal, if you deem them worthy of insertion there. Its establishment is a source of great satisfaction to all those who know how well you deserve the reputation you have acquired.

I remain, Sir,

Your affectionate Friend.

A. DEL RIO.

TO MR. FEATHERSTONHAUGH.

EXPERIMENT WITH FLOWERS.

If the lobelia fulgens, which is of a pure blood-red, is viewed by the light of an alcohol lamp, with a little salt added to the wick, it becomes absolute black, which is not the case when observed by solar, or chemical light. The scarlet geranium too, naturally reflects a compound of red and yellow, but when seen by the spirit lamp, with salt, appears yellow. Purple colours under like circumstances appear blue. If a candle is put on one side of the lobelia, and a spirit lamp on the other, one half appears black, and the other, red. The explanation of this beautiful experiment is suggested by the study of the nature of reflecting bodies, and of light. Coloured bodies are so formed, as to reflect rays and combinations of rays, peculiar to them in their natural state. Hence, red flowers reflect the red ray which they obtain from light. But the light of a spirit lamp gives out—as may be proved by a prism—no red ray, and hence the lobelia, when observed by this light, has no red ray to reflect, and appears black. The geranium receives no red ray, and appears yellow. The purple receives no red ray, and appears blue. Those unacquainted with the properties of bodies and of light, are generally contented to believe that the natural colour of an object belongs to it inherently, as much as its form does. But this is not so. Whatever the reflecting structure of bodies may ultimately depend upon, they must be in connection with light before they can reflect; and as it is remarked, in a work that will perhaps bear reading oftener than any other that modern times have produced, "Preliminary Discourse on the study of Natural Philosophy, by John Frederick William Herschell," &c. &c. "when the differently coloured prismatic rays are thrown, in a dark room, in succession, upon any object, whatever be the colour we are in the habit of calling its own, it will appear of the particular hue of the light which falls upon it. A yellow paper, for instance, will appear scarlet when illuminated by red rays, yellow when by yellow, green by green, and blue by blue rays; its own (so called) proper colour *not in the least degree mixing with that it so exhibits.*"

Perhaps at some future day, light may be so managed, as to admit of bodies reflecting particular colours, without adding the expense of dying or painting to them. Editor.

ANTHRACITE COAL APPLIED TO GENERATE STEAM POWER.

The Editor had the satisfaction, a short time ago, to direct the public attention, to the simple means adopted by Mr. John Price Wetherill, of this city, to remedy the defect inherent in this Coal, viz: the want of hydrogen. The Editor is informed by that gentleman, that a great many persons were induced, in consequence, to visit his White Lead Works, and to adopt his improvement. The non-bituminous coals of this state, which are now universally called anthracite, vary somewhat in their qualities. Some are more easily ignited than others, have a portion of sulphur in them, and leave a greater residuum; but they may be generally designated as hydrates of carbon, the purest containing upwards of ninety parts of carbon, water, and a siliceous earthy residuum, which we understand from some of the master masons here, *sets mortar better* than any siliceous matter they have hitherto used. The small quantity of hydrogen given out by this coal, is insufficient, or has been hitherto thought so, to produce the proper degree of flame wanted to generate steam. Hence, its application to generate steam power, has been almost despaired of, and hence, also, the insignificance of its value for this purpose, when compared with bituminous coal. There have been attempts in many quarters to remedy this great defect, and which have been attended with more or less success. We have materials on hand for showing with how much energy, persons at a great distance from each other, have been exerting their ingenuity in this direction. The details of a conflict of this kind, between art and nature, would not be uninteresting; indeed, what concerns us more nearly than the history of the gradual ascendency of mind over matter, and the steady progress of man's dominion over nature. Upon the present occasion, we shall confine ourselves, with one exception, to a brief relation of the manner in which, from the simplest beginnings, Mr. Wetherill's discovery grew into importance.

In January, 1825, Messrs. Jonah and George Thompson, of this city, completed, for their Phœnix Nail Works, on French Creek, a steam engine for anthracite coal. We understand this was the first successful application of this fuel to the generation of steam. This was accomplished by a sub-division of the furnaces, and other mechanical arrangements. The necessity of increasing the flame, induced them to try many experiments. The introduction of steam was resorted to, and succeeded to a great extent. These experiments were made in July, 1829.

The history of Mr. Wetherill's improvement is remarkable for its simplicity. In the early part of 1829, to obviate the inconvenience arising from the dust when the cinders were riddled, water was thrown on them, and the cinders being very hot, the water was decomposed, and the effete residuum of the coal gave out more flame than the anthracite when first ignited. Mr. Wetherill, who is a good practical Chemist, and who, like every body else, had often witnessed the effect resulting from water thrown upon fire, without attending much to it, saw now what a useful application could be made of it. Accordingly, when the flame is low in his bed of coal, he, by means of a small pipe connected with his boiler, which is led under the grate of his furnace, passes a stream of steam into the hot coals, which is decomposed, and the hydrogen, when it reaches the top, becomes a powerful flame, that can be regulated by the quantity of steam admitted. When the cock of the pipe is stopped, the flame dies away, when it is turned, it revives.

Considering it probable, that this method of producing the inflammable principle, will effectually cure the inherent deficiency of non-bituminous coals for the generation of steam power, we regard it as leading to ulterior consequences of primary importance to the coal interest, and the useful arts. We especially look to steam navigation, as likely to derive immediate profit from it. There is no known fuel of which vessels can carry so great a burden, as of anthracite coal. One of the great objections to marine steam navigation will be thus overcome. We encourage the hope, therefore, that marine steam navigation, which, from various causes is slow in establishing itself, will, ere long, be universally successful, and that the steady velocities of rail-road communication, may be transferred, in a great extent, to navigation. Ere this takes place, we think it probable, a revolution will be effected in the forms of vessels, and that the perpendicular sides of ships, necessary to give room to the machinery of masts and sails, will be abandoned for improved constructions, consistent with perfect safety, and peculiarly fitted for steam navigation. Vessels as they are now constructed, present perpendicular sides to the assaults of the waves, or a definite resistance, to an indefinite power of attack. We had an opportunity three years ago, of inspecting the break-water, at Plymouth, in England. Its massive perpendicular walls, promised to defy the violence of storms, but they soon gave way: nor was it until outward slopes, or inclined planes were constructed, that the power of the waves was defied. We can conceive of vessels of vast burden, fitted for oceanic navigation, with abundance of room for freight and fuel, where the decks shall be covered in with a perfect watershed, like the roof of a house, and the machinery be placed below. Such vessels might be made perfectly tight against stormy weather, and admit of every comfort in fine weather.

We have ventured upon these reflections, merely to draw the public attention still more to the great value of the non-bituminous coals of the State of Pennsylvania. EDITOR.

DESCRIPTION OF THE JAWS, TEETH, AND CLAVICLE OF THE MEGALONYX LAQUEATUS.

By Richard Harlan, M. D.

WE are indebted to our friend Dr. Harlan, for the following valuable paper. Knowing the deep interest which is taken in the fossil osteological remains of this continent, and especially by the naturalists of Europe, we have deferred other matters for the present, and have caused drawings and engravings to be made of the bones described in this paper. They are entirely new, these being the first jaws, and teeth, and clavicle of this extinct animal, hitherto found. In order to give our readers, at home and abroad, the most perfect satisfaction in our power, respecting these interesting remains, we have, with the permission of our valuable correspondent, Dr. Harlan, added to our plate, the isolated tooth of the M. Laqueatus, first described by him in his paper, read March 8th, 1831, before the Academy of Natural Science of Philadelphia. EDITOR.

"Desirous of examining the fossil bones, now in New York, in the possession of Mr. Graves, I proceeded there with my friend, Mr. Norris. Amongst others, I found a bone, which I had not seen before, and which is the first that has been described of this animal. I presume it to have been the clavicle of a Megalonyx laqueatus, lately described by me, as portions of this part of the skeleton of this species, were found at the same time and place. The individual, of which the remains now described, were a part, was older and larger than the one discovered at White Cave, Ken.

"This clavicle* belonged to the left side, is long, flattened, and slender, curved somewhat like the human clavicle. The sternal extremity is thickened and hemispherical, where it forms the articulating surface: the scapular extremity is compressed, and furnished on the inner, or inferior surface, with strong tubercles for the attachment of ligaments. The anterior, or superior aspect of the sternal extremity, is marked by an arterial groove. The length of the clavicle is seventeen inches, the greatest circumference, four inches; the breadth one inch and eight-tenths; the greatest thickness, one inch.

"The fragment† I am now about to describe, is a portion of the dexter lower jaw of the Megalonyx, containing four molar teeth; three of the crowns of these teeth are perfect, that of the anterior one is imperfect. These teeth differ considerably from each other in shape, and increase in size from the front, the fourth and posterior tooth being double the size of the first, and more compressed laterally: it is also vertically concave on its external aspect, and vertically convex on its internal aspect; the interior, or mesial surface is strongly fluted, and it has a deep longitudinal furrow on the dermal aspect, in which respect it differs from the tooth of the M. Laqueatus, previously described by me,‡ of which the dermal aspect is uniform, but to which, in all other respects, it has a close resemblance. I suppose it therefore, probable, that this last may have belonged to the upper jaw. The three anterior molars, differ in shape, and markings: they are vertically grooved, or fluted, on their interior and posterior aspects, a transverse section presenting an irregular cube. The length of the crown of the posterior molar is two inches; the breadth about five-tenths of an inch: the length of the tooth is three inches and six-tenths. The diameter of the penultimate molar is eight-tenths by seven-tenths of an inch. The length of this fragment of the jaw bone is eight inches and four-tenths; the height three inches and six-tenths: the length of the space oc-

* Figure 7, plate 3.

† Plate 3, fig. 1, is a flat view of the Jaw, looking down. Fig. 2, the interior aspect. Fig. 3, the exterior aspect.

‡ No. 4, is the fluted surface; No. 6, the external, or dermal surface; and No. 6, the crown of that tooth.

cupied by the alveolar sockets, five inches and eight-tenths. The crown of the tooth presents no protuberances, but resembles that of the sloth; the roots are hollow.

"There is also in Mr. Graves' collection, a tibia, nearly perfect, from the right leg: the segment of a flattened sphere, on which the external condyle of the femur moves, is rather more depressed, than in the specimen from White Cave. Other marks and peculiarities are observable on this bone, not found on that of the Megalonyx of White Cave, but they are probably due to a difference in the age of the individuals.*

"Of the remains of Mastodons in this collection, I shall only notice the recomposed cranium of an animal, not yet adult, but which appears nearly perfect. The tusks are of an enormous size, and there exists a very deep cavity immediately anterior and below the aperture for the anterior nares, for the lodgment or origin of the large muscles which moved the trunk. This cranium does not appear to differ specifically from that of a specimen in Peale's museum, New York, and which gave occasion to the too hasty proposal of a new genus, under the designation 'Tetracaulodon,' or 'four tusked;' a name which would be more appropriately applied to the wild boar, the Hippopotamus, and many other quadrupeds which are furnished with four tusks.

R. HARLAN."

THE UNITED STATES ARE EXEMPT FROM DESERTS, AND ALL THE EVILS CONSEQUENT THEREON.

The physical conformation of North America, precludes all possibility of deserts, or extended wastes. Those arid regions result from a want of moisture, and attach to those extended plains in the neighbourhood of the tropics, too vast and disproportioned for the quantity of rain that nature has assigned to them. They drink, and are still dry. The clouds of heaven float over them in vain. Like Pharaoh's kine, they devour all, but change not their miserable condition.

* From these very lucid details, it is evident that if persons in possession of isolated osteological remains of this character, would submit them to the inspection of an experienced comparative anatomist, we should soon be in a situation to reconstruct this, and many other extinct animals of this continent. We invite gentlemen to correspond with us on this interesting subject; a rude drawing will be sufficient to enable us, if required, to apprise them of the intrinsic value of the objects represented.—[*Editor.*]

What are those physical phenomena that have insured us against all the ills of deserts? Geography tells us, that whenever a continent or country is expanded, more than a few hundred miles, in the equatorial regions, with a surface comparatively low and flat, it will become a desert. This is the result of the natural inability to be supplied with moisture. Most of Africa; the middle and southern regions of Asia; and even Hindostan, where mountains do not prevail, have become sterile and desert. The face of nature in those countries, is deformed; and vast chasms are created in those regions, where the vegetable and animal kingdoms are unable to flourish.

New Holland owes its moisture to its insular situation: the peninsular form preserves fertility in Spain, Italy, Greece, and Asia-minor: back-bone mountains save Hindostan from entire barrenness; and the vicinage of some sea, or mountain elevation renders those parts of Africa, Asia, and Europe, which the great deserts do not reach, the fit abodes of man. In Central Africa, and Asia, and the coasts of the Red sea and Indian ocean, no mountains exist, to collect from the atmosphere stores of moisture, and spread them over those thirsty plains, to fertilize and clothe them with verdure. No commanding Cordilleras overlooking their plains, catch upon their long slopes the vapours of heaven, and preserve, upon their cloud-capped summits, reservoirs of eternal snow, with which to irrigate the plains that meet their base. It requires, then, a mountain range; the vicinage of some sea, or ocean, or a high, temperate latitude, to insure freshness to extended plains, and impart to them a fertility, proper for the comforts and wants of man.

Let us examine our own continent, and learn the causes that have guaranteed to us, this exemption from deserts. Within the tropics and their neighbourhood, N. America is narrowed into a strip: it has all the advantages of an insular position, and drinks the moisture of two oceans. This is not all: the Cordilleras traverse the whole space, rising upon the Mexican table, to an elevation of 11,000 feet, and commanding the neighbouring seas. All winds, but more especially the heavily laden trades, pour forth their vapours upon this happy region, and clothe its long slopes and rich plains, with all the luxuriance of vegetation. These friendly mountains, after upheaving the tropical parts of our continent to the regions of eternal verdure, bear aloft their wide spread arms, (the Chippewayan and Alleghany ranges) as far as it is necessary to counteract the heats of a southern sun, and impart fertility to the great valley of the Mississippi, which seems especially consigned to their fostering care. But when elevations become no longer essential to the certainty of moisture and vegetation, they sink into the great plains of Canada, and disappear. How wise is this arrangement! For if these mountains had carried their characteristic elevation far north, they would have chilled with their eternal snows, all the northern portion of our country, and rendered it barren, not from drought and deserts, but what is equally to be deprecated, the blights of intolerable cold. These friendly ranges of mountains, are thus the everlasting guarantees of our country's fertility. The Alleghany range derives its moistnre from the Atlantic, and waters not only all the States that intervene between it and that ocean, but the States and districts that rest upon its western base, and contributes its full part to the great plains of Mississippi and Missouri. The Rocky, or Chippewayan range, draws heavily from the Pacific ocean, and abundantly waters not only that slope, but the extended plains which meet its eastern base. The narrow slopes of the two ranges of mountains which border the two oceans, are easily and very naturally irrigated from those oceans; and their slopes pointing inwards from the oceans, and the plains immediately in contact with them, draw moisture from the numerous founts and reservoirs of the mountains themselves. The great valley of the Mississippi, however, is too extensive, and too important to the rising population of this country, to be left to any uncertain supply of moisture. The sources of the mountains with which it is enfiladed, might prove to be inadequate, and certainly would, if all depended on them. Other guarantees are found; and powerful aids provided in the case. That great valley opens itself without barrier, on the southern end, to the trade winds, which become deflected by the Mexican coast, enter it, fraught with all the moisture of the gulf, and deposit on this region, a supply, literally inexhaustible, because those winds themselves are perpetual. Lest the mountain supply and trades both, might not reach the northern end of this great plain, nature has thrown there the largest reservoirs, or accumulations of fresh water in the world. The great and numerous lakes of Canada, over which the winds pass, and from which clouds charge themselves with vapour, insure a never failing supply of water to all that portion of the plain which lies contiguous. Thus every thing is provided, and nothing left to chance. Elevation, mountains, contiguous oceans, and internal reservoirs, all co-operate to insure to the territory of the United States a constant supply of moisture. The native fertility of the soil is therefore great, and yields to the wants of man with certainty and abundance. This supply of moisture is well tempered, and rarely pours forth in excess. In some countries, particularly in the north of Europe, in England and Ireland, the crops oftener fail from excess of moisture, than a deficiency. The grain blights in the field, or moulds and rots in the granary, and acquires a musty smell and flavour, which takes away its merchantable character, and disqualifies it for the fine breads. Our seasons, fortunately, are just moist enough to give perfection to vegetable growth, without injuring it by excess: just regular enough to exempt us from all the labour of artificial irrigation, and leave the air dry and elastic enough to enable us to preserve all our vegetable productions. Happy country! where the elements hold so steady a balance; where rains prevail to mature, not to injure vegetation; where the sun shines to ripen, and not to parch up verdure; and where a clear, elastic air gives spring to the animal frame, and vigour to all nature.

Where deserts exist, they not only preclude vegetation, and consequently population in the districts where they prevail, but exert a baneful influence upon all the neighbouring regions that are inhabitable. They absorb the moisture from them, and render vegetation very uncertain. The heats that steam from the deserts, enfeeble and stint all that has life and growth in the adjoining districts. Siroc winds prevail, collect the deleterious matter, heated and active, from their parched surface, sweep the neighbouring countries, carry languor, disease and blight in their train, and convert all that is green into a brown desert. Hordes of locusts seem by nature, associated with the deserts; rise in clouds, warp upon their winds, and like a deadly blast, couch upon the adjacent countries, and destroy all that is verdant. It results, therefore, that deserts not only mar the habitable globe to the extent that they prevail, but inflict upon the adjoining countries, all the evils of famine, uncertainty, and disease; thus limiting the numbers, the comforts, and the power of man.

We will now briefly note the effect of deserts upon the human figure, upon population, industry, the arts, morals, and liberty. The human form in connection with deserts, is without its wonted symmetry—thin, dry, and emaciated; and the complexion dark swarthy. Man seems formed there to drift with the sands, to move his light and elastic frame with all the quickness that uncertainty might require, but possesses not the muscular power necessary to effective labour. The Africans, Arabians, Tartars, Bedouins, and others, are swarthy, dark, and devoid of all the symmetry of which the race is susceptible, and strikingly illustrate our position.

In such countries population is sparse, and the few who draw a scanty support from the stinted and uncertain vegetation, are unfixed in their habits, and wanderers. They realize nothing, improve not their condition, are actuated by the sudden impulses of want, or the emergency occasioned by the irregularities of the elements around them.

When the seasons and climate of the country in which man lives are uncertain; when no human effort can control them, and no art or foresight render labour available, he partakes of all the irregularity of the seasons; becomes as wild as nature herself; puts himself afloat with the elements, and is in his turn a devastator.

If industry exists not, and human labour be unavailable, none of those improvements which change the condition of our race, and give to us character and comfort, have any existence. Without surplus production, there can be no commercial exchanges; a limit is thus placed to social improvement, and a barrier erected against civilization. Man, under such a state of things, cannot multiply his race, because his supply of food is limited; nor create wealth, because his labour is unproductive and without stimulus; nor make valuable improvements in the arts, comforts, and intercourse of society, because he has neither the means nor the necessary numbers; nor can he polish and refine himself, because his state of society is essentially wild and violent.

Morality, is there, nothing beyond those simple virtues which are connected with self-preservation; that rude hospitality, the necessity of which, dire suffering has felt; and that reckless bravery which has been prompted by despair. High and honourable feelings, sterling integrity, truth, and that habitual propriety that discharges all the duties of man to his fellows; are unpractised, and comport not with such an uncertain state. The religion of the inhabitants of the desert, is wild and superstitious, because it has no moral guarantee. The imagination creates the punitive power that makes brown the desert, that waves with the sands, and spreads around famine and devastation. It is invoked to destroy, and worshipped from fear. The ways of God to man are not justified, as in that fabric of good order, intelligence, and virtue, which is reared under more favourable circumstances.

Liberty, in such countries, is the freedom of the desert, as unfixed as its votaries, and as wild as nature herself. Man's safety there, is not the guarantee of the laws, but the strength of his own arm, or the ease with which he can escape. He governs himself by circumstances, not by any principles of justice, or legislative enactments. Government has reared no permanent altar in such countries; it moves in wild democracy with the wanderings of man; and accommodates itself to all his irregularities. We see, therefore, that our race, in such countries as are connected with the deserts, is scant and of uncouth form; their virtues wild and rudely primitive, their labour unavailable, wealth and improvements have no place, the arts and elegances of life have no existence, commerce no basis, liberty and religion no temples but the desert, and no guarantees but a wild and irregular nature.

In the United States it is widely different. We are exempted from deserts and all their concomitant evils. An almost uninterrupted fertility spreads through our extensive land, with scarcely a mountain crag to break its continuity. Equally secure from an injurious excess of moisture, we lean with confidence upon our seasons; we understand our climate, we appreciate the productiveness of our soil, and feel that we have all the guarantees which nature can give against want and famine; all the certainty of property in the avails of our labour, every stimulus to exertion and industry, and the most perfect assurance to us and our posterity, of moral and physical enjoyment. Where nature herself is regular, the population full of intelligence, the arts well established, and plenty throughout the land, good order and good taste will prevail. Liberty, with just government, is the natural consequence of such a condition of things. Already has it taken deep root. Every right is regarded, and every interest protected. The broad shield of the law covers all. Famine, and unavoidable disasters, drive man to despair; he looks to the present moment only, because the future is wrapped in doubt; he runs all chances, and neglects all system, and the providence necessary for accumulation and comfort. Under the mighty guarantees that we have named, we may expect great perfection in our race, a maximum population, a productive industry, a moral condition, a high degree of intellectual developement, the greatest advancement in the arts, commercial prosperity, all the refinements of society, and a government of laws which will reach and guard all.

All these blessings are in store for this nation, if the people are true to themselves. Nothing can impede the happiness and glory of this people, if they can only be led by a wise and general system of education, to reject the insidious pretensions of artful and selfish men, and to lean voluntarily upon the wise and just for the administration of their affairs, and the preservation of their institutions. W.

EATON'S GEOLOGY.

Communication from the writer of the article "Geology," in the North American Review, for April, 1831.

The writer of the article "Geology," in the number of the North American Review, is not surprised to learn that Professor Amos Eaton, and his friends, have winced under the merited castigation he received. That they should have put his defence upon his "having contributed to awaken the spirit of inquiry on geological subjects in this country," was to be expected, and is admitted to be true to a certain extent. Mr. Eaton has done for geology, pretty much what the bellman does for a lost child; he has set people looking for it. In a passage in the preface to his geological text-book,—the work reviewed in the article above alluded to—he gives us at once a clue to his own capacity in this line, and for the moving causes which have brought one of his defenders forward, in a somewhat unexpected manner. This is the passage: "Geology is a progressive science; and he, who has any respect for his future reputation, should be exceedingly cautious about committing himself on matters of fact or speculation. I confess, that I have, *most egregiously*, violated this rule; but there are peculiar circumstances in my case, arising from my being 'a hireling drudge' to the most *munificent patron* of this science, which will palliate, at least, if not justify." This passage in the original is italicised, and pointed, exactly as it is here printed. It would be a difficult matter to produce from the annals of literature, a more extravagant instance of self degradation, than this passage unblushingly exhibits.

Mr. Eaton has discreetly remained silent under this infliction, which, as it is stated in the article, fell upon him from a reluctant hand, "actuated solely by regard for the interests of science, and not taking pleasure in wantonly exposing Mr. Eaton, or any other individual." But Mr. Eaton's friends have not been equally discreet: his "munificent patron"*—who is only once referred to in the article, and then under the designation of "a generous individual"—is brought forward in an offensive attitude; and in a note referred to by a postscript of the Editor, appended to the July number of "The American Journal of Science and Arts," is made to take up a position which neither covers his allies, nor protects himself. General Van Renselaer's note, to be sure, is flanked, right and left, by the postscriptum of Professor Silliman; but the Professor's demonstrations, although flattering to an inexperienced eye, seldom in the field, look plaguily like going over to the enemy. The Professor is an amiable and a peaceful man, one who has a proper horror of the "charge"—a movement so pregnant with excitement to men with a belligerent turn—and who knows that a scientific bayonet would not come doubly blest, the pleasure, in such cases, being altogether monopolized by the giver. When the Professor, however, says, that the appearance of General Van Renselaer's note, is "less an act of courtesy *than of justice*," he means, no doubt, to inspire General Van R. with the belief, that he entirely concurs with that gentleman in his opinions, as they are found in the following passage of his note.

"It is to be regretted that the author of the review, whose professed object was to advance the science, did not examine professor Eaton's views with a little better spirit, and *point out*

* General Van Renselaer.

and *correct* the supposed errors. Let any serious mistakes be *pointed out*, and *fairly proved,*" &c. &c.

As the critic in the N. A. R. finds himself thus publicly reproved and challenged, before the bar of the public, by individuals who, in the language of legal practice, have chosen to change the venue, from the North American Review of Boston, to the American Journal of New Haven: he, to secure to his cause, the utmost attainable fair dealing in the case, chooses the Monthly Journal of Geology, of Philadelphia, as quite appropriate to the conduct of a controversy originating in geological matters.

Before the writer shows how completely he stands justified with the public, in relation to the manner in which he reviewed Mr. Eaton's geological text-book, he desires first to show what sort of provocation General Van Renselaer and professor Silliman have received from him; that the nature of their motives may be surmised, if possible, for the attack to which this communication is an answer. The only allusion in the article to the former of these two gentlemen, is contained in the following passage, at page 482, of the N. A. Review.

"We have read his [Eaton's] works, and continue to witness, with surprise, his pertinacious adherence to an arrangement of rocks, and a nomenclature, entirely at variance with nature and perspicuity. If Mr. Eaton had, in a modest, unpretending manner, brought the geological facts he had from time to time collected in the State of New York, into the general stock of practical information, he would have deserved and received unqualified praise. But presuming upon the supposed ignorance of his readers, he has preferred to set himself up for a genius. In this he has most lamentably failed; has greatly injured a cause he seems to be zealous in, and has abused the rare opportunities he has had of doing good, through the favour of the generous individual who has been his patron."*

In relation to the second of these gentlemen, the only passage where his name is mentioned, or where he is alluded to in any part of the article, is the following:

"We notice, however, with pleasure, an increasing attention to the study of natural history, in our principal colleges; and we are particularly happy in rendering justice to the persevering

* General Van Renselaer.

zeal and talents of Professor Silliman. Considering the many difficulties he has had to contend with, and the vigour with which he has kept the flag of science flying for so many years, we can say, with all our hearts, that we believe he will be as gratefully remembered hereafter for his public zeal, as he is now cherished for his private worth." If the writer has made palpable mistakes in any of the passages of that article, he knows where to lay his finger upon them.

The manner of General Van Renselaer's attack, is, as has been stated, unexpected. Either that gentleman has become an admirer of the casuistical tricks of hacknied disputants, or, what is more probable, he has never read Mr. Eaton's geological text-book, nor the review of it. Had he done so, he could not have descended to an affected candour, and have seriously proposed, that the writer should have examined "professor Eaton's views with a little better spirit, and *point out* and *correct* the supposed errors." Had he read those pages, he would have seen that this had been most justly and rigorously done, and that in no instance had the writer given into the base practice of attempting to injure Mr. Eaton's reputation by inuendo; but that in almost every instance, the reprehended passages were quoted at full length, or referred to. It would be as well for that gentleman too, to know that Mr. Eaton in his preface to this very work, says, "*I beg the favour of the most rigorous criticism on this book, small as it is.*" Severe as the article may appear, the terms "most rigorous" by no means belong to it, as could be most easily shown, if it should become indispensably necessary to recast it.

Under all the circumstances of the case, it cannot but be felt as a very difficult task, to satisfy General Van Renselaer, that he has taken a wrong view of this matter. In his note, he candidly says, "I am not a geologist myself." Now none but a geologist can be made to comprehend how futile Mr. Eaton's labours have been. What is to be done? Why do men complain of refutations not satisfying them, when they won't read them? Mr. Eaton seems to be satisfied; like good old Dogberry, finding there is no remedy, he is willing to be written down without making any fuss about it. Notwithstanding what General Van R. says of "the assurances of many of our distinguished scientific men," it may be asserted without fear of contradiction, that there is not an unbiassed geologist in this country,—and it is a matter of considerable importance in the question—who does not know that Mr. Eaton's efforts have been a failure; and that it is so considered, both at home and abroad. That Mr. Eaton may have shown zeal in the service of his employer, has not been denied; and that he has made us acquainted with the localities of many rocks, is true: but this, as a branch of geology, is a merit of the lowest order, and more than counterbalanced by the gross errors of his arrangements, and the nonsensical rhapsodies of his nomenclature. These have been repeatedly exposed in Europe, and the proofs of this were given, in the article complained of. Let any one compare his "Synopsis of North American Rocks and Detritus," in Silliman's Journal, Vol. XIV. page 145, with the tabular view of De la Beche, the approved result of the labours of the first geologists of the age—let them see the confusion he has introduced into the order of rocks, and the effrontery with which he has placed rocks in his American Synopsis, which neither he, nor any other individual ever saw on this continent, as in the case of his "lias:" the creation of three graywackes—his making basalt superincumbent to his third graywacke, when he does not even pretend he ever saw it there; and that silly division of the superficial soil, into six formations, with Greek terminations; let all this nonsense be seen and understood, and not one word more will ever be said about Mr. Eaton's geology.

But leaving this scientific method of treating the subject, the attention of General Van Renselaer is asked to the following illustration. Geology, as far as the order of succession of rocks is concerned, resembles our alphabet, the letters of which follow each other in a definite order. A—taking the column in the descending order,—being always at the top, where the superficial diluvium is usually found, and Z being always at the bottom, where granite and the primitive rocks are always found. The intermediate letters are also immovable as to the order of succession, M always preceding N, and S never preceding R: so it is with the intermediate rocks. Now the order and forms of our letters, are derived from those of the Roman alphabet—those from the Greek, and these last from the Phœnician and Hebrew; so that every letter in our alphabet is a simple or compound copy of a Hebrew letter, as every rock on this continent has its equivalent in Europe, both as to mineral structure, and place in the series. An individual is now to be supposed, who has heard of this affinity of languages, but who is ignorant of the Hebrew. He must be endowed with impudence, to pretend to teach it, and credulous people must be found to employ him. Let him possess a Hebrew bible, without an arranged alphabet. In his attempt to make out the order of the alphabet, such an individual, relying upon approximating resemblances, and ignorant of the elementary principles of graphic language, will proceed altogether by guess, and where the resemblances are doubtful, will make frequent mistakes—placing n, before m, S, before R, &c. &c., and knowing there are twenty-four letters in the English tongue, and ignorant that there are not so many by one-third, in the older languages, he will think the varying forms of the same letter, are different letters, and will swell the number of the letters of the oriental alphabet, to that of his vernacular tongue. This Mr. Eaton has done for geology. Unacquainted with the European types, except through the most deceptive of all things, hand specimens; and thinking all the rocks in Europe were probably to be found in the State of New York, he has not only put rocks out of their place in the series, but has swelled his imaginary column by introducing the lias, in a country where the whole oolitic system is wanting; and this, where there was not the least approximation, either in mineral structure, or organic remains. It is greatly to be regretted it is so, but this is the truth. When it is considered that Mr. Eaton boasts of having taught such a defective system—to say nothing of his universally rejected nomenclature—to seven thousand pupils, it is by no means a harsh thing to say of him, that " he has injured a cause he seems to be zealous in, and has abused the rare opportunities he has had of doing good." But these glaring demerits, though often the subject of conversation among scientific men, were indulgently overlooked; it was hoped experience would have its usual effect. This was a vain hope; the appearance of " the geological text-book," made further forbearance almost criminal.

As this answer to the attack upon Mr. Eaton's reviewer, will probably be looked into, by those who would seem not to have read the article in the N. A. Review, or to have seen its references in vain, the writer of the article " Geology" reluctantly, and in his own defence, once more cites a few passages, from the Review, and the " Geological Text-book."

"I beg the favour of the most rigorous criticism upon this book, small as it is."—*Preface.*

"Should these observations ever fall under his notice, it may be well that he should remember this invitation."—*Review.*

"If the earth was washed and the rocks left clean, they (geologists) would not disagree in regard to rocks."—*Preface.*

"For ourselves, we can only say, that were the earth washed as clean as a penny, we should be very much tempted to take up our hammer and chisel, and try what we could find within its rocks: for, although Mr. Eaton may not know it, it is a fundamental principle of the science, to identify rocks by their organic remains, rather than by their mineral characters, which are very fallible guides."—*Review.*

"To stimulate men of science to the work of examination, and of criticism, I will state, that I intend to publish *considerable* in scientific journals; also, a full system upon this plan."—*Preface.*

"We love variety, and a full system, after the empty one before us, will be an agreeable change."—*Review.*

"Mr. Eaton has a habit of making confessions, which are not to his credit, and of which we do not see the motive. He says, "I may be accused of fickleness on account of the changes which appear in every successive book I publish; I confess, this is the *ninth time* I have published a geological nomenclature, and that I made changes in each, of more or less importance." Again, "the various deposits of detritus had not been thoroughly studied by any American, when I published my last nomenclature. I believe I have made a few changes in that department, which will finally obtain." "On this head, we must venture to differ from him in opinion. We greatly doubt whether any of his opinions will obtain."—*Review.*

"The following passage is remarkable for its novel orthography, and also for its tone in regard to one of the most learned and philosophic men of the age, to whose labours Geology has been indebted in the highest degree." We allude to Henry de la Beche.

"With all *defference* to the high character of *La Bache,* as an experienced teacher, I may say, that his numerous sub-divisions, if adopted, *will ruin the science.*"

"We would suggest to Mr. Eaton, that Mr. de la Beche's subdivisions, are the result of a careful examination of all the geological beds, effected by the joint labours of the most enlightened geologists of Europe. The establishment of the series in this detailed manner, is the perfection of human industry and science, and is the true philosophical key to the mineral and organic structure of the earth. And here we have *an experienced teacher*, who does not know how to spell his native tongue, and whose geological information is limited to a few rocks in the State of New-York, stating, that Mr. de la Beche will *ruin the science*, for no other reason, that we can imagine, but to exclude from public notice, every work upon the subject, except his own."—*Reviewer*.

"The only geological fact in this work, which is absolutely new to us, is contained in the following passage.

"He, (Werner,) closed his long life in the full splendour of his scientific glory, in the same year (1817) in which *we* begun to make our humble efforts in the application of his views to American earth."

"Werner was singularly happy in two things; one, that he did not outlive his reputation; the other, that he died before Mr. Eaton applied his views to American earth." A few lines afterwards, he says, "Scarcely had that earth received his (Werner's) manes, &c." "We would suggest to Mr. Eaton, that *manes* and *remains*, however similar in sound, do not mean the same thing."—*Review*.

The writer in the North American Review, does not wish further to encumber the pages of the Monthly Journal of Geology and Natural Science, by quotations from the article in question. There are certain passages alluded to, which bring Mr. Eaton's want of fair dealing into a conspicuous point of view; and others, as at page 488, which are ridiculously amusing. Nothing can be more gross than his blunders, when he ventures to talk about organic remains, a branch of Geology he is entirely ignorant of. Thus, at page 51, he says, "But immediately over the carboniferous slate (coal measures) we find oviparous vertebral animals. I have before me the relics of a *crotalus* (rattle snake,) found by Dr. Rose, of Montrose, Pennsylvania. Hence, we infer, that oviparous vertebral animals were created soon after the bituminous coal deposites were made." The palpable absurdity of this assertion was exposed by the Reviewer. Every geologist knows that all the reptiles belonging to the ophidia, are exclusively of the present order of nature, and that a man might as well say he had found a petrified roll of butter with the maker's name upon it, in a formation of that period, as a snake of any kind. Not convinced, he ventured, in a subsequent number of Silliman's Journal, to publish a lithographic plate of it, when it turned out to be one of the commonest fossil coal plants.

Gen. Van Renselaer having supposed Dr. Buckland to speak in an approving manner of Mr. Eaton's labours, it may not be amiss, by way of answer, to quote the following bombastic passage from page 14 of the "Geological Text Book."

"Since that time, Buckland, aided by the veteran Cuvier, has commanded the whole geological phalanx to leave, for a while, the deep abode of rocks, and to examine 'the open caverns and the furrowed earth.' He has led out before us, from the cave of Kirkdale, the *antediluvial mastodon*, chased and gnawed by hundreds of hyenas. He has shown us the torrid abodes of the river horse and the elephant, to have been in the latitudes of Caledonia and Scythia, &c. &c."

The opening of the cave of Kirkdale, when discovered, was about two feet wide in a solid rock. The adult mastodons were from ten to twelve feet high, so that it was impossible for any animal of that genus, young or old, ever to get in, or get out of such a cave, which was a mere den where hyenas brought the bones of dead animals. *But Dr. Buckland never found even any fragment of a bone of the mastodon in that cave.* It is evident, Mr. Eaton never read Dr. Buckland's book, or he would not have made an assertion so easily exposed. Are we to suppose that Dr. Buckland, one of the first minds in Europe, has lost his judgment, and can approve of such stuff?

But Gen. Van Renselaer says, "I am perfectly satisfied with Professor Eaton's labours."

And Mr. Silliman coming forward in his editorial capacity, to the defence of Mr. Eaton, says, "it is less an act of courtesy than of justice" on his part. If these gentlemen are satisfied to take such trash for Geology, it is very certain that the world at large will not be so. This is an intelligent age, and will stand by any writer who fearlessly speaks the truth, and diligently labours to prevent quackery and pretension from degrading the minds of the rising generation."

REMARKS.

The Editor of the American Journal of Science and Arts, having thought proper to throw his weight into the scale against the critic in the North American Review, whose answer now appears, we shall also enter the arena, and declare that our opinion differs from that expressed by him, toto cœlo. We do not see why it was necessary to designate the courtesy due to a distinguished gentleman, "less an act of courtesy than of justice" to Mr. Eaton. Finding him thus self-constituted a party to the dispute, we were not surprised at the eulogium he subsequently passes upon Mr. Eaton. The defence set up for him, when it is asserted, "that with respect to theory and nomenclature, there is room both for fancy and error," is no small encouragement to the Eaton school, which is thus assured of a comfortable corner, to take a nap in, after their labours. When a new nomenclature for chemistry, shall be proposed by some future inspired village pedagogue, that will be done for chemical dynamics, which Mr. Eaton has attempted to do for geology. The minds of ingenuous young men, will be enfeebled and obscured, in the vain attempt to draw from a mass of trashy ignorance, some particle of useful knowledge, some beam of pleasant philosophy. We will not enter into this criminal conspiracy against the powers of the human mind. When our columns shall cease to exhibit science as it results from facts, learning without pedantry, and the divine feelings of religion, without the cant of the old Pharisees, our undertaking will be at an end. Sir James Mackintosh, in his able account of the rise and progress of the reformation, has said of "all those who oppose hinderances to free, fearless, calm, unprejudiced and dispassionate inquiry," that "they lessen the stores of knowledge, they relax the vigour of every intellectual effort, they abate the chances of future discovery." We lay our account in meeting with much opposition, from men of this class. But our object is not to win opinions from a limited number of selfish individuals, more interested in humbugging the public, than in enlightening it. We stand up for truth and justice; our aim is to instruct and amuse the millions—these are the "munificent patrons" we look to for approbation.

We have been unwillingly forced into these remarks; if it should be necessary to recur to the subject, we inform those concerned, that we mean to do it, con amore. EDITOR.

ANECDOTES OF NATURAL HISTORY.

"N. K." System of Arrangement.—A naturalist, travelling in the interior of Pennsylvania, stopped at a very neat, clean tavern, and was agreeably surprised to find the chimney-pieces, cupboards, &c., crowded with specimens of minerals and fossils, each of them having a label with N. K. on it. Puzzled by these letters, he sought for information of a smart-looking woman, who was the landlady. She informed him that her nephew, who was gone to Kentucky, was the owner of these specimens, and that he had pasted some long names upon them, he had learnt from the doctors in Philadelphia; but they were so hard to pronounce when her neighbours asked her questions about them, that she had taken them off, and had put N. K. upon every one of them. The naturalist assenting to all this, asked her the meaning of N. K. "So, you don't know what the meaning of N. K. is?" said she. "Upon my word, I have not the least idea," he replied. "Well," said she, "I thought the Philadelphians knowed every thing; however, if you don't know, I'll tell you: N. K. means 'Nayterul Kurossitys.'"

A Case where the Specimens required no Labels of Locality.—It is stated in the memoirs of Sir Stamford Raffles, that Dr. Horsfield, during a tour in Sumatra, having given the geological specimens he had collected to his coolies to carry, wished to examine them after the day's journey. The Doctor seeing their baskets full of other stones than those he had given to them, expressed himself angrily; when they very simply stated, that seeing he was anxious to collect stones, they, preferring to travel with empty baskets, had thrown those he gave them away, and had filled their baskets again at the end of their day's journey.

Preparations to receive a Royal Naturalist, by the Lord of the Castle of Rabenstein, in Franconia.—Dr. Buckland has fully described the cave of Kühloch, in Franconia, in his Reliquiæ Diluvianæ, page 137, et seq. In 1829, two English geologists, Mr. Egerton and Lord Cole, being on a scientific tour in Germany, paid a visit to that ancient deposit of the remains of extinct animals. The following extract of a letter from Mr. Egerton to Dr. Buckland, will tell the melancholy story of this second punitive visitation upon the mammifera within the dominions of the Lord of the castle of Rabenstein.

Schaffhausen June 26, 1829.

My dear Sir,—Lord Cole and myself are just returned to Schaffhausen, from a three weeks' visit to the caverns of Franconia; and knowing the great interest you feel in their welfare, I write to inform you of the melancholy fact of the total destruction of the deposit of bones in the caves of Kühloch and Rabenstein. His Majesty, the king of Bavaria, having announced his intention to visit Rabenstein, the owner of that castle has thought fit to prepare these two caves for his reception; in order to do which, he has *broken up the whole of the floors, pounding the larger stones and bones* to the bottom, for a foundation, and spreading the earth, and finer particles, to form a smooth surface over them. *Conceive our horror* on arriving at Kühloch, at finding thirty men at work, wheeling out the *animal* earth,* to level the inclination of the entrance, by which you have so satisfactorily explained the phenomenon of the absence of pebbles and diluvial loam, in this remarkable cavern. There was not a bone to be found there when we arrived; however, with a little management, we contrived to obtain two beautiful fragments of lower jaws of hyena, besides some very good bears' bones, and one ulna that had been broken during the animal's life, and the sharp edges of the fracture rounded off by the absorbents into a smooth stump. We likewise procured from one of the workmen, teeth of a fox, of a tiger, and a molar tooth of the right lower jaw of Rhinoceros—all of which he said he picked up in Kühlock."—*Philosophical Magazine and Annals of Philosophy.*

The following anecdote has been communicated to the editor by a gentleman of distinguished standing at Washington, who is a very curious observer. This defensive faculty of a well known insect, is a new discovery, and the attention of some naturalists will probably be drawn to it.

"Walking on the back piazza, I noticed that one of the lightning bugs, had become entangled in a spider's web. The spider instantly attacked him, and endeavoured to secure his wings. The bug emitted his light very rapidly, the spider alternately attacking and retreating, until at length it appeared distressed, and sustained itself upon the web with difficulty, staggering and tum-

* The presence of such quantities of this animal earth, made this cave particularly interesting to naturalists, as it consisted of broken down animal matter.

bling in its last retreat from the contest, until it gained the wall, against which it rubbed itself, as if to remove some offensive matter from its body. It appeared to experience great difficulty in retaining its hold on the wall, from which it frequently fell, suspended by one limb. At length it appeared to recover, and remained quiet. In the mean time, the bug ceased struggling, and merely emitted its light; the web soon gave way, and it escaped. These facts were observed by me with great interest, and occurred as I have represented them."

Case of a Bee, Self-decapitated.—We paid a very interesting visit a short time ago, to a gentleman, who is a keen observer of nature, and whose great experience in apiaries has not only been productive of much curious information, relating to the economy of bees, but which has been directly useful to numerous persons, who maintain apiaries, in order to supply our markets with honey. This anecdote was related to us, whilst examining his well constructed hives. Editor.

"A large humble-bee, strayed near to one of his hives, and alighted near the entrance. Instantly he was attacked by great numbers of bees. One of them, seeking a favourable opportunity of lodging his sting under one of the rings of the humble-bee, made a fierce blow: but the sting striking upon the hard and bright corslet, glanced off; and as it is the habit of the bee in the act of striking, to bend the head towards the tail, the sting, upon this occasion, entered deeply into its own head. After many powerful exertions to extricate it, at length the entire head came off, and remained attached to the tail. The insect now gravely with its feelers, began to paw about his neck, as if to examine the nature of the accident which had occurred to it, spinning round, and feeling, and then stopping for awhile. In about twenty minutes the insect was exhausted and died.

The Rattle-snake.—Dr. Harlan exhibited the following experiment to Capt. Basil Hall, and some gentlemen. He severed the head from a rattle-snake, and afterwards grasping the part of the neck adhering to the head, with his thumb and finger, the head twisted itself by violent movements, and endeavoured to strike him with its fangs. Afterwards, a live rabbit was presented to the head, which immediately plunged its fangs into the rabbit very deep. Dr. H. then asked Capt. Hall to take hold of the tail, which he had no sooner done, than the headless neck bent itself quickly round as if to strike him. This last movement may by attributed to muscular habit.

Every lover of nature will be touched with the eloquence of the following passage from the journal of a Naturalist.

"The little excursions of the naturalist, from habit and from acquirement, become a scene of constant observation and remark. The insect that crawls, the note of the bird, the plant that flowers, or the vernal green leaf that peeps out, engages his attention, is recognized as an intimate, or noted from some novelty that it presents in sound or aspect. Every season has its peculiar product, and is pleasing or admirable, from causes that variously affect our different temperaments or dispositions; but there are accompaniments in an autumnal morning's walk, that call for all our notice and admiration: the peculiar feeling of the air, and the solemn grandeur of the scene around us, dispose the mind to contemplation and remark; there is a silence in which we hear every thing, a beauty that will be observed. The stump of an old oak is a very landscape, with rugged alpine steeps bursting through forests of verdant mosses, with some pale, denuded, branchless lichen, like a scathed oak, creeping up the sides, or crowning the summit. Rambling with unfettered grace, the tendrils of the briony (tamis communis) festoon with their brilliant berries, green, yellow, red, the slender sprigs of the hazel, or the thorn; it ornaments their plainness, and receives a support its own feebleness denies. The agaric, with all its hues, its shades, its elegant variety of forms, expands its cone, sprinkled with the freshness of the morning; a transient fair, a child of decay, that "sprang up in a night, and will perish in a night." The squirrel, agile with life and timidity, gamboling round the root of an ancient beech, its base overgrown with the dew-berry, (rubus cœsius,) blue with unsullied fruit; impeded in its frolic sports, half angry, darts up the silvery bole again, to peep and wonder at the strange intruder on his haunts. The jay springs up, and screaming, tells of danger to her brood; the noisy tribe repeat the call, are hushed, and leave us; the loud laugh of the woodpecker, joyous and vacant, the hammering of the nuthatch, (sitta europœa) cleaving its prize in the chink of some dry bough," &c.

TO READERS AND CORRESPONDENTS.

We are indebted to a friend for pointing out to us, almost at the moment of closing our number, an exparte statement, which the committee on publications of the Franklin Institute have inserted at page 7 of their Journal for July, 1831. This statement, made by one of their members, and on a subject very foreign to the useful arts, is directed against an individual who is not a member of their society, and who, never doubting of such an attack, was precluded from the refutation of it, either by himself or his friends. That Journal having thus, by the act of the committee, become the vehicle of defamation in its most insidious form, it has become necessary to notice so unexpected a departure from propriety on the part of the committee. That the members of the Franklin Institute may understand how little we have deserved such unjust treatment from their society—for it is the editor of this journal who is falsely accused of having attacked the reputation of their deceased member Dr. Godman,—we proceed to state: that it was our good fortune to make publicly known for the first time, a beautiful and useful invention of Mr. John Price Wetherill, to create flame in the combustion of anthracite coal. As the public caught rapidly at this valuable improvement, we agreed with Mr. W. to make it more extensively known, and to insert a paper with appropriate plans concerning it, in the first number of this Journal. When the preparations were about completed, Dr. Isaac Hays took an opportunity of requesting the editor not to insert the plans, &c. of Mr. W's furnace, stating, that it might seriously injure the circulation of the Journal of the Franklin Institute, if the Monthly American Journal, were also to draw upon that branch of natural science for support. We told him without hesitation, that our respect for the founders and supporters of the Franklin Institute was unfeigned, that we should upon all occasions give it our entire and unequivocal support; and that, if it was the wish of the society to avail itself of Mr. W's invention, we would cheerfully withdraw our paper, and release Mr. W. from his agreement with us. We accordingly called upon Mr. Wetherill the same day, explained to him what had passed, and requested him to transfer his drawings to the use of the Franklin Institute. We regret having done so—we have, from generous motives, been the cause of their being withheld from the public, and have received but a sorry return for our kindness. Our good wishes, however, for the success of the Franklin Institute are not abated; and whilst we are surprised at the authorized publication of what was intended to injure us, we would by no means revenge upon the interests of a valuable society, the act of one of the most insignificant of their members. We know how difficult it is for a numerous society to prevent an intriguing, pharisaical individual from committing them occasionally.

As to Dr. Isaac Hays' statement, as found at page 7, we have only room to say, we shall hereafter show it is *a deliberate falsehood* from the beginning to the end. We have been strongly solicited to expose the previous moral obliquities of that mendacious little individual, and we have hitherto withheld our hand. But all consideration for him is now at an end. We cannot be silent when low contrivances, aiming to bring us into discredit, and to impair our usefulness, are resorted to, for no purpose but to bring into notice a parasite who lives by dishonouring the labours of others.

The promised paper on Big bone lick, has, for reasons beyond our controul, been delayed until the next number.

It is very true, as our correspondent G. observes, that we were in possession of his paper in season for our first number. Our answer is, that when papers equally meritorious come into our possession at the same time, the editor must claim the privilege of selection, and that his preference may be governed by considerations, it would be quite inexpedient to enter into with every correspondent. It is of importance that the contents of the Journal should be various.

The three interesting papers on the origin of the Indian languages of this continent are under consideration.

We hope soon to have an interview with the distinguished naturalist, who has favoured us with a paper on "the domestic animals of the Indians of this continent."

The editor will transmit a note to Rusticus, if he will leave his address at the Literary Rooms.

The plate of this number, representing fragments of the jaw and teeth of the Megalonyx laqueatus, should have been numbered III.

☞ In a few copies of this number, the asterisk on page 55 is misplaced. It refers to the period of Herodotus, in the line below where it stands.

Plate 4.

Fig. 1.

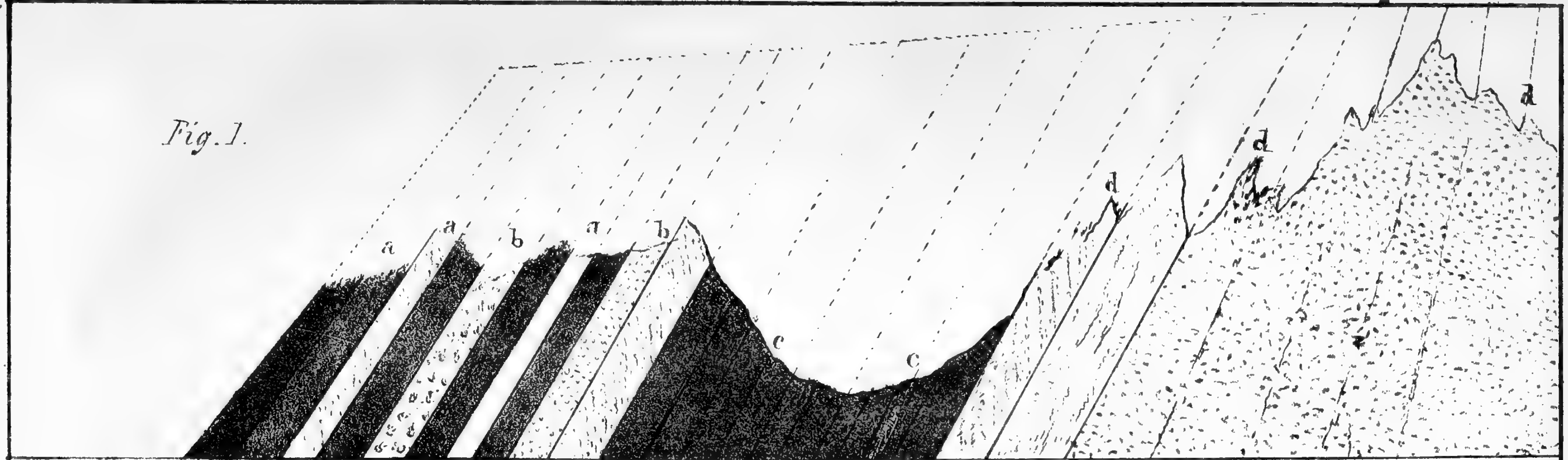
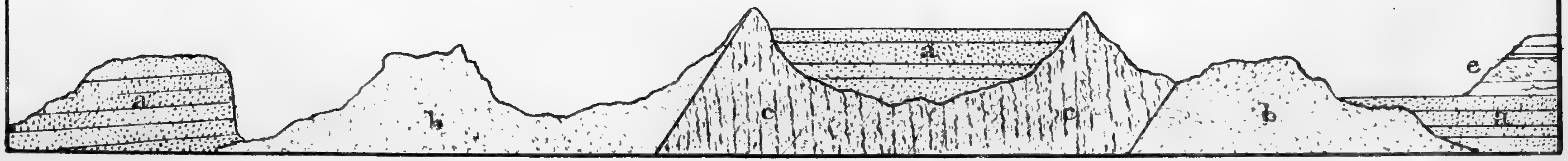


Fig. 2



a.a. Horizontal Sand Stone, b.b. Granite, c.c. Slate, ... e. Lias.

THE

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OF

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AN EPITOME OF THE PROGRESS OF NATURAL SCIENCE.

(*Continued from page* 58.)

The philosophical period, when human opinions were first released from the bondage of theocratical power, began among the Greeks; a curious and active race, whose geographical situation had contributed much to form their character, and deriving their origin, in a great measure, from the nations connected with the Euxine, or Black sea. The Pelasgi are supposed to have penetrated into Greece from India, at the earliest periods: the architectural remains, called Cyclopean walls, were of their day. In the time of Pausanias,* it was known that those walls were anterior to the arrival of the Egyptian colonies. The situation, however, and maritime habits of the Greeks, had enabled them to hold communication with the Phœnicians, Babylonians, and other nations, long before the arrival of Cecrops.† The chiefs who led these first colonies from Egypt, were not priests, but rather bold adventurers, like the Normans; and although they brought over the external form of their religion, yet it appears the meaning concealed under their emblems, was not spread amongst the people where they colonized.

Now the mythological forms in Egypt, and those generally obtaining in the east, were only the emblematic expression of a system of general philosophy, confined to the priesthood: hence science necessarily became stationary, since no one, without incurring the charge of irreligion, would venture to entertain any opinions, which did not emanate from sources that were admitted

* A. D. 175. † B. C. 1550.

to be divine. But the Egyptians having exported, as it were, the clerk without the parson, religion and science happily became separated, and the Greeks were left free, at the planting of knowledge in their country, to adopt their own philosophical opinions. The benign influence of that freedom was soon felt; it led to the establishment of a school of philosophy, and of the arts, that will be honoured and admired to the latest generations.

Of the influence of this philosophy, we are living monuments; for the revival of letters in Europe, was nothing but the revival of that philosophy; and but for this fortunate disenthralment of the human mind, from the tyranny of the sacerdotal caste, instead of the inimitable manly beauty of the Apollo, and the graceful proportions of the Venus, together with the countless treasures of sculptured excellence, that received all but life from the hands of Phidias and Praxiteles, we should probably have received nothing from Greece, but metaphysical monsters—gods with quadruple heads, and a hundred hands—goddesses with the heads of the inferior animals. Of all the nations of Greece, the Hellenes were the earliest civilized; and although the religion of the country partook strongly of the Indian and Egyptian origin—under the influence of Orpheus, at once a priest and a poet—yet the Hellenes at length introduced the worship of Apollo, the cultivation of the arts, and gave their name to the whole country. We shall pass by the period of the Trojan war, and the evidences contained in the writings of Hesiod and Homer,* of the great progress the Greeks had made in the arts, in order to come at once to the brilliant period of the schools of philosophy.

The family of the Asclepiadæ had begun to cultivate science with practical views, as far back as the thirteenth century before Christ. This was properly the ancient medical school of Greece, and the temples of Æsculapius—a name bearing a strong affinity to that of the family—were served with priests out of this family. The Ionian schools, founded by Thales of Miletus, about 600 B. C.,were spread chiefly amongst the continental Greeks of Asia Minor, and partook of an Egyptian origin; for when Psammeticus called in the Greeks to his aid,† Thales, Pythagoras, and other philosophers, passed over to receive instruction from the priests of Egypt.

Pythagoras flourished about 550 years B. C.: after finishing

* B. C. 900. † B. C. 600.

many arduous journeys in the east, undertaken through the pure love of philosophy, he retired to Crotona, in Italy. As Thales, the chief of the Ionian school, devoted all his attention to the discovery of a first principle, independently of experiments by way of induction, so Pythagoras endeavoured to discover the same principle in the power of numbers. Pythagoras is deemed to have preceded, to a certain extent, Copernicus, in the received opinions respecting planetary motions.

Herodotus, Xenophon, Hippocrates, Ctesias, and other philosophers who flourished about these times, were contributors to natural science. Herodotus, the earliest prose writer among the Greeks, had travelled extensively in the east, and in Egypt. He described the crocodile, and other animals of that country, with much accuracy. Xenophon was born thirty-nine years later than Socrates, and was one of his pupils. He was at once a soldier, a statesman, and a naturalist; was the declared enemy of the mythology of the Greeks, and taught a system of pure idealism, including all things in the divinity. In the Cynegetics, which is a treatise on hunting, he treats of the different races of dogs, and of the various kinds of game pursued by hunters: the retreats of wild beasts, their stratagems to elude pursuit, and their means of defence, are there described. It is in this work we learn that lions, panthers, jackals, and other species of wild beasts now found in hot climates only, were the inhabitants of Macedonia; an interesting zoological fact, bearing upon the speculations of some modern naturalists. Hippocrates and Ctesias belonged to the caste of the Asclepiades. In the pathological knowledge of diseases, in diagnostics, and in medical treatment, the first has acquired a great reputation, to which his fanciful and very deficient mode of considering anatomy and physiology, have not contributed. Ctesias was made a prisoner on the memorable expedition of the ten thousand, and resided, in the quality of physician, seventeen years at the Persian court. In an account of India, which he borrows from the Persian writers, he mentions the elephant, an animal at that time unknown to the Greeks. His work, however, is full of absurd stories; he describes emblematic animals as real ones, and the fabulous stories of the flying griffin, the unicorn, &c. &c., are probably due to him.

Leucippus, the founder of the atomistic school, taught that every thing was matter and motion: he was a pure materialist, and acknowledged nothing but atoms, and a vacuum to move in. Figure and motion, and the arrangement of his atoms, produced, according to this philosopher, all the properties of bodies, colour, consistence, heat, cold, &c.

Democritus of Abdera,* a disciple of Leucippus, was a comparative anatomist, for he endeavoured to deduce the habits of animals from the differences he had observed in their organization. On the conquest of Asia-Minor by Xerxes,† the principal philosophers of these various sects, who had brought forward, in turns, all the metaphysical views known to ourselves, established themselves at Athens, in central Greece; when Anaxagoras, the father of the Socratic school, finally taught the reasonable doctrine, that mind and matter were separate principles, and cultivated more extensively the deduction of the rationale of things from practical observation.

Socrates was the true reformer of Grecian philosophy: he sought to reduce physics to common sense and observation, and metaphysics to logical reasoning. He endeavoured to overthrow the miserable sophistry that had sprung out of the Eleatic school, and it is to him we owe the elaboration of the thought of Anaxagoras, that an intelligent principle has arranged the world. If the universe, he reasoned, be the work of an intelligent mind, it must be so disposed as to concur to an intelligent end. From this great thought results the important natural truth which geology establishes, that organized beings are connected by necessary relations, *and that a perfect organized body must contain in itself, all the conditions proper to the performance of the part assigned to it.* Socrates declared his regret, at not being sufficiently conversant with natural history, to demonstrate this truth as extensively as it might be done. This great and virtuous man was a cotemporary of Pericles, Alcibiades, Xenophon, and Hippocrates, and died a victim to the intolerance of his enemies, and the splendour of his character, B. C. 399.

Plato, the youngest of the disciples of Socrates, after the death of his master, went to Egypt, and studied under the priests. He afterwards received instruction in the Pythagorean schools, established in Lower Italy: having before his travels in Egypt, exercised himself in dialectics, with Euclid—who had been himself a pupil of Socrates—he now, fraught with knowledge, returned

* Flourished B. C. 400. † B. C. 480.

to Athens, and opened the celebrated academic school, the influence of which has been so powerful. We pass over his metaphysical speculations, to his opinions which are more particularly connected with natural history. Many of these are based upon the traditions of geological revolutions, similar to those reflected to us from every people. In one of his dialogues, he supposes Solon to have been told by a priest of Sais, in lower Egypt, that Sais had been founded 10,000 years before; that subsequently, all the monuments of men, save those in Egypt, had been destroyed by numerous deluges. That these inundations were historically true, may be admitted, but it is a glaring inconsistency to except from their influence, a low, alluvial territory, that would have been one of the first countries submerged. The disappearance of the island of Atalantis, is another story, founded in like manner, perhaps, upon an ancient geological convulsion, but the details of which are due to the exuberant fancy of this philosopher. In the same dialogue, is a curious approximation to the modern science of chrystallography, derived by him from the Pythagorean school, which, as we before adverted to, sought the remote principle of all things in the power of numbers: for it is stated that the four elements, air, earth, fire, and water, owe their separate properties to their primitive form; the primitive chrystal being pyramidal in fire, cubical in earth, octohedral in water, and icosihedral in air: lending himself to a fanciful cosmogonico-generalization, he asserts that each of these solid primitive forms resolves itself into tetrahedrons, so that the universe is ultimately composed of triangular pyramids. His physiological system, which evinces some acquaintance with anatomy, does not merit much attention, and his zoology is altogether fanciful.

Adopting the metempsychosis of Pythagoras, he asserts that trifling and unjust men, at their first transformation, are changed into women; the most depraved men are transformed into fishes. According to this system, the affinity which exists between animals of different classes, is attributable to each retaining something of its former state. However fancifully physiological and zoological subjects were treated by Plato—sometimes perhaps to veil doctrines it was not safe to divulge openly—there may nevertheless be discerned in his writings, the outlines of those three principles of motion, which in our own times have been called organic life, animal life, and intellectual life.

Such schools, and such men, which entered upon the discussion of every branch of knowledge, could not fail to plant its seeds deep in some powerful mind, and to the great benefit of mankind, if such a mind was free to exert itself, untrammelled by the superstition and jealousy which had cramped the intellectual labours of Socrates and Plato.

Accordingly, after the death of this last philosopher, in the 348th year B. C., in the eighty-first year of his age, Aristotle the Stagyrite, his disciple and successor, appeared upon the scene—an individual, if we are to value men for the variety of their attainments, and their disinterested devotion to the improvement of their fellow creatures, who may claim to receive the highest meed of praise so great a benefactor can receive at our hands. He was fortunate in the period in which he lived, having been brought up at the Macedonian court, a cotemporary with Philip, who subsequently appointed him tutor to his son, Alexander the Great. It was his good fortune to inspire his royal pupil with a love for natural science. It appears that he caused to be transmitted to Aristotle the most remarkable productions of the countries he subdued; so that although the conquests of Alexander were not, in their effects, permanent victories for his family, yet each of them was a real enlargement of the empire of knowledge. Pliny states that more than a thousand persons were placed at the disposition of the philosopher, to assist him in collecting the materials of his history of animals, beside an almost unlimited command of money. At his school, the lyceum, he attended in the mornings with his disciples, to examine his specimens, and in the afternoon he expounded the higher branches of his philosophy. Diogenes Laertius has preserved the title of two hundred and sixty works of this extraordinary man, most of which are lost. They appear to have embraced almost the whole range of human knowledge. Logic, rhetoric, poetry, morals, politics, metaphysics, general physics, meteorology, mineralogy, and the history of animals. On all these subjects, he lays down no rules, but those deduced from observed facts. It may be truly said of him, that he gave to all the sciences the right method of advancement; and that in the natural sciences especially, he collected more facts, and deduced more general laws, than all his successors have done, up to the period of that great naturalist of our own times, Cuvier. Many of his principles in general physics, as well as in some other branches, have indeed been found false and imperfect, but they were the general expression of the facts he had observed, his intelligence being only limited by his opportunities. His history of animals is a surprising work; it is impossible to think of this monument of his industry and genius, without offering the greatest tribute of admiration to his memory, by admitting, that whether in his classification of animals, or in his immense number of facts and general propositions, he has almost anticipated all that we owe to modern investigation. We reluctantly forbear to enter upon the tempting details within our reach; but to show that his aphorisms are not founded upon à priori assumptions, and that they are the bold results of practical observation, we shall lay a few of them before our readers.

He observes, that all animals, without exception, are furnished with a mouth, and that they possess the sense of touch: these two characters, he considers the only ones that are indispensable: but all animals, he states, of whatever species, differ from another species, in the presence or absence of some other character, common to animals.

All land animals, he observes, have locomotion, but many water animals have not.

Winged insects which have stings in the head, never have more than two wings; but those which have stings in the posterior part, have four wings. He divides animals into those which have red blood, and those which have not, and forms his groupes in a very natural manner. His class of insects is divided into those having wings, and those without wings. This is the distinction adopted by Linnæus, and prevails at this day. He gives the definition of a genus, by adducing solipeda, or simple hoofed animals. This genus is distinct from all others, and includes those animals only which have a simple hoof, such as the horse, ass, &c. &c. Although the Greeks had only become acquainted with the elephant in his own time, he had studied it with his usual accuracy. Experience has shown, that even Buffon has always erred, when he has ventured to contradict this great naturalist, although he lived at a distance of more than two thousand years from the period of Aristotle. His knowledge of fishes appears to have been greater than we possess at the present day. Of their habits, their mode of generation, their food, their emigration, their diseases, he speaks with the greatest detail and accuracy.

After the death of this great naturalist, 322 years B. C., Theophrastus was the most celebrated of the philosophers of the Lyceum. He was in botany, what Aristotle had been in zoology: but Greece being now subdued by the Macedonians, and the Roman power having gradually interfered with the independence of all free states, science began to decline: nor can the efforts of Pliny the naturalist, be considered a revival of natural science; feeble as those efforts were, they were soon lost in the prostration of all independent action, under the despotism of the Roman emperors. After the death of Augustus, flatterers and panders of the basest kind alone flourished, with few exceptions. The Roman people, at length, unaccustomed to great examples of virtue and knowledge, lost all reverence for them; and before the final overthrow of the empire, by the descendants of those pastoral tribes who had so frequently interrupted the first dawnings of science, the Romans did not know where the dependencies were situated, of which they were the nominal masters. So surely does it happen, that when men, from whatever causes, are permitted to administer the government of a people, with reference solely to their own gratifications, that the public mind, having no bright examples to impel it forward, ebbs, and exposes a vast and unproductive barren. Such was the result long before the fall of the Roman empire.

(*To be continued.*)

ANTIQUITIES AND LANGUAGES OF THE MEXICAN INDIANS.

The writer of the following communication, a distinguished Mexican gentleman, is entitled to the cordial acknowledgements of the Editor, for this interesting paper, and flatters himself it is only the first of a series, that will reflect great light upon both the antiquities and languages of the aboriginal nations of this continent.

There are strong reasons for supposing that the ancient Indian monuments which are found so widely diffused over the territory of the U. States, derived their origin from a people, skilled in arts to which the natives here, who have been known to our race, have always been strangers. We have no evidence, that the modern races of red men, have ever, with slight exceptions, passed beyond the hunter state. There are instances of stone hatchets being found in tumuli, in the State of New York, made after the Mexican manner, and of a material peculiar to Mexico. This points to a connexion between the ancient nations of Mexico, and the people who constructed the monuments that are found, even in the northern parts of the territory of the U. States. We now want architectural comparisons, between the monuments in the U. States, and those found in the southern parts of America. In this point of view, the present communication of our intelligent correspondent, may prove extremely valuable.

Editor.

No. 1. Palace of Mictla.

Sir,—We cannot but regret that the conquerors of Mexico have destroyed, with a barbarism ignominious even for the fifteenth century, the most remarkable edifices and monuments of the various nations which inhabited that extensive portion of the American continent. The Bishop Zumarrága caused the precious annals of the Mexican Indians to be burnt, and destroyed what had escaped the fury of the conquerors. The conduct of these last, formed a contrast with that pursued by their countrymen in the Peninsula, in relation to the celebrated palace of Alhambra, and other monuments of the Arabians. Zumarrága and the first monks who arrived at Mexico, preferred the example set by the inquisitor Tormequada, to that of the monks of the congregation of St. Mauro, in whose convents the sciences found a refuge, and where the treasures of Grecian literature were preserved.

Thus, few monuments of Mexican antiquities have remained, except those capable of resisting the ravages of time; those immense masses, which the nations, as if by instinct, have constructed, as memorials of their existence to future ages.

The writings and paintings which were saved from the conflagrations of Zumarrága, were but few, and consequently, the notices we possess, respecting nations so far advanced in civilization, are scarce, and deserve to be cherished.

The investigations which you propose to insert in your Journal, touching the antiquities and languages of the aboriginal Indians, deserve much attention, and I have thought myself bound to communicate to you some information which I possess, respecting the Indians of my own country: happy to assist in forwarding your laudable intentions.

One of the few monuments of the first people, which are still preserved in Mexico, is the palace of Mictla, distant twenty miles from the city of Oaxaca, in 17° 20′ N. lat. Mictla, in the Mexican tongue, signifies hell; and the Zapotecas who inhabited that country, called it Liobáá, which means, a place "devoted to repose." The monarchs of Zapoteca, dwelt at Mictla. They were feudatories of the emperors of Mexico, and paid tribute to them in those coloured feathers, of which great use was made for their standards, as well as by the dignitaries of the empire, and their priests. The High Priest of the Zapotecas inhabited the palace of Mictla. Mictla, according to the relation of the few persons who have visited that great catacomb, was an immense cave, which the industry of the Zapotecans converted into a subterranean palace. It consists of four compartments, above and below, with an extensive square in the centre. The edifice is supported by means of columns of porphyry of one entire piece, eight feet in diameter, and five Spanish varas (about fifteen feet) in height. They are after the Grecian taste, without pedestals, and perfectly smooth. They support the roof, which consists of slabs, two varas in length, one in breadth, and one-half in thickness. The slabs, which are about equal in dimensions, are not united by any kind of cement.

The form of the edifice is that of a ducal crown, the superior part having a greater circumference than the inferior. It must be confessed, that in this respect the civil architecture of the Zapotecans is entirely original. In the walls, the cement is as hard as stone. The surface of the walls is covered with mosaics of white stone, derived perhaps from the fine quarries of white marble which are found in the territory of Oaxaca. The pieces of mosaic, are not united by any cement; they are admirably executed, and form branches. It is remarkable that without the use or knowledge of iron,* the Mexican Indians could quarry, form, and polish marble, flint, and the hardest stones.

The entrances—very spacious—were made of three stones of equal size, of an entire piece, and of the same thickness as the wall. Each of the compartments or saloons, served as a temple and sepulchre, to the kings and nobility.

* Mexican tools of copper have been found.

The chief priest performed the functions belonging to the worship of the idols, upon a large slab, raised in the hall, appropriated to these deities. He was clothed in a white garment of cotton, resembling the surplices used by Catholic priests, with another above it, adorned with figures of birds and other animals: he bore a sort of mitre on his head, and a buskin on his legs, studded with pieces of gold. The worship in that temple, or royal chapel, consisted of profound genuflexions, and offerings of incense, furnished by the odoriferous gums, which abound in the woods of Oaxaca. This was the place destined to the sacrifice of human victims, whose hearts were offered to the idols, whilst the bodies were cast into the cave, through a door, closed by a slab, which is yet preserved. Prayers, penitence, and fasting, were also performed in the same place, when any favour was sought, or any evil deprecated from their deities. The chief priests enjoyed the privilege of a sepulchre in one of the compartments.

The kings of Teozapotlan were carried to the sepulchre, in their richest garments, feathers, and jewels, and with exquisite collars of gold; a shield was placed in the left hand, and the spear which they used in war, in the right. At the funeral, discordant and lugubrious instruments were played upon, and amidst lamentations, the life and achievements of the deceased were sung.

Their kings, their great chiefs, in the same manner as the victims sacrificed at the temple, were thrown into the cave, and even some, whilst living, voluntarily threw themselves there, believing it led to the mansions of eternal felicity. The Zapotecas also had their elysian fields: hope and fear have given birth to the same dogma in America and in Egypt.

The Zapotecans believed that the cave was three hundred leagues deep; and in fact there does exist a very great cavity, which has been formed by some cause. I am disposed to believe that riches are buried there, whose resurrection would console the arts. It is to be hoped that the enlightened government of Mexico will cause it to be ascertained whether in Mictla we do not possess a new Pompeii or Herculaneum.

One of the superior compartments was the palace of the Zapotecan pontiff. In it was his throne, covered with the skins of tigers, and rich carpets of the coloured feathers of birds. The other halls, even that of the King, were lower than that of the high priest. It was, no doubt, a theocratical government: the sacerdotal order was as much respected as the divinity; it was hereditary; and although the priests were not married, yet at certain solemnities they had intercourse with the other sex, and the fruits of this commerce were destined to the service of their religion.

There was a distinct compartment for the priests of an inferior order, one to receive the king in, and another for the nobility. When they were assembled at the palace, all, of whatever rank and dignity, were under the authority of the pontiff. All the floors were covered with mats, upon which they slept; no bed being raised higher for any person whatever.

The Zapotecans were warlike, and had made great progress in the art of fortification. Their last king, Cosijopü was as prudent in his rule, as his father Cosifoeza had been valiant. The Mexicans endeavoured more than once to subdue the Zapotecans, but were always repulsed. Even at this day, the war-like spirit of their ancestors is yet preserved, in the miserable remains of this nation. The Indians of the whole State of Oaxaca are industrious, well mannered and patient.

It is to be regretted that Mictla has not been visited by some one competent to appreciate and describe those rare objects which vulgar eyes assign no value to. I remain, sir, your most obedient servant, A MEXICAN.

ON THE ACCLIMATING PRINCIPLE OF PLANTS.

IT is nature's plan, that nothing should remain fixed and stationary. She exists by motion, and manifests herself through endless changes: even death and decomposition are her pioneers, to prepare the way for life and existence. The very rocks and minerals, (unorganised matter,) are changed by the action of the elements, form new affinities, and yield to the circumstances of moisture and heat, with which they may be surrounded. Animals exhibit still more changes; they possess powers of developement, and the means of continuation of kind. Endowed with locomotion, they can change their climate and habitation: with a natural pliancy of constitution, they can accommodate themselves to the quality of their food, and character of the country upon which they may be thrown, and appear beautiful or deformed accordingly as they may be acted on by circumstances. Many of them can bear the most violent contrasts of heat and cold, and adapt themselves to many climates.

Vegetables too, are organized, have their growth and decay, and the powers of reproduction. Beyond this we allow them but few capacities; no locomotive powers, none of the sensibilities common to animals, nor that pliancy which can accommodate itself to circumstances. They are the fixtures of nature, with but little latitude in which to flourish, and but little diversity of soil from which to derive nutriment. The object of this paper is to enlarge their sphere, and to show that they possess more power to change their climates, and capacity to bear the contrasts of heat and cold, than we have generally ascribed to them; to illustrate it with many instances where they have actually adapted their growth and habits to a great extent of country, and diversity of latitude, and to urge agriculturists to make more efforts to vary their culture.

Plants have *directly* no locomotive powers, but *indirectly* they have in a great degree the faculty of changing their places, and, consequently, their climate. The embryo germ wrapped in a kernel, or seed, is virtually a plant, ready to germinate when thrown upon its parent earth, and affected with heat and moisture. It is in a most portable shape, and can be transported with ease to an unlimited distance. Nature in many instances superadds to seeds, wings, down, feathers, and chaff, by which they become buoyant, and are carried by the winds of heaven, by the storms that sweep the forest, and by the streams, and currents of rivers, and the ocean, to an immense distance, and through many degrees of latitude! They become finally deposited in some genial soil, and at one remove, or through a succession, they occupy extensive regions. Nature manifests her great care of the embryo, by coating some of her seeds with shells, which protect them from the attacks of insects, and the action of the elements; others have bitter, narcotic, or poisonous qualities, which forbid animals eating them; and many are filled with oily, or resinous matter, which resists for ages, and even centuries, the action of the elements, unless acted upon by the proper degree of heat and moisture. By such qualities they endure, and await a suitable time and conveyance to their destined place, in order to extend and vary their families.

Birds also convey the seeds of plants in their crops over a wide extent, before they become triturated and digested; and when these winged carriers die, or decay, from accident or age, the seeds are deposited, and take root in some distant land. Animals also convey them in their stomachs to a considerable distance, and pass them uninjured by the powers of digestion.

Man, more provident than all, to whom plants are necessary, whose support, whose comforts, and whose pleasures connect him with them, carries their choice seeds, slips, and scions, far and wide. His interests foster their growth, his attentions enrich their products, and his skill and science preserve their existence, and adapt them to their new condition. In an improved community, man's wants multiply: he has occasion for the more varied and rich fruits; more abundant and luxurious clothing, and furniture of vegetable growth; odours to regale his senses, vegetable flavours to pamper his appetites, and all the medicinal plants to heal his various diseases, and invigorate his shattered constitution. He attaches himself to agriculture and horticulture: plants become his companions; he carries a creative resource into those departments, and by his attentions, forms new varieties and excellences, unknown to the wild state of vegetable existence. Such are the means nature has provided for the propagation and extension of plants; such are the indirect locomotive powers they possess. We must no longer, therefore, consider vegetables such inert and sluggish beings.

We will now treat plants as having a kind of locomotive existence. We know that they are very perfectly organized, have sensibility, and sexual intercourse. We know that they have lungs, by which they breathe, and are connected with the air. We know by abundant experience, how easily they are affected by the elements, by heat and cold, moisture and drought. We know how radically soil affects their productiveness, how immediately they are stinted or stimulated by the nature of the extraneous circumstances with which they are surrounded. Beings therefore, that have such perfect organization, that although they are fixed in their places, are deeply changed by every shower, and every breeze, and every stroke of the cultivator—beings, so necessary to the wants, and very existence of animated nature—should possess, in a high degree, the faculty of changing their climate, and of accommodating themselves to circumstances, and the strong contrasts of seasons. Nature else would be wanting in her usual foresight, and in her adaptation of one thing to another.

If an animal is carried by accident, or its own wanderings, to a country or climate that is not congenial to its nature, it can and does make use of its locomotive powers, to regain one that is more suitable to it. This happens every day. Thousands of birds and fish, and other animals, migrate regularly, to avoid even the different seasons of the same year, and could not, with all their versatility of constitution, exist without it. We may infer, then, that plants, which, after having rooted themselves, cannot migrate at all, should be endowed with faculties to bear all the changes of the seasons, and even of climate, in the same dull place of their existence. *They are so endowed*, and can often bear more changes, and support more disasters of storms and ravages of insects, than animals; and often continue to flourish under violent and sudden changes.

Human care, and the providences of nature, have given to many plants a great extent of climate and latitude, an enlarged growth, and an increased and improved product. Let us bring together such instances as are within the knowledge of all, and which ought to stimulate our cultivators to greater efforts.

The valley of the Euphrates was doubtless the native region of all those fine and delicious fruits which enrich our orchards, and enter so largely into the luxury of living. We thence derived all the succulent and nutritious vegetables that go so far to support life; and even the farinaceous grains appertain to the same region. The cereal productions began in that same valley to be the staff of life.

Our corn, our fruit, our vegetables, our roots, and oil, have all travelled with man from Mesopotamia up to latitude 60°, and even farther, in favourable situations. The cares of man have made up for the want of climate, and his cultivation atoned for this alienation from their native spot. The Scandinavians of Europe, the Canadians of North America, and the Samoides of Asia, are now enjoying plants which care and cultivation have naturalized in their bleak climes. Melons and peaches, with many of the more tender plants and fruits, once almost tropical, have reached the 45th degree of latitude in perfection, and are found even in 50°. Rice has travelled from the tropics to 36°, and that of N. Carolina now promises to be better than that of more southern countries. The grape has reached 50°, and produces good wine and fruit in Hungary and Germany. The orange, lemon, and sugar-cane, strictly tropical, grow well in Florida, and up to $31\frac{1}{2}$°, in Louisiana, and the fruit of the former much larger and better than under the equator.

Annual plants grown for roots, and vegetables, and grain, go still farther north in proportion, than the trees and shrubs, because their whole growth is matured in one summer; and we know that the developement of vegetation is much quicker when spring does open in countries far to the north, than in the tropics. In Lapland and on Hudson's Bay, the full leaf is unfolded in one or two weeks, when spring begins, although it requires six or eight weeks in the south. Nature makes up in despatch for the want of length in her seasons, and this enables us to cultivate the annual plants very far to the north, in full perfection. The beans, pumpkins, potatoes, peas, cabbages, lettuce, celery, beets, turnips, and thousands of others, seem to disregard climate, and grow in any region or latitude where man plants and cherishes them. The fig is becoming common in France; the banana, pine-apple, and many other plants, have crossed the line of the tropics, and thousands of the plants valuable for food, clothing, and medicine, and such as are cultivated for their beauty, fragrance, or timber, are extending their climates, and promise much comfort and resource to man. Plants lately introduced, whose cultivation has not run through many ages or years, have acquired but little latitude in their growth, and show but little capacity to bear various climates, because time has not yet habituated them to such changes, and human cares have not imparted to them new habits and new powers.

Nothing can be effected by suddenness in *acclimating* plants; too quick a transition would shock them; it must be a very gradual process, embracing many years, and many removals. The complete success that has attended the plants first named, the earliest companions of man, proves this. In the more recent plants success is exactly in proportion to the length of time that a plant has been in a train of experimental culture.

The most striking method of testing the effect of climate on plants, is to carry suddenly back to the south, such as have been extended far, and become habituated to a northern climate.

Such plants have so much vigour, and the habit of a quick and rapid growth so firmly fixed on them, by a long residence in the north, that when suddenly taken to the south, although the season be long and ample, they continue, from habit, to grow and mature quick, and obtain the name of rare-ripe; because they do not take half of the time to mature, that those of the same family require, which have never been so changed. Gardeners give us early corn, peas, fruit, and turnips, by getting seed from places far to the north; and cotton growers renew the vigour of the plant by getting the most northern seed. This practice is common in the case of most plants, and is founded on the supposition that plants do, and can acquire habits.

The fact supported in the first number of the American Journal of Geology and Natural Science, "that plants are most productive near the northern limit in which they will grow," that they bear more seed or fruit, and have more vigour of constitution, offers much encouragement to agriculturists. This proves that it is not a meagre, stinted existence, devoid of profit or productiveness, that we give to plants, by pushing their culture far north, but a strong and healthful growth, one that repays the labour and attention, by a greater product than belongs to more southern situations.

Every view that we can take of this interesting subject, every fact within our knowledge, whether drawn from the actual state of cultivation, or from physiological investigations into the habits, nature, and construction of plants, goes to show that plants do become acclimated, both in the natural and artificial way, to a great extent. Enough has been witnessed to prove that plants have a physical conformation, that does accommodate itself to circumstances, and have capacities more extensive than are generally ascribed to them: enough has been realized to encourage farther efforts, and to give us hopes of much future benefit.

In this enlightened age, where invention in the arts and mechanical philosophy, is changing the whole order of our social economy, where new comforts and resources, unknown to our fathers, are daily developed, and, as it were, created; in this age, where labour-saving machinery is redoubling the productions of the arts, almost exempting man from in-door exertion, and cheapening all the elegancies of clothing, furniture, buildings, and books, until luxuries are common to rich and poor, and education within the reach of all, why should not agriculture awaken, put forth its energies, and partake of that spirit of improvement that is working its magic in all other departments? Why does it not avail itself of that knowledge of the nature of the soil, which chemistry gives? those tabular statements of the weather and climates, which naturalists furnish? those philosophical investigations into the nature and habits of plants, which have been presented? and that labour-saving spirit that seems to know no limits in other branches of business? Why should all our capital improvements fly the open fields, where culture exists, and be realized only in cabinets and manufactories?—Agriculture follows the old dull routine, and its products lumber on to market in heavy carts, whilst all other branches move on, aided by a thousand inventions, with ease and despatch. That field, whence our food is derived, and on which our very existence depends, lies neglected, whilst we cultivate luxuries to a morbid excess. Every thing is cheapened but human food; every thing becomes annually more attainable, but the necessaries of the table. If this disproportion between the arts and agriculture continues to advance, we are destined to live in a sort of splendid pauperism: enjoying the luxuries of fine houses and furniture, we shall enjoy every thing to satiety but bread. W.

FOSSIL REMAINS, FOUND IN ANNE ARUNDLE COUNTY, MARYLAND.

A PARAGRAPH having appeared in the public papers, stating that some very curious fossil remains had been found in the State of Maryland, by Dr. J. S. Owen, the Editor addressed a letter to that gentleman, containing a set of queries. Dr. Owen, with great promptitude, has answered them in a most intelligent manner, and has added to the value of his communication, by enabling the Editor to examine the fossil remains themselves.

They prove to be the dorsal vertebra of a small whale, and the caudal vertebra of a larger one, together with the fragments of some of the ribs. The shells, which have reached us in a very mutilated state, are the Pecten Jeffersonius, Turritella Plebeia, of Say, and Venerecardia Blandingi of T. A. Conrad,* together with other well known tertiary shells. The deposit in

* Journal Acad. of Nat. Science, Vol. VI. part 2, p. 229.

which these remains were found, is a very extensive one. Mr. M'Clure, in his sketch of the geology of the U. States, designated the low part of the Atlantic coast, as alluvial. This was in the infancy of the science, before the line was well drawn here between marine and fresh water fossils, and before it was known that this deposit exclusively contained marine remains. Dr. Van Renselaer, we believe, was the first to give it its true place in the tertiary. Subsequently, the zealous labours of Dr. S. G. Morton, and Professor Vanuxem have not only made known to us many of the fossils of the Atlantic coast, but have made a permanent distinction between the tertiary beds in Maryland, and those much lower in the series, of New Jersey. Mr. T. A. Conrad has a very satisfactory and intelligent paper on this subject in the journal of the Academy of Natural Science, Vol. vi. part 2. The valuable papers of Dr. S. G. Morton, are in parts first and second, of the same volume, to which we with pleasure refer our readers. Mr. Say's able "account of some of the fossil shells of Maryland," is found at page 124, of Vol. iv. of the Journal of the Academy of Natural Science.

Had there been any thing new in the fossils Dr. Owen has so obligingly forwarded to us, we should have devoted a plate to it. Dr. Owen's section is valuable, and we publish it, together with his letter, not only because he deserves every attention at our hands, but because we think it a model for all future communications of this kind, made under similar circumstances. It is only by noting every thing, and preserving every thing, that we can hope to become thoroughly acquainted with the geology of this flat part of the coast, especially. EDITOR.

LETTER FROM DR. J. S. OWEN, TO THE EDITOR.

Anne Arundle, Md. July, 1831.

Sir,—THE statement which appeared some time past in the papers, respecting some fossil remains, said to have been discovered by me, was not altogether correct, only a few bones having been found, and those not such as to enable me to say to what class of animals they belong. This statement was made without my knowledge, and contrary to my wish; and it was not until after the lapse of some weeks, that I was informed any publication on the subject had taken place.

Yet as the bones found are of a large size, and as I have no doubt many more could have been obtained, had not unavoidable circumstances prevented, I will endeavour to answer the queries you have so politely favoured me with. But from my ignorance of geology, I am fearful that I shall not be able to give you as explicit information on the subject, as I could wish.

Query 1. At what depth from the surface were the bones found?

Ans. At the depth of thirty-two feet.

2. Were they found separated from each other, or lying together?

Ans. They were found lying together.

3. Were they found in a situation to induce a belief, that the animal died on the spot, or that the bones were accidentally transported there by water, or otherwise?

Ans. From the bones found being so few in number, I am unable to form any opinion, as regards the probability of the animal having died on the spot, or of their being brought thither "by water or otherwise." They were found lying horizontally, the vertebræ a few inches within, and the ribs part within and part without the well, during the excavation of which, they were discovered.

4. Are the bones *rolled* or water-worn?

Ans. Not rolled, but water-worn.

5. What is the nature of the soil through which the digging was effected? was it composed of loose unindurated earth, with mud, pebbles, or gravel? or not?

Ans. The entire depth of the well is seventy-two feet, eight inches. I have drawn up, according to your directions, the following table of the beds.

Feet.	
1	Rich black vegetable mould.
12	Hard and firm clay.
3	Sandy, a little gravel, no pebbles.
10	Potter's clay, in numerous layers.

Bones. 46	A dark ash-grey bed, very compact and firm, requiring the pick-axe for some few feet, and fracturing into large flakes. Then sandy, somewhat firm, the colour a shade darker, and so continued without any marked difference to the bottom of the well. No pebbles or gravel were found below fifteen feet. The bones were found six feet within this dark ash-grey bed, at thirty-two feet from the surface.

6. Was any vegetable matter or shells found near the bones, and of what kind?

Ans. Vegetable matter was found a few feet below the bones in considerable quantities, but exceedingly decayed, rendering it impossible to say of what kind. From the size of the pieces removed, I at the time judged them to have belonged to some tree.* These vegetable remains were intimately blended with a fine compact earth, which, when separated, had a knotty, snake-like appearance. No shells were found remaining near the bones, but their impressions were found in *great abundance*, a few above, but vast quantities below. There are both univalves and bivalves. About twenty-eight feet below the bones, a bed of oyster shells, one foot thick, was found; and a few feet below them, a number of shells, and some few teeth of fish, all in a perfect state of preservation.

7. What bones have you found? Do you think they are the bones of one animal, or of more than one? Give a rough sketch of the grinding surface of the largest tooth.

Ans. There were only found two vertebræ, and parts of several ribs. The length of the largest vertebræ is four inches and five-eighths. The distance from the extreme end of one transverse process, to the extreme end of the other, six inches and a half.†

The spinous process, as well as the spinal arch, is wanting, having been knocked off. The diameter of this vertebræ, at its largest end, is three inches and five-eighths; its shortest two inches and a half. The spinal arch is entire; its greatest diameter one inch and three-fourths; its shortest, one inch and a fourth. The

* Lignite?—Ed.

† In this measurement, I have allowed for that part of each transverse process, which is wanting.

ribs are unfortunately much broken, and not being able, from their situation, to attain but some portions of them, I am unable to state accurately their length; but from a careful examination made by myself, on the spot, I am disposed to think they were from four and a half to five feet in length. The smaller vertebra is convex before, concave behind, has a bold strong spinal arch, and no processes on the fore part. The bones are petrified, but in the smaller vertebra and ribs, the petrification is more complete. No teeth or jaws of this animal were found.

I have no doubt that many more bones might have been found; several feet below the spot whence the described bones were taken, many ribs were found jutting into the well. I only desisted from continuing my search after more bones, on account of the apprehensions of the workmen that the sides of the well would fall in, and because a supply of water was particularly important to me at the time.

It will give me great pleasure to forward these fossil remains to you, in any manner you may point out, being very respectfully your obedient servant,

J. S. Owen.

To Mr. Featherstonhaugh.

ON THE SILVER, GOLD, AND PLATINA, OF RUSSIA.

By James Dickson, Esq. F. G. S. M. B. S. &c.

New Brunswick, N. J., August 17, 1831.

My dear Sir,—I do myself the honour of forwarding to you for insertion, if you please, in your Journal, the following communication, which has been extracted principally from the journal I kept, when recently in Russia. My long residence in the mining districts of South America, has made me familiar with the subject of the precious metals.* I anticipate great pleasure in a visit I propose making in a short time to the "gold region" of the United States, when I shall pay particular attention to the

* The writer of this paper is the Mr. Dickson whose desperate resistance to, and extraordinary escape from the Mexican banditti, near Puebla de los Angelos, in 1829, is narrated in the New Monthly Magazine, 1830, lately edited by Mr. Campbell.

It requires to know Mr. Dickson, and to have seen the frightful scars he bears upon his person, as we have done, to give full faith to that most romantic narrative.

Mr. Dickson is a very experienced metallurgist, and his proposed visit to the south, will be highly favourable to our knowledge of its metallic and mineral resources.

Editor.

analogies you suppose to exist between it, and the gold district in Mexico. I remain, my dear sir, very assuredly yours,

James Dickson.

To G. W. Featherstonhaugh, Esq.

St. Petersburg, 1831.

"Gobolefsky accompanied me next morning, and introduced me to General Karnieff, director of the imperial mint, and of the mines in general of all the Russias. A little, good-looking old man stood at one of the windows of the saloon as we entered, and on my name being announced, he came forward and welcomed me. Our conversation turned upon the mineral resources of the distant regions of Irkoutsk, on the Chinese frontiers, where of late, much silver ore had been obtained. The mines of Ekatherineburg had long been an object of interest to the Russian government, and the science of mining had been particularly patronized by the emperor Nicholas. Notwithstanding the minute and scientific research which had been devoted to the improvement of their mines and mining operations, their eager spirit of discovery, and their almost ridiculous—from the extreme to which it was carried—ideas of economy, had rendered them ever restless, and eternally on the *qui vive* for every new invention.

"The mines of Irkoutsk, many thousand versts from the scene of their other operations, had been worked to a considerable extent within late years, yielding, according to the Russian ideas of silver mines, a large and increasing revenue. In the silver ore of these mines some gold had been met with, which, with the increasing produce of those of Ekatherineburg, had rendered the establishment of the French process of refining with vessels of platina, necessary. Their principal source of gold, was, however, in the gold washings of the Ural mountains, which bade fair to rival, in extent and value, the more celebrated gold alluviums of the Brazils.

"The silver ores of Ekatherineburg were considered to be of greater value than those of Irkoutsk, or the other districts which had lately shown themselves productive; although high expectations were entertained as to the result of the exploring commission which had been sent northward the preceding year, since reports of vast riches, embosomed in their most northern snows, had been the favourite theme of discussion among the scientific men of St. Petersburg.

"Little as I had been struck previously with the produce of the Russian silver mines, I was fain to confess, then, that another Potosi or Valenciana might arise in their distant Siberia; and it was with awakened interest that I availed myself of the request of the mining corps to investigate and analyze the gold and silver ores of Siberia.

"The mining corps establishment at St. Petersburg, is an interesting exhibition. It is there that young men of genius and talent are patronized, educated, and provided for by the emperor; it is from thence that individuals are sent abroad into the various countries of Europe, to visit all that is magnificent, and all that is famed, in the annals of mining. England, Germany, and Sweden, have been again and again explored, and the gradual improvements and interesting discoveries of each mining district, presented in detail before the committee of this mining corps. Joined to a large and magnificent collection of minerals, amongst which may be seen the rare and massive specimens of platina and gold, and those large beautiful beryls, all products of Siberia. Extensive models of the working of mines are constructed for many versts under ground, extending to a considerable distance along the banks of the Neva; while one large saloon is entirely occupied with the models of every machine used in mining operations throughout the world.

"The silver ores of the Russian mining districts, are principally found with a matrix of quartz; the green and blue carbonates of copper form a prominent feature in the character of these ores, and although they consist of native, and oxides of, silver, they deserve rather the name of copper, than that of silver ores. Of sixty samples, all of them from the mines of the interior, upwards of forty-four were carbonates of copper; the others resembled more than any thing else, the 'jabones' of the Mexican veins.

"Those who have witnessed the immense produce of one single silver mine in Mexico, and the quality and richness of the ore, would doubtless have participated in the surprise which I felt during the progress of my investigation. To find that those ores which had been held up as of great value, were scarcely equal to the lowest quality of Mexican ore, was indeed a disappointment. Most of the samples returned the ore at the rate of sixteen ounces of silver to the ton weight; there were here and there, it is true, one which might be calculated at twenty times that amount; but the great mass was of that quality from which a Mexican miner would have turned away, without bestowing on it another thought.

"I have said before, that some of the silver ores contained gold. I had the satisfaction of informing the mining corps of a discovery of gold, and one which held forth promise of great results, in one of the carbonates of copper from Ekatherineburg.

"The Mexican silver ores are seldom worked, so as to leave any profit, if they contain less than six or seven marcs of silver in the monton of thirty-two cwt. The Russian mining corps complained bitterly that they were unable to obtain more than twelve ounces out of the sixteen ounces contained in the ton weight; an ore so poor, that no Mexican would ever dream of working it; and yet these men not only procure a considerable quantity of silver, but obtain it at but little cost; to be sure, their cheap slave labour, and their immense forests of fuel, are advantages with which no other country can pretend to compete.

"The annual produce of silver in the Russias, is estimated at about 1000 pouds of forty pounds each; but what, after all, is this 1000 pouds or 40,000 pounds, to the produce of the Valenciana mine in Mexico, which for many long years produced its millions of dollars annually.

"Young Demidoff had not yet returned from Italy; from his relation and agent Daniloff, I met with every attention. His cabinet contained many beautiful specimens of platina, most of which were designed as presents to the crowned heads of Europe. Although some single masses of platina weighed seven or eight pounds, none could be compared to those in the cabinet of the mining corps, one of which weighed about twenty-seven pounds. My own specimens, which were presented to me by Zobolefsky, although weighing 800 grains each, and of which I had been not a little proud, dwindled away in the view of the great rarities lying in profusion in Demidoff's cabinet. Owner of the most celebrated platina deposits, and gold washings, he had had many opportunities, in the course of a few years, of selecting and putting aside, not only large massive lumps of gold and platina, but what was yet more interesting; a great variety of most beautiful and perfect crystals of gold.

"The mass of platina before alluded to, as weighing twenty-seven pounds, was found completely isolated, and at nearly sixty versts from the usual deposits of platina, in a bed of red clay, where some slaves were employed in making bricks. Those streams, in the beds and on the banks of which, the gold deposits are met with, contain more gold, and less platina on the European, than those on the Asiatic side of the Ural mountains. The amount of gold obtained from these washings, had amounted for the year 1830, to nearly half a million sterling.

"It may be well imagined to what an extent their operations must be extended, when the hundred pouds or four thousand pounds weight of soil, seldom yields above sixty-five grains of gold, and varies from sixty-five to one hundred and twenty grains,—which is there considered rich,—to the hundred pouds. Nevertheless, their mining operations are conducted with such skill and success, as even to obtain of this limited quantity nearly the whole amount; and that too, with such little cost, as to have been indeed far beneath my expectation.

"Of the simple, and yet beautiful processes made use of in the gold washings of the Ural mountains, I shall hereafter speak, well convinced of the great utility and service which they would be of, if made known to the mining regions of other countries.

"The Demidoffs, Davidoffs, and many other Russian families, are acquiring princely revenues from the employment of their slaves in these gold washings; but it is not alone the gold, the platina itself is another great source of their prosperity; more especially since all the platina is now coined at the imperial mint, and established as part of the current coin of the realm.

"The coins made of platina are beautiful; those large pieces with the head of the emperor are the best, and show better the effect and polish which coins of this metal can take. Though many hundred pounds weight of platina are coined monthly, into pieces of eleven and twenty-two rubles, they disappear rapidly from the circulation. They may be met with occasionally, and a few at a time, in the hands of the brokers. I consider their price much above the London price of malleable platina, which is at present about twenty-five shillings English per ounce: considering that the crude platina is the produce of the country, the Russian price for malleable platina, which is about twenty-eight shillings, is too extravagant; and yet this does not arise from the expense of manufacturing, but from the cost of the material itself, which is far higher than the platina of South America. The cause of this, is the monopoly and easy disposal of it at a high price through the coinage.

"The price in St. Petersburg for crude platina, is fixed at three rubles, paper, per zolotnicht, or about twenty shillings English per ounce.

"Humboldt has already pointed out the resemblance which exists between the gold formations of Russia, and those of the Brazils. From the extensive and minute researches which he made while exploring these districts, much information has been given to the scientific world.

"They had not as yet met with any veins containing gold, although they were ever on the alert. There is on the property of Demidoff, a position in which a river empties itself into a morass, bounded on one side by a hill of quartz, and then issues again. No gold is found in the bed of that river previous to its entering the morass, but when it flows from out of it, its sands are rich in metal. Some pieces of quartz, containing gold, had been met with, to all appearance the debris of the outcropping of some vein.

"Difficult would it be to form a true theory of the manner in which gold deposits have been effected; and many, indeed, have been suggested which have looked well at first, and then vanished into nothing before the stubborn facts which reveal themselves in a long-continued and minute research into the origin of the gold alluviums of many countries.

"The gold washings of Tippeanni in La Paz, belonging to the Indian chief Pazas Kanki, now attaché of the Buenos Ayres legation in London, are of the most singular and interesting that have met my notice. There are facts in the history of these gold deposits, which differ from all others with which I am acquainted.

"On a subject such as the origin of gold or platina deposits, it is indeed difficult to generalize; and though a theory reconciling the various incongruities, and striking facts of each gold district, has been with me a subject of no slight consideration, yet I must confess, many as have been my opportunities of ascertaining their exact nature and position, I must leave it to be determined by abler men.

"It might be imagined, that the circumstance of finding gold in the beds of rivers, would naturally suggest the exploring of the river to its source, in quest, among the distant mountains of the place, from whence it came. Though the explorer might be gratified in finding his search successful, and meet in some rent and broken ravine through which the waters are now rushing, with the veins of quartz, displaying to broad view their metallic riches; yet let him seek to effect his object, under similar circumstances, in another, and perhaps adjacent district, he will lose himself in an investigation of a formation which never yet, or ever will be found to contain gold. He will meet with the debris of rocks long ago passed away in the conflicts of the elements; he will meet with evidences of a state of things which now no longer exists on the surface of these wild and singular regions. In some tracts of land the gold will be found disseminated poorly yet regularly in layers; in others it will be disclosed in some peculiar position, en masse—in one solid lump—in little circles of a few feet, as if deposited by the vortex of some minor whirlpool; and in fine, in such occasional directions as to set all attempts at theory at defiance.

"Data, nevertheless, have presented themselves during the progress of gold mining in various countries, which have proved highly interesting, and of the greatest service in assisting the investigation of the position, nature, and quality of gold deposits."

ON THE EFFECTS OF VARIOUS POISONS ON LIVING VEGETABLES.

By Richard Harlan, M. D. Surgeon to the Philadelphia Alms-house Infirmary, Member of the Royal Academy of Medicine of Sweden, &c. &c.

I completed last year the following series of experiments, in order to test the powers of vegetable life in resisting the effects of vegetable and mineral poisons. The positive nature of the results which were obtained, is calculated, in my opinion, to throw considerable light on the *physiology* of plants; a department of science, at the present time, too much neglected, even by the members of the medical profession, and by the practical agriculturists, for the most part, entirely overlooked.

The application of certain poisons to plants and flowers, in order to destroy noxious insects, is not unfrequently recommended; and doubts have been expressed as to the injury that might occur to the plants themselves by such treatment: it has even been positively asserted that the destruction of the plant is the necessary consequence of the application of certain vegetable poisons in some instances.

In the progress of science, next in importance to the accumulation of true knowledge, is the necessity to disencumber ourselves of error. If the results of the present experiments possess no other merit, they will be esteemed interesting on this account alone. I have been led to the present investigation by perusing a notice of experiments of a similar nature, by M. Marcaire Princep, a professor of botany in Geneva, in the "Bulletin des Sciences Naturelles," for March, 1830, of which the following is an extract:

"The experiments detailed in this memoir, have for their object to prove that the juices or extracts of plants, poisonous to animals, are equally so to the vegetables from which they are obtained. Thus M. Marcaire has succeeded in killing branches, and even entire individual plants, of the *datura stramonium, hyosciamus niger*, and *mornordica elaterium*, by plunging them into distilled water, charged with the juices and extracts of these plants, or even by watering them with this narcotic water."

"M. Goeppert, of Breslau, has published in the annals of Poggendorff, an account of experiments from which he derived very different results." But neither of these authors extended their experiments to the introduction of poisons into the substance of the plants.

I first confined myself to a repetition of the experiments of M. Marcaire, but obtained results entirely at variance with his. I now determined to pursue the subject on a more extensive scale. In the garden of the Philadelphia Alms-house Infirmary, I selected a number of young and thriving plants, and assisted by the gardener, and several of the resident physicians, I applied the following named poisons, as hereafter specified, taking care to wound the *bark* of the *perennial*, and the *interior* parts of the *annual* plants, so that the poison should be directly applied to the wounded sap-vessels. The poisons used, were, the extracts of stramonium, belladonna, and cicuta; the essential oil of *nicotiana tobacum*, diluted hydrocyanic acid, and powdered oxydum arsenici.

Experiment 1. September 18th, 1830. A strong thick solution of the extract of belladonna and cicuta, (German manufactory,) was introduced into the bark and pith of different stems of the stramonium, at 12, meridian.

2. Extract of belladonna introduced into the stem of the palma christi.

3. Powdered white oxyd of arsenic was freely spread about the root of a young palma christi, and the plant watered.

4. Arsenic introduced into the stalks of two young tobacco plants, near the roots.

5. Two young stramonium plants were selected: arsenic was introduced into the stalks and stems of one, and spread about the root of the other, and the plant watered.

6. Dilute hydrocyanic acid introduced into an incision made into the stalk of a stramonium.

7. Dilute hydrocyanic acid poured on the root of *impatiens balsamina.* (Lady-slipper.)

8. Strong oil of tobacco introduced into the stalk of palma christi.

9. Idem into the stalk of stramonium.

10. Idem into the stalk of a young tobacco plant.

11. Idem into a branch of *ficus carica.* (Fig tree.)

12. Idem placed freely round the root of a young pyrus, (pear tree,) the earth being loosened and watered.

13. Idem placed round the root of palma christi.

14. Idem introduced into the stalk of euphorbia sericea.

15. Arsenic freely spread round the root of the *mimosa sensitiva*—exposed to the rain and dews.

It is not necessary to enter more minutely into details of these experiments, some of which were frequently repeated, with great care. The same result universally followed in every instance. Not one plant, shrub, or flower, displayed signs of the least injury from the varied applications of the different poisons; some, indeed, appeared to thrive better, for the attentions which were rendered them.

I shall only add a list of plants, on which some of the experiments were subsequently repeated at my request, by Mr. John Carr, at Bartram's botanic garden.

1. *With extract of belladonna.—Zinea elegans, impatiens balsamina, vinea rosea,* and *kœlruteria paniculata.*

2. *With extract of cicuta.—Zinea elegans, tagites, vinea rosea,* and *salvia splendens.*

3. *With oil of tobacco.—Amaranthus and Zinea.*

These additional experiments, performed by a skillful practical botanist, confirm the observations previously made: hence, we are permitted to conclude, first, That the experiments detailed by professor Marcaire, are erroneous. Second, That substances which act as lethel poisons to animal life, are not so to vegetables.

We cannot but admire the wisdom, order, and harmony of creation! fixed to the earth by immutable laws, plants and flowers would have soon ceased to exist, had their susceptibilities, like those of animals, rendered them liable to the agency of poisons, to contact with which they are so much exposed.

R. Harlan, M. D.

We had the satisfaction of assisting, during the present month, together with professor Del Rio, at a repetition of those curious experiments on vegetable substances, with vegetable and mineral poisons. They were conducted by Dr. Harlan, assisted by Dr. Moore, in the garden of the Philadelphia Alms-house Infirmary, and the results corresponded precisely with those obtained in September, 1830.

The plants to which the poisons were applied, were palma christi, stramonium, nicotiana tobacum, balsamina impatiens, brassica, geranium, and carduum benedict.

The poisons used in the experiments, were ol. tabaci, oxyd. arsenic, extr. stramonium, extr. cicuta, corros. sub. in sol., ol. terebinthi, and a strong solution of opium.

Each of these poisons was separately introduced into the circulation of individual plants, by incisions made in the stems, under the leaves, and by similar, separate applications of them to their roots; by infusions, and by powder also, in the case of arsenic. In some instances the poisons were placed around the roots only, viz. corros. sublimate, arsenic, sp. turpentine, and oil of tobacco.

In none of these instances was any of the plants poisoned. One of the young geraniums faded, after constant impregnation, for three days, of the earth about its roots, but this is evidently attributable to its soil being rendered unfit for the support of vegetable life.

We must therefore adhere to the reasonable opinion, that plants have the property of segregating from the soil or atmosphere, those principles which are proper for their healthy state, and of rejecting those which are injurious to their organization.

If plants yield to the deleterious influence of those principles which are injurious to other organized bodies, it is because—as in the case of the young geranium—they cannot appropriate those salutary principles, upon which their existence depends, and which enables them to exercise their natural functions, one of which is, to reject that which is injurious to them. We speak now of the circulation of plants, and not of mechanical application of poison to their parts. Oil of turpentine applied several days to the bark of many trees, and especially the linden tree, will soften, and eventually destroy the part; but the experiments tried with the balsamina, or lady-slipper, the palma christi, the cabbage, and tobacco plant, whose roots were liberally supplied with spirits of turpentine, prove that it did not affect them through their circulation. Dr. Harlan's attention to this subject, will be properly appreciated by those engaged in the study of the physiology of plants.

EDITOR.

ON THE VALUE OF GEOLOGICAL INFORMATION TO ENGINEERS, AND ON THE INEQUALITIES OF THE EARTH'S SURFACE, AND THEIR TRUE LEVELS ABOVE TIDE WATER.

THE very gratifying encouragement which this work has received from so many distinguished officers of the government, resident at Washington, has induced the Editor to suggest through these pages, that this unexpected patronage, which, on account of the advancement of science, is so honourable to all the parties concerned, may receive the most beneficial direction, and our knowledge of the geology of this continent, and of physical geography, be greatly increased, if the gentlemen connected with the military branch of the U. S. government, would direct some physical reconnoisances to be accurately made; in our present ignorance of which, we are not able to describe faithfully, the degree of inequality of the surface of this continent, nor ascertain the natural connexion between mountain ranges, and table lands, that are locally distinct from each other. The trigonometrical surveys that have been performed in Great Britain, and the maps which have been executed by order of the board of ordnance, upon a scale of an inch to a mile, are valuable monuments, as well of the intelligence of that government, as of the cultivation which natural science has received in that country. They give all the information which military engineering requires, and in practical geology, they point out the probable existence of all the useful metals and minerals, and the extent of the formations in which they are contained. No blame, it is true, can attach to the government here, for having hitherto omitted to follow that example. The field of investigation is too extensive, and the probable expense too great, to be undertaken without the authority of congress. Nevertheless, opportunities appear to have been neglected, of adding to our stock of knowledge, in this branch of natural science, without the necessity of going into additional expenditures; at least, any that would be regarded as objectionable, when compared with the importance of the object to be obtained. The very extensive surveys and reconnoisances which have of late years been made by order of government, in relation to internal communications for military and civil purposes, are here alluded to. Admirably as they have been executed, it is nevertheless true, that they have been performed without reference, in most cases, to the value of those mineral and metallic substances, which are contained in the geological formations, the engineers were obliged to travel over, and the production of which would go far to justify the execution of those contemplated internal improvements. There is no evidence that geological or mineralogical information, have been held of any account, in those expensive surveys, whilst it is true, that any person competent to the examination of those branches, might in all cases have conferred an intrinsic value upon those surveys and reconnoisances, even if none of them were executed. When the value of geological information shall become more extensively known, territorial maps will probably have geological characters given to them, which can be done for almost the same expense, in every case of original survey. Where important information of this character, is omitted to be acquired, it is a loss to the nation, and an omission which ought to be brought, both before the consideration of the government, and the public.

There is no mathematical truth more firmly settled, than that the mineral formations, of which the crust of the earth is formed, succeed each other in an invariable order. That the most important deposits of metals are found low down in the series, as well as the marbles most used in the arts. Coal, that invaluable combustible, upon which the wealth of Great Britain has been mainly raised, lies always beneath certain rocks, and never above them.* We see, then, how important it is, for the practical engineer to possess geological information, as a part of his profession; or, where this combined information does not exist to the desired extent, that a practical geologist should at least be associated with the engineer. In either of these cases, the engineer in running his lines, would be able to report to his employers, the true mineral character of that part of the geological series he is treading upon; and as we now know that all the formations are invariable in their order of succession to each other, so from knowing what the superficial formation is, we infer with certainty, the probability of our finding the most valuable deposits of metals, minerals, or coals. Maps, with these geological characters, have a great intrinsic value. It cannot be denied that individual proprietors are interested in ascertaining the vertical, as well as superficial value of their possessions; and the day will arrive, when geological surveys, will become quite as important as superficial ones. It is easy, then, for government to confer, in this manner, an intrinsic value upon all their surveys and reconnoisances; and the writer of this paper will be happy, if these suggestions should attract the attention of some of those distinguished gentlemen, connected with the government, whose names are included in the list of his subscribers. It is the want of accurate knowledge in the structure of rocks, and the order of their succession to each other, that detracts so much from the value of the published account of those various expeditions to the north-western parts of this continent, undertaken by order of government; it is due, however, to the distinguished travellers, to whose direction these expeditions were confided, to say, that they could not be supposed to possess that intimate knowledge of geology, which distinguishes the present times, and which is the fruit of a very rapid advance in the science.

Hoping that the next expedition ordered by government, may be free of those defects inherent in those, which, in all other respects, have been so admirably accomplished, it is now respectfully suggested for the consideration of Maj. Gen. M'Comb, and the other officers in the military branch of the government, that

* This applies to the productive beds; as varieties of vegeto-carbonaceous matter are found higher up in the series than the great deposits.

a great deal of valuable information, connected with the scientific knowledge of the surface of country, might be collected from officers on service, without exposing the government to any material expense.

The study of chains and ranges of mountains, forms at this time a most interesting branch of geology. It would seem that all the great inequalities of the earth's surface, which have not been formed by the action of excavating waters, owe their origin to an expansive subterranean power, which has thrust them up through ancient surfaces. During the present era, mountains have been formed in this manner, both from the sea and land. In the year 1538, Monte Nuovo, in the bay of Naples, was thus thrown up through the water, in one night, to the height of four hundred and fifty feet; and in Mexico, in 1759, a tract of land, from three to four square miles in extent, was upraised, together with the cone or peak of Jurullo. The mass in its most convex part is five hundred and twenty-four feet above the old level, and its celebrated peak Jorullo, is 1695 feet high. The rock, constituting the old level, was a base of green-stone, with porphyry, basalt, &c. It is evident from a very careful consideration of geological phenomena, that all the mountain ranges, with the exceptions before made, have been formed by that sort of subterranean action, which has produced Monte Nuovo and Jorullo. All mountains, then, have come up through other beds, and have necessarily dislocated them, and laid them upon their flanks at high angles. In various parts of the world, we find mountains thus situated, and without any horizontal deposits lying upon the edges of the ancient disturbed beds; whence, we are authorised to infer, that the epoch of their upraising is comparatively recent, and posterior to the last deposits.* In Leicestershire, England, the granite, b, b, and slate, c, c, of Charwood forest,† exist in beds highly inclined; but on the edges of those beds, new red sandstone, a, a, and lias, e, are found in a horizontal position; proving that these last have been deposited subsequent to the upraising of the first. We thus infer, that those primitive beds, were partially raised in the ocean; and that at a subsequent period, the secondary rocks were deposited upon them, marking two distinct geological epochs. On the other hand, the system of mountains,

* This is a safe conclusion in cases where no presumption exists of beds, superincumbent upon them in the series, being absent from particular causes.

† Plate 4, fig. 2.

to which Mont Blanc, and the western Alps belong, have the oolites, the green sand, and the tertiaries; or the upper secondary rocks, and the very last deposits, previous to the diluvium or superficial soil, lying in a disturbed manner upon their flanks; showing that the mountains, having moved all the other beds, were upraised since the tertiaries were deposited. Hence, we come, by a fair induction, to the conclusion, that the western Alps of Europe, were upraised at a different period from the granite hills in Leicestershire, and at a geological period, much nearer our own times. To illustrate this principle, we have borrowed from Bakewell, pl. 4, fig. 1, a section of Alpine beds, near the Col de Balme, and Mont Blanc; a, a, are alternate beds of oolite, sand stone, and lias, equivalents of those horizontal beds e, in pl. 4, fig. 2.; b, b, are disturbed beds of pudding-stone, with the pebbles not lying on their longest axes, but vertical; c, c, a col, or passage excavated in the soft slate of the mountains; d, d, vertical plates of granite beds, with pyramidal caps, called aiguilles, or needles. The dotted lines mark the supposed original prolongation of the beds, before the granite came up, bearing them like drapery on its flanks, where they lie at an inclination, varying from 65° to 80°. Mont Blanc is 15,534 feet high, and these pyramidal peaks, which time, and the deluges consequent upon their upraising, have worn into their present forms, were once 10,000 feet beneath the surface. Thus we have the proofs, that the lias formation in England, was deposited subsequent to the upraising of the granite at Charrwood forest; and that the Pennine Alps were raised subsequent to the deposition of the lias.

Since the crust of the earth, with the exception of the igneous rocks, is composed of a series of beds, that have been deposited in succession to each other, it results, that chains of mountains, and table lands, may have been upraised at any of the periods belonging to this succession, and that each period may have its peculiar system of mountains. This, to a great extent, has been found to be the case, and we can thus distinguish their geological periods, not in the chronologies affecting the present order of nature, but in the great history of subterranean dynamics, to which the surface of the earth owes its present form, modified, as it no doubt has often been, by the action of the waters, which have been displaced by these elevations. The practical uses, then, to be derived from the detailed geological examination of mountains, are numerous.

If any chain should be productive of useful metals, or minerals, we may investigate all the branches of the system it belongs to, with a view to trace its continuities.

In the establishment of boundaries, indestructible and unvarying monuments present themselves to the geologist, which escape the attention of the engineer, if he does not know how to avail himself of them. It cannot be denied, that the expense and inconvenience, consequent upon the light manner in which the northern boundary was settled, in the treaty of peace in 1783, would have been greatly avoided, had the disputed territory received a rigorous geological examination. From the documents which have hitherto been published, it does not appear that geological data have been much relied on, for the adjustment of this important question, which is not yet settled. It is greatly to be desired, that in the re-surveys which are yet to be effected, before the delivery of the respective territories is definitely made, that these considerations be not overlooked.

There are other branches of this subject which deserve the attention of that estimable officer, Col. Abert, of the topographical bureau, to whose department information of this kind properly belongs. The details of our physical geography are incomplete: many inaccuracies have crept into the only accounts we have of the mountains, table lands, and lakes, in the interior of the United States. Their respective levels above tide water, have, in most instances, been the result of estimates, rather than of admeasurements.

As it may be supposed, that there is not a cantonment under the U. S., which does not possess one or more officers, regularly trained as military engineers, all these errors might be gradually corrected, if those officers were to avail themselves of the rare opportunities which many of them possess, being quartered in situations almost inaccessible to others. The contributions which they could make to physical geography, would form an important addition to our knowledge of the earth's surface, independently of their great practical uses. The general elevation of table lands, the true height of mountains and hills, the exact level at which the great western lakes are found above tide water, are important branches of the geology of the U. States. In the valuable labours of Lt. Col. Long, much has already been done; but the time has arrived, when this science demands accuracy, and this can be given to us only by actual admeasurements. Perhaps at some future day, Congress may authorise a general trigonometrical survey, which will include all these objects; in the mean time, much may be effected through the influence of the commander in chief.*

Of some parts of this continent we are almost without details: of California, we know little or nothing, and of that extensive territory north of 50° N. latitude, we have scarce any geological information. The chain of high lands, which branches from the Chippewayan mountains there, and which runs N. E., between lake Winnepec, and the great Slave lake, appears to be the water shed of that region. It is said to connect itself with the highlands, running north of lakes Superior and Huron. It would be a great service rendered to science, if some of the British gentlemen, familiar with that part of the physical geography of the British dominions, would give us some accurate information of the country. In giving an account of the elevation of countries, it is best to state the general height of the table lands, distinct from that of the mountains which are based upon them: in the following table, the elevations of the table lands, above the level of the sea, are alone expressed.

	Toises.		Feet.
Table land of Irun, in Persia, .	650,	or	3900.
Moscow, in Russia, . .	67,		402.
Swabia, in Germany, .	150,		900.
Lombardy, in Italy, . .	80,		480.
Auvergne, in France, .	174,		1044.
Schweitz, . . .	220,		1320.
Bavaria, ...	260,		1560.
Spain, ...	350,		2100.
Plains of the Rocky mountains,			3000.

The following table expresses the most authentic elevations above the level of the sea, which we possess. Many of them have been admeasured: others, no doubt, are mere approximations.

* It would be an act of injustice to Peter A. Browne, Esq., of this city, not to notice his indefatigable endeavours to interest the government of this State, in the geology of Pennsylvania, with a view to the construction of an accurate geological map. The disinterested and useful labours of that gentleman in the cause of geology, do him great honour.

	Feet.
Long's Peak, Chippewayan, or Rocky mountains,	15,000.
Mount Washington, N. Hampshire,* . . .	6,234.
Mansfield mountain, N. Peak, Vermont, . .	4,279.
Catskill mountains, Round Top, N. York, . .	3,800.
Black Hills, lat. 40° N. W. of Missouri, . .	3,500.
Alleghany mountains, in Virginia, . . .	3,100.
Ozark mountains, west of Mississippi, . . .	2,250.
Wisconsan Hills, S. of lake Superior, . . .	2,250.
Catskill mountain-house, N. York, . . .	2,214.
Sources of streams tributary to lakes Winnepec and Superior,	1,200.
Head waters of the Mississippi, ...	1,200.
Break Neck, near West Point foundery, . .	1,187.
Rainy lake, S. E. of lake of the Woods, . .	1,100.
Tourn mountain, Rammapoo, N. Jersey, . .	1,067.
Lake of the Woods, ...	1,040.
Dog lake, ...	1,000.
Source of Miami, ...	964.
Source of Sciota, ...	919.
Sources of the St. Peter and Red Rivers, . .	830.
Mouth of the Platte, Missouri, ...	680.
Mouth of the St. Peter, Mississippi, . . .	680.
Lake Winnepec, ...	630.
Lake Superior, ...	595.
Lakes Huron and Michigan, ...	571.
Ohio, near Wheeling, Virginia	565.
Lake Erie, ...	565.
Ohio, at Cincinnati, ...	414.
Point Levi, opposite Quebec, ...	310.
Mouth of the Ohio, ...	300.
Lake Ontario	231.

EDITOR.

* This is the loftiest of the White mountains.

ORNITHOLOGICAL BIOGRAPHY.

By John James Audubon, F. R. S. &c. &c.—Published by Judah Dobson, and H. H. Porter, Literary Rooms, Philadelphia.

To say that this is one of the handsomest books ever reprinted in America, is to assert one of its slightest merits. The great reputation which Mr. Audubon had acquired as an artist, by the publication of that most magnificent of all works, "The Birds of America," has been very much increased, by the work we are now about to notice, which, whilst it is a companion and key to the first, is, itself, an acquisition to any library. The "Introductory Address" at once reveals the history and character of the author.

"In Pennsylvania, a beautiful State, almost central on the line of our Atlantic shores, my father, in his desire of proving my friend through life, gave me what Americans call a beautiful 'plantation,' refreshed during the summer heats by the waters of the Schuylkill river, and traversed by a creek named Perkioming. Its fine woodlands, its extensive fields, its hills crowned with evergreens, offered many subjects to my pencil. It was there that I commenced my simple and agreeable studies, with as little concern about the future as if the world had been made for me. My rambles invariably commenced at break of day, and to return wet with dew, and bearing a feathered prize, was, and ever will be, the highest enjoyment for which I have been fitted.

"Yet think not, reader, that the enthusiasm which I felt for my favourite pursuits, was a barrier opposed to the admission of gentler sentiments. Nature, which had turned my young mind towards the bird and flower, soon proved her influence upon my heart."

He married, passed twenty years in varied and in infructuous attempts to acquire riches, "after the ways of men;" and at length, worn out and irritated by ill fortune, and the remarks of his friends, he broke "through all bonds," and abandoned himself to nature, in "the woods, the lakes, the prairies, and the shores of the Atlantic"—thus cutting himself off, for ever, from the hope of rising to the dignity of justice of the peace in his own county, or from the advantages of keeping "the best liquors of any store-keeper of the village." These, in the face of the remonstrances of his friends, were abandoned for nature, cultivation of heart and mind, and that approbation of the wise and good, which no adverse circumstances can now deprive him of.

In the report made to the Royal Academy of Sciences, by Baron Cuvier, is the following passage:

"The Academy has commissioned me with rendering to it a verbal account of the work, which, in one of its preceding sessions, has been communicated to it by Mr. Audubon, and which has for its object, the birds of North America. Its character can be given in a very few words, by saying *that it is the most magnificent monument which has hitherto been raised to ornithology.*"

Mr. Swainson, one of the most distinguished naturalists of the age, has said of this work,

"It exhibits a perfection in the higher attributes of zoological painting, never before attempted. To represent the passions and the feelings of birds, might, until now, have been well deemed chimerical. Rarely, indeed, do we see their outward forms represented with any thing like nature. In my estimation, not more than three painters ever lived, who could draw a bird. Of these, the lamented Barrabaud, of whom France may be justly proud, was the chief. He has long passed away; but his mantle has, at length, been recovered in the forests of America."

The "Ornithological Biography" contains a description of one hundred birds, natives of America, all of which are delineated of full size, and coloured after nature, in the great work which Cuvier and Swainson have so justly praised. To these descriptions are attached others of the trees, shrubs, herbs, and flowers, where the birds build and disport, in their native woods. The botanical characters of these plants are annexed. The ornithologist and the less learned lover of nature, will find a rare treat in these vivid descriptions, comprehending the most delightful details of the manners and customs of the feathered tribes. But what, perhaps, will be deemed by general readers, to enrich especially this attractive work, are the rare, and most interesting narratives and local descriptions, interspersed, very judiciously, to the number of twenty, through the work. They are as follow: the Ohio, the Great Pine Swamp, the Prairie, the Regulators, Improvements in the Navigation of the Mississippi, a Flood, Meadville, the Cougar, the Earthquake, the Hurricane, Kentucky Sports, the Traveller and the Pole-cat, Deer Hunting, Niagara, Hospitality in the woods, the Original Painter, Louisville in Kentucky, the Eccentric Naturalist, Scipio and the Bear, and Colonel Boon. All these passages arrest the attention very forcibly, and some of them are written with great eloquence. So powerful are the impressions made by those graphic narratives, that we rise from the repeated reading of them, almost as familiar with the subject, as if we had been the companions of Mr. Audubon in his many romantic adventures.—Upon a future occasion we propose giving our readers some extracts, for which we have not room at present.

In awarding to him these just praises, we seek to vindicate his claims to the confidence and admiration of his countrymen.

We believe it is Madame de Stael, who, when speaking of neglected merit, observes, that time pays both principal and interest. So it will be with Audubon: 'ere long, the intrinsic value of his labours to natural history, will be universally recognized. We shall hear of no more unfriendly remarks upon the great "Woodman" of America, as he has been called in Europe, from city ornithologists, who, like Cowslip in the Agreeable Surprise, are most of all pleased with the sight of a "roast duck." We know that some of Mr. Audubon's "strange stories" have alarmed some tender consciences, that annually

> "Perform their scientific rounds,
> As far as Bow bells fling their sounds."

In his great work, Mr. Audubon gives, in plate 21, a representation of "Mocking birds defending their nest from a rattlesnake." The serpent has got up the bush, and has reached the nest to suck the eggs, when the birds attack him. It is one of the most masterly drawings we ever saw. Swainson says of it, "every part of the story is told with exquisite feeling." Whether any one besides Mr. Audubon, has ever seen the crotalus in that situation, we do not know. Mr. Audubon declares he has; and we have no idea of disputing his word, because we have not seen, perhaps solely from want of opportunity, what he knows he has witnessed. So rapid is the progress of natural science, that what may be called romance to-day, becomes history to-morrow. We certainly did not know it was the habit of the rattlesnake to climb plants; Cuvier says they do not. But the mocassin snake is well known to climb plants after his prey; and both this snake and the rattlesnake live upon birds and squirrels. Now the mocassin, which is the Coluber tisiphone of Shaw, Trigonocephalus of Oppel, is approximated to the rattlesnakes by Cuvier, who says it is "distinguished from them by the want of a rattle, but having the same pits behind the nostrils, and being equally venomous." The truth is, they are so much alike, that it must be a very difficult matter to distinguish between living specimens at liberty, where the rattles of the one are mute, and not apparent: and such situations may well occur. We saw, only a few days ago, in the possession of Dr. Blanding, of this city, a preserved specimen of the mocassin, so precisely like the rattlesnake, that there was no apparent difference, except that it wanted the rattles: this renders it possible that Mr. Audubon may have mistaken one serpent for another, and altogether improbable that his statement is a fiction. Yet this has been ill-naturedly attributed to this great naturalist, who may really have found the rattlesnake itself in this position, for aught we know to the contrary.

Mr. Audubon has in these works shown the world, that nature has not spoken to him in vain, and that he can express the feelings she has inspired him with, with great force. As an author and a naturalist, he has raised himself beyond the reach of that envy and neglect, which are too often successfully directed against genius, ere its plant has grown into strength, and has put forth the blossomed honours, which impose silence even upon detraction. We gathered from his introductory address, that those social honours which have been lavished upon him in Europe, have been denied him, in this, his native country. We imagine it is because he has been comparatively unknown here. Where there are

> "To censure, many,
> And but few to praise,"

a man wages fearful odds against his adversaries, such as none but the most unequivocal merit can prevail against. That of Audubon has prevailed, and his native country is, as she well may be, proud of her son. He will hereafter find himself more justly appreciated. It will give him pleasure to learn, that since the recent publication of his "Ornithological Biography," the American Philosophical Society has enrolled his name amongst those of its members. We understand Mr. Audubon is soon expected from Europe, to pursue his investigations, and to complete certain departments of his works. We hope on his arrival in his native land, it will somewhat contribute to cheer his heart, to know how much we admire and value his works, and how ready we are to do justice to them.

TO READERS AND CORRESPONDENTS.

We pledged ourselves in our last number to show, that a statement in the Journal of the Franklin Institute for July, 1831, attributing very unworthy conduct to the individual who is now editor of this Journal, was, on the part of Dr. Isaac Hays, from whom it proceeded, a *deliberate falsehood*.

Before we make that pledge good, we beg to offer a few remarks to our subscribers for the following reasons. First, because we are desirous, at once, to apologize to them for having, in a moment of irritation, been provoked to the use of epithets which could not possibly either amuse or instruct them. We regret having done so. We wish that time and room—neither of which were then at our disposal—had permitted us, instead of angry words, to have laid a temperate statement before them, of the causes that required our entering upon a defence against the statement which offended us, and which, as we shall show, was only one part of a systematic attempt to injure, through the editor, the circulation of this Journal.

Second. We wish to show, that this, far from being a private dispute of the editor, is a question of a much graver nature, involving the freedom of opinion in matters of science, and the right of an individual to expose a malignant attempt, to which more than one individual is a party, to make him odious in the eyes of the friends of a deceased naturalist, and so affix upon him with the public, the character of an unfeeling and heartless disturber of the ashes of departed worth. It has been imputed to us in the columns of one of the best journals of this country,* that this bears no evidence of being any thing but a private dispute. In the narrative we are about to draw up, we cannot but indulge the belief, that our readers will agree with us, that had the editor remained silent under continued attempts to misrepresent his conduct and opinions, the result would have been injurious to the cause of science, to himself in the social circles of the city he dwells in, and fatal to the circulation of the journal he conducts. With such motives before him, he feels himself justified in entering upon that defence in the pages of his own journal, which will be found upon this, as upon all other occasions, devoted to good sense, fair dealing, and truth.

In the early part of 1831, the editor of this journal was induced to deliver a public course of lectures on geology, in the city of Philadelphla, as he had previously done in the city of New York, for the sole purpose of advancing the cause of natural science in this country. The unexpected popularity of these lectures, was the leading cause of the existence of this journal. Whilst his residence in this city was considered only a temporary one, every thing, as far as it affected himself, reflected *couleur de rose;* but as soon as he became a permanent resident, and a candidate for public confidence in the walks of science and literature, he discovered that Philadelphia was the seat of a self-constituted authority over literature and opinions; and that any one who ventured to doubt the validity of the appointment, was sure to come in for a full share of anathema. This authority, too, was well acquainted with the use of that efficacious weapon, 'spargere voces ambiguas.' There were feuds also in the domains of science, and not to be a declared friend, was, in the estimation of some, to be an enemy. For a while the editor went on, unscathed amidst the absolutists of literature and science, without selecting particular advisers and assistants for the arduous course he was about to pursue; but as soon as he made known his determination to choose where he was sure of finding honesty and intelligence, and to discountenance all empirics and pretenders, he was made sensibly to feel that he was *monsieur de trop*, and that it was not intended he should sit upon a bed of roses. Anonymous letters, scurrilous attacks from country papers, which had been refused by the press in town—private misrepresentations of the editor's conduct and opinions—all these were resorted to. In one newspaper it was asserted "Mr. Featherstonhaugh is a *foreigner*, and did not only bring with him, but now fosters in his bosom, a contemptible opinion of American literature and talents." This, directed against one who has resided twenty-five years in the United States, and who has devoted his youth and his fortune to the advancement of its interests, was not thought too gross for the columns of an American newspaper. The calumny closed by stating, that the establishment of this journal would "absolutely retard the advancement of science in America;" and then concluded, "I have heard a number of scientific gentlemen express themselves much in the same manner that I have done; and it is to be hoped they will act as they have talked, and will influence others to do so when Mr. F's prospectus comes out." Meaning, to dissuade others from subscribing to it.

Certainly no one can suppose that the editor could be insensible to such proceedings: it is in vain to say, that malignancy of so low and scurrilous a character ought to be disregarded. If this were true, as it affected himself, the editor was bound to feel for the interests of his publisher, and to protect this work for that sole reason. To have remained silent, would have been to abandon, not to protect the interests of his friend. Those who have censured him for the epithets he has used, did not know the private annoyances he

* The Chronicle of the Times.

was subject to, and how much restraint he had put himself under, by not noticing them before.

How he could be so much provoked, as to indulge in those epithets, we now come to relate.

In the twelfth of those geological lectures before alluded to, when on the subject of comparative anatomy, the lecturer, having his table crowded with fossils, had to explain each of them, in a rapid manner, in turns. There were two mutilated jaw bones of the Mastodon, which he had drawn from the collection of the American Philosophical Society, where they had been hitherto unnoticed. These, as they differed from any other jaw bones of the mastodon, having an alveolar process, or socket, towards the end of each, he thought it proper to make a few slight remarks upon; inasmuch as the description of a young scull of the genus mastodon, under similar circumstances, had been published in the Transactions of the American Philosophical Society, and had been, by a deceased naturalist, raised to the rank of a new genus, under the following title: "*Description of a New Genus and New Species of Extinct Mammiferous Quadruped. By John D. Godman, M. D.*" It is due to truth to say, that when this conformation was proposed, as a new species of a new genus, it was rejected by every naturalist of the city of New-York; and long before the lecturer had declared his opinion on the subject in public, Dr. Harlan of the city of Philadelphia, who is without a rival there in the knowledge of comparative anatomy and zoology, had publicly declared, that the characters relied on for raising the animal to a new genus were altogether insufficient; the reasons for which were subsequently published in Ferrusac's Bulletin des Sciences Universelles, for 1830. These opinions, without mentioning any names, the lecturer stated he concurred in, and believed the genus would have to be abandoned. Having those jaw bones before him, he could not, without doing injustice to his class, and to the cause of natural science, pass over one of those erroneous conclusions, to which all naturalists are subject, and for the treatment of which as erroneous, he had such able support. But he did it with the consideration due to the memory of a meritorious naturalist, whose name never escaped him upon the occasion. He had no motive for throwing a shade over his memory, for he never had had any intercourse with the late Dr. Godman, never came into any sort of collision with him, and believes he was equally unknown to that gentleman.

This, the lecturer pledges himself was his conduct upon that occasion, and without appealing to, perhaps, the uncertain recollections of his class, he esteems himself fortunate in being able to show, from the best proof the nature of the case will admit, that it was so. Two or three days after the delivery of that lecture, Mr. Chandler, the intelligent editor of the United States Gazette, published, as it had been his custom to do during the course, a full report of it. It cannot be imputed to that gentleman, that he had any motive to misrepresent what fell from the lecturer upon that occasion; his talent and accuracy are undoubted. On turning, then, to the report of Mr. Chandler, in the files of the United States Gazette, we find the following passage, which comprehends all that was said on the subject:—

"He took occasion here to state his opinion, and adduced facts to prove its validity, that the new genus Tetracaulodon Mastodontoides, must be abandoned; as the only distinctive character upon which it rested, was the presence of milk tusks in the lower jaw, which were common to various species of the Mastodon, before the individuals had reached their full growth." This account, which substantially agrees with the private notes of the Lecturer, has been placed beyond all doubt, by an admission made in an anonymous communication which appeared in the National Gazette on the 24th May, 1831, a week after the publication of the Report of the Lecture in the United States Gazette. And as this anonymous communication has a great deal to do with this controversy, we shall insert it.

A few days after the delivery of this lecture on the 13th May, Dr. Isaac Hays, at one of the stated meetings of the American Philosophical Society, addressed the meeting on the structure of the jaws, and dentition of the mastodon, using upon this occasion, the two jaws which the lecturer on geology had previously exhibited. After various reasonings, he made the following declaration: "That perhaps if that were the occasion for him to express his opinion, he would say that this character (the teeth in the rostrated extremity of the lower jaws) was insufficient to raise the animal to the head of a new Genus." Now Dr. Isaac Hays came to this conclusion,—which was *the identical one expressed by the lecturer*—after inspecting the jaws which the lecturer had *previously presented to his class.* It is true, Dr. Isaac Hays, added, that notwithstanding this, he was disposed to believe it was an animal distinct from any species of mastodon previously described, and was entitled to be considered a new species. At this meeting the lecturer on geology was present, and was silent: he perceived that Dr. Isaac Hays had embraced his opinion, as far as he had expressed it concerning the genus, and as to the supposition that it might be a new species, that was a totally different question, which could be hereafter decided only by the examination of many similar osteological remains, if fortunately they should ever be discovered. In philosophical zoology, the creation of a new genus is a matter of some moment. The surface of the earth is variously constituted, as to climate, inequalities, and productions: but nature animates every part of it, and gives to every animal functions appropriate to the condition of its existence. The ox has cloven feet, which spread, and give him a better support when he treads, and thus enables him to seek his food in the marshy lands, which the small and solid footed horse does not venture upon. The voluminous tusks of the elephant and mastodon, are given to them in like manner, for conservative purposes. So are our own teeth to ourselves: but if every unconformable case of dentition, every instance of teeth protruding in the wrong places, or running obliquely to the direction of the jaws; or, if every particular contraction or expansion of the jaws themselves, and every varying external appearance, shall be deemed of sufficient importance to constitute a new genus or a new species, every individual will be a distinct genus, and classification will eventually become a branch of mathematics. If we are bound to treat this occasional deviation in the dentition of the mastodon in this manner, what will be made of our own race, when the present surface of the earth shall be added to the number of the ancient geological formations, and our bones be disinterred by some future race of intellectual beings?

At the conclusion of Dr. Hays' address, he handed in to the president a paper containing, as he expressed, the substance of the remarks: a committee was formed to examine it, and report upon it for publication. At the head of this committee was placed *his particular friend;* a preconcerted arrangement often very convenient, both for good and for evil, and therefore acquiesced in sometimes. As this address was a somewhat unusual procedure before the American Philosophical Society, and as it involved a matter of some interest in fossil zoology, the few naturalists who were present looked with some attention to the future proceedings of that committee. If there had existed any real difference of opinion between the lecturer on geology, and Dr. Isaac Hays, the subject was now in the hands of a committee of the American Philosophical Society, and the parties for the present, were certainly bound to leave it there. We shall see how far this decorum was observed by one of the parties. Dr. Hays's address was delivered on Friday, the 20th May: on the 24th, the following anonymous article signed X, appeared in the National Gazette:—

"It is with great pleasure we learn, that some of the scientific investigations of our lamented Godman, which had been incidentally alluded to in a recent popular lecture on geology in this city, have been triumphantly sustained and vindicated in a lecture delivered before the American Philosophical Society, a few evenings since, by his friend Dr. Hays. It was asserted in the geological lecture, that 'the new genus Tetracaulodon Mastodontoides (of Godman) must be abandoned, as the only distinctive character on which it rested, was the presence of milk tusks in the lower jaw, which was common to various species of mastodon, before the individuals had reached their full growth.' It is believed that Dr. Hays satisfied every member present, that Dr. Godman's animal was different from any other heretofore described; in corroboration of which he produced from the splendid collection of the society, two of the largest jaws, both of which were possessed of the socket supposed to exist only in the young. The good feeling which prompted the defence of the scientific character of a departed friend, has been amply rewarded in the investigation of the subject by the *brilliant discovery* of four new species of this extraordinary family, among the fossil bones of the rich collection of the society, and that of Mr. Wetherill. A description of these was presented the same evening to the society, intended for publication in their transactions, and it is believed that the public will be very shortly favoured with it, illustrated by engravings of the different species. "X."

The palpable misstatements contained in this article, could not escape any one interested in the subject. Instead of Dr. Isaac Hays's address being a "triumphant vindication," it was an unequivocal abandonment of the new genus: it was disingenuously concealed, that the two largest jaws were the identical jaws presented by the geological lecturer to his class; and as to the *brilliant discovery* of four new species, it had no existence out of romance. It was not worthy of being distinguished from amidst the mass of disgusting puffs which force their way into the public papers, but for one circumstance, which disclosed to the lecturer on geology, that it was also intended to wound him. He soon after its publication, *got the complete proof,* that this anonymous publication originally contained very hostile allusions to him, which had been subsequently expunged; that the composition had received some assistance from, and had been given to the press, by the very individual, bound in honour and duty, to discountenance its production, viz. *The chairman* of the committee of the American Philosophical Society, charged with the consideration of the subject.

That Dr. Isaac Hays was the author of that disingenuous puff, the writer of this narrative does not assert, not having the proof of it; that is a secret between *his friend* and himself. It is hardly to be supposed, that any one would take the trouble to draw up such a paper, without a prospect of deriving some supposed advantage from it. The unexpected discovery of the conduct of the chairman of the committee having opened the eyes of the lecturer, to the combination forming against him, he sent the following answer to X., which was published in the National Gazette of May 26, 1831.

"*To the Editor of the National Gazette.*

"Sir—When a matter has been referred for adjustment to impartial arbitrators, the appearance of exparte anonymous statements is evidence at once of weakness and unfairness.

"Such is the character of the communication signed X., in your paper of Tuesday, the 24th. Neither was your Gazette deemed of sufficient importance to attain the secret object of the writer; a literal copy of it having been lodged at the same time with a respectable morning paper, into whose columns it thus surreptitiously got the next day.

"It is not the intention of the writer of this note to repeat at this time the particular history of the transaction which has produced this anonymous attack, the nature of which is perfectly understood by those whom it concerns. That history is to be found in the United States Gazette of this morning. The writer will content himself with stating, that the matter upon which the difference of opinion has arisen was referred on Friday, the 20th, to a committee of three members of the American Philosophical Society, supposed to be entirely unprejudiced, by a majority of the members present. If any one of them was not so, he will not be able to conceal the fact that he was covertly placed on that committee for the purpose of perpetuating error. Unimportant as the matter may appear, the interests of natural science and of truth are involved in it; and individuals who clearly show they are not friends to impartial investigation, must suppose their conduct will be vigilantly attended to.

"It has been usually attributed to those who cherish the love of natural history, that their truest reward is that certain elevation of mind they receive in the cultivation of their pursuit. A true naturalist loves only to be taught by nature, and disdains to teach by other means. It is the empirical pretender alone who is your anonymous oracle.

"As to the statements of X., they are all wide from the truth. He is afraid of the decision of the committee, and, therefore, 'with trumpets and with shawms,' he is 'triumphantly sustaining and vindicating *brilliant discoveries*,' the fame of which, it is predicted, will never extend beyond the columns of a newspaper." "F."

Dr. Hays, however, it appears, was determined to force himself into notice, and to remove all doubts as to who wrote the article signed X., he procured the following statement to be published in the July number of the Journal of the Franklin Institute.

"Dr. Hays rose, and after some prefatory remarks, stated in substance as follows. That an attack upon the scientific reputation of Dr. Godman, late Professor of Natural History in the Institute, having been made very recently by a lecturer on geology, in a public lecture delivered in the hall of the Institute, at which many members of the society were present; and that a thorough investigation of the subject having resulted in a complete refutation of the attack, he thought it would be interesting to the members of the Institute to be put in possession of the facts upon which the vindication of their late Professor rested.

"The lecturer before alluded to, had stated to his class, that the animal described by Dr. Godman as new, under the name of *Tetracaulodon Mastodontoideum*, was nothing more than the young of the common mastodon. In support of this, the lecturer had exhibited two lower jaw bones from the collection of the American Philosophical Society, one of which he stated to be that of a young animal, and showed the socket which had once contained the tooth characteristic of the animal described by Dr. Godman, while the other, which he said was that of an adult, was asserted by him to have contained no such socket. The lecturer had also exhibited a tusk which he said was the milk tusk of the young of the gigantic mastodon.

"Doctor Hays proceeded to say, that the jaw exhibited by the lecturer as that of a young animal, had proved, on examination, to be that of an adult, as the dentition clearly showed; while in that admitted by the lecturer to be the jaw of an old animal, the remains of the socket which had once contained a tusk, was clearly to be seen. And further, that the tusk exhibited by the lecturer as a milk tusk, was evidently that of an old animal.

"Dr. H. stated that he had communicated to the American Philosophical Society, the proofs of the accuracy of the preceding statement.

"A. D. Bache, *Chairman*.

"J. Henry Bulkley, *Rec. Sec.*"

This statement, which is malignantly intended to injure the editor with the friends of Dr. Godman, and with the public, is a mass of inconsistency and falsehood.

First. It has been shown that the scientific reputation of Dr. Godman never was attacked.

Second. That there had been no refutation of an attack, but that an unequivocal assent had been extorted from Dr. Hays, by the specimens which the lecturer in geology had used.

Third. That the lecturer never had asserted one of the jaws to have been that of a young animal with a socket, and the other, that of an old animal without a socket; but had produced them before his class, for the sole reason that they each had a socket. Of this the note below is a convincing proof.*

The number of the Franklin Institute, was put into the Editor's hands, when the last page of his Journal was printing. Irritated at so open and undeserved an attack from the pages of a Journal, to which he had, as he has shown in a note of his last number, endeavoured to be useful, he spoke of this Dr. Isaac Hays, as he thought he deserved to be spoken of; but if time for reflection had been given to him, he should have preferred to have suppressed some epithets he indulged in, in his anger, and have patiently waited for a more favourable opportunity, of narrating the true history of this unpleasant controversy, into which he has been compelled to enter. He wishes he had done so, and in that wish he expresses an earnest hope, that he will be excused by his subscribers, if any of them thinks he has passed the bounds of decorum. They will perceive in this narrative, that he has no slight grounds for believing there is a malignant conspiracy on the part of a few active individuals, to hinder the circulation of this Journal. This has been attempted both in public and *in private*, without success; *the only instance* where a subscription to it has been discontinued, is that of the chairman before alluded to. There have been a few instances of vindictive and scurrilous attacks in some of the newspapers: these have been disregarded, because, considering the public press as an engine, having a great influence upon writers, and the success they many endeavour to attain, the Editor feels under a deep sense of gratitude to it, for the most unexpected, flattering, and encouraging approbation he has received, from almost every distinguished paper in the city and union.† It is his sincere desire to avoid all controversies; he regrets having been forced into this. Whilst it is a part of his duty to expose sciolism, pretension, and every movement calculated to retard the progress of natural science, he admits that the chief object he has proposed to himself in the establishment of this Journal, is the developement of American natural history and geology, and the doing justice to the talent and learning of American writers on these interesting branches. He appeals to all that he has hitherto published, for the sincerity of his professions. He repeats the pledge contained in his prospectus, that all "approved original papers from correspondents, bearing the stamp of good sense, will be published upon convenient occasions."

He has the satisfaction of informing his readers, that the subscriptions to this work, are now become too numerous, to admit of the names being published, after this number, without inconvenience.

EDITOR.

* I accompanied Mr. Featherstonhaugh when he selected two jaw bones of the mastodon from the collection of the American Philosophical Society: they were selected, because each of them, having an alveolar process or socket, Mr. F. intended by them, to illustrate the structure of jaws of that class, and which, in conformity to his intentions, he did, during his lecture.

RICHARD HARLAN, M. D.

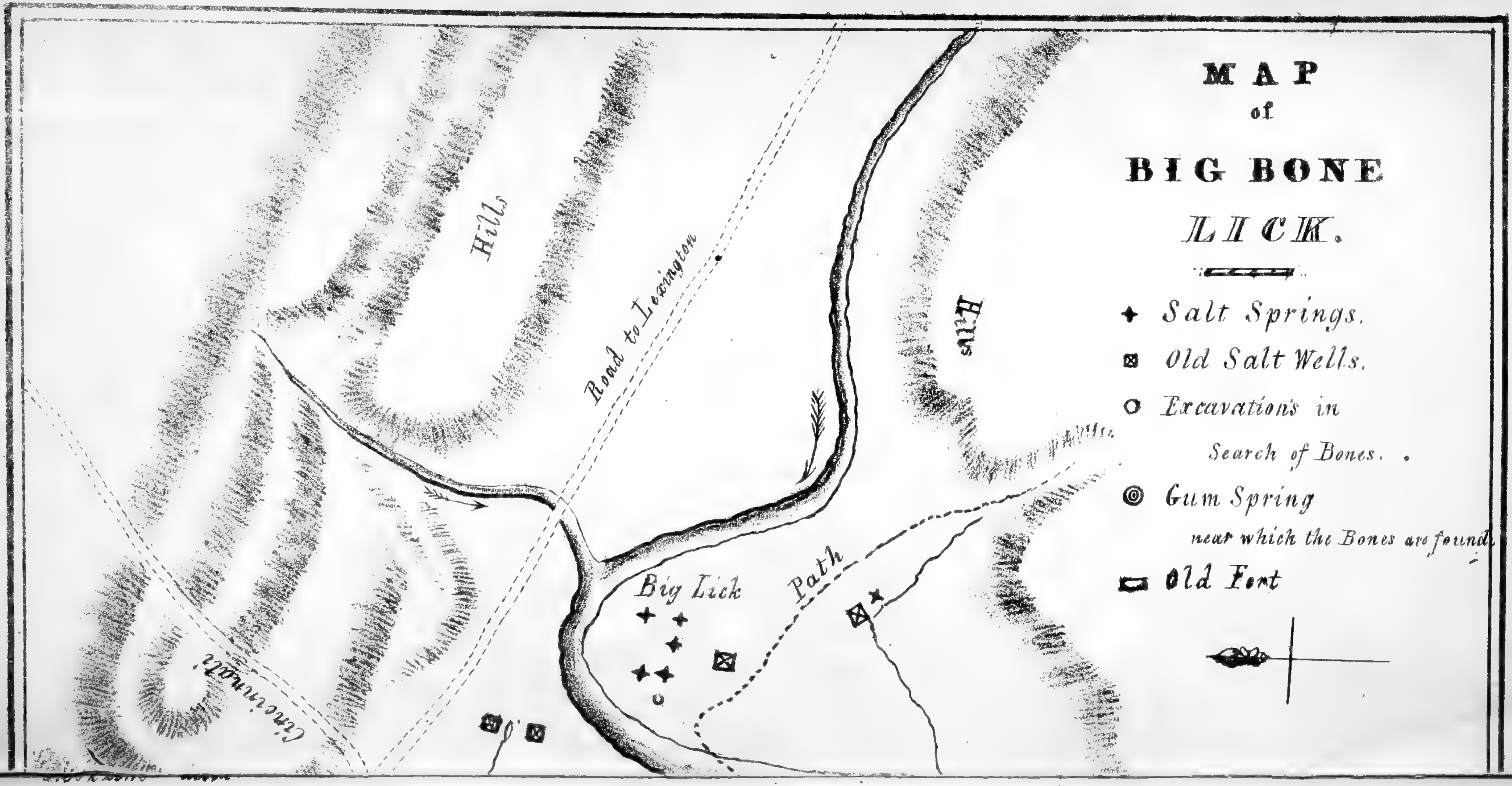
† The National Gazette is an exception amongst the city papers. In its columns the Monthly American Journal, devoted to American natural history, has never been alluded to, although it was, according to custom, presented to the Editor.

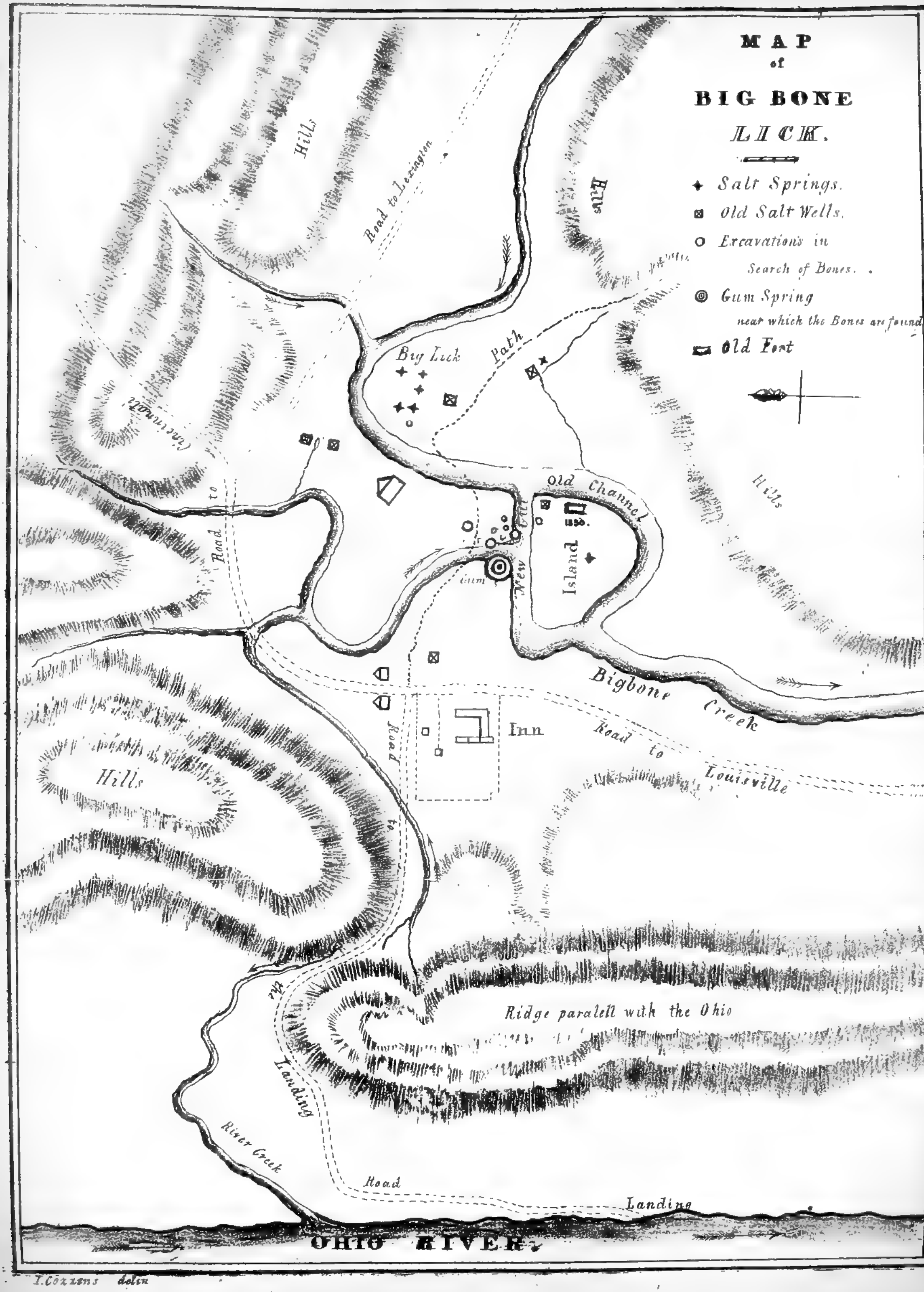
We take very great pleasure in commending to the notice of the public, the Illinois Monthly Magazine, published at Vandalia, in that State, and conducted by Mr. James Hall. We frequently, after hurrying over the multifarious periodical literature of the day, turn to its refreshing pages, which come upon our fatigued spirit, as its kindred breezes do, in these canicular times, upon the face of nature, drooping under excess of heat. The contents of the last number we have received, for July, are very attractive, especially the "Notes on Illinois," which we shall take an early opportunity of republishing. The Gopher there mentioned as a non-descript, is the Geomys bursarius, or earth-rat, with pouches, of Rafinesque.

We have been favoured, by "A Subscriber," with a copy of Wood's Mosaic History, revised and improved by the Rev. J. P. Durbin, A. M., of Augusta College, Kentucky. We shall hereafter notice this interesting work, and rejoice that geology possesses, in the western States, so valuable and intelligent a friend as Mr. Durbin.

☞ *The period of the delivery of this number, has been retarded by an unexpected disappointment, which obliged the Editor to substitute one article for another, and consequently to cause a different plate to be engraved.*

G. W. F.


MAP
of
BIG BONE
LICK.
Salt Springs.
Old Salt Wells.
Excavations in
Search of Bones.
Gum Spring
near which the Bones are found.
Old Fort
Hills
Road to Lexington
Big Lick
Path
Cincinnati
Hills



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THE

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OF

GEOLOGY

AND NATURAL SCIENCE.

Vol. I. Philadelphia, October, 1831. No. 4.

AN EPITOME OF THE PROGRESS OF NATURAL SCIENCE.

(*Continued from page* 104.)

We have seen how truly science and arts may be said to have been cradled in ancient Greece. The Romans received them late; they were amongst the other fruits of their conquests, and they retained them but a short time; two centuries of intellectual splendour being all they can boast of. Victory, and its attendants, riches and luxury, corrupted the Roman people; the ancient simple national spirit fled, barbarians filled the ranks of their armies, and thus the glory of their name, and the integrity of their wide possessions, were left to the protection of strangers. Then came the contests for supreme power, amongst the Roman leaders, and the successful ambition of Cæsar, who ceased to be a Roman when he triumphed over the liberties of his country. Fatigued with civil dissentions, and the bloody proscriptions that had almost extinguished the class of pre-eminent citizens, those who remained, were glad to take shelter under the protection of one, who had once been their companion and equal, and who, to the military renown he had acquired, united the greater security of a highly cultivated mind. That vigilance for the public welfare, which had been the common duty of all, had now devolved upon one, and to him, the source of honour and power, all consecrated those energies, which belonged to their country. Adulation took the place of patriotism. This base spirit arose to a fearful height, under his successors, Augustus and Tiberius. Panegyric alone was permitted in Rome: the eloquence which has truth for its object, was unknown, both to the forum and the senate. The want of great living examples of excellence, finally degraded the public mind. We have the complete proof in the Attic Nights of Aulus Gellius,* of the decline of Roman letters. Sulpicius Apollinarius, whom he extols, boasted of being the only one who could comprehend the history of Sallust, who died not quite one hundred and seventy years before. So insensible had the Romans become to the beauty and force of their ancient language. The other individuals, of whom Gellius speaks, are obscure orators and grammarians, and the work itself has nothing in common with the sublime spirit of thought, which distinguishes most of the writings of the older Romans: indeed, the men of this day, appear to have almost lost sight of the pre-eminent citizens who had preceded them. It is true, there were still regular schools of philosophy in Rome, which had their disciples and their disputations. Plutarch† was of this period, and was much honoured of the emperor Trajan, who appointed him governor of Illyricum; but Plutarch was a Greek, and his protector was one of the superior men of his time. The only school which enjoyed much reputation at this period, was the Eclectic school. Plotinus‡ and Porphyry, who flourished somewhat later, were of this school.

Whilst Roman literature was thus passing away, the multiplicity of laws, inseparable from the constant changes of their masters, were favourable to Roman jurisprudence, which continued to flourish. Nevertheless, those distinguished jurists, Papinian and Ulpian, became victims to the irreverent violence of the times. The first was assassinated by order of Caracalla,§ the second was murdered by the Prætorian guards,|| whilst under the immediate protection of the emperor Alexander Severus. The confusion attendant upon these anarchical times, was greatly increased by the bloody persecutions the Christians underwent, which only terminated by the accession of Constantine to the throne, who, having embraced the Christian religion, took them publicly under his protection.¶ Low as the state of Roman intellect was at this time, by his removal of the seat of empire to Byzantium, the ancient capital of Thrace,** he accelerated its total ruin, as well as that of the empire. The removal of the whole machine of government, drew along with it nearly all the

* A. D. 130. † Died A. D. 140. ‡ Died A. D. 270. § A. D. 212.
|| A. D. 226. ¶ A. D. 319. ** A. D. 328.

rank and wealth of Rome. Courtiers, generals, magistrates, counsellors, ministers, all these, with their households, their slaves, their wealth; the artists, manufacturers, and merchants, who depended upon them, all abandoned Italy. The public revenue, too, being no longer collected and expended in Rome, a void was left there which was deeply felt for five centuries.

Whilst by this great movement, the total ruin of Roman letters was perpetrated, a new literature, which had been growing into importance, during the controversies of two centuries, attained its height under this emperor. This literature arose in the conflict which the first Christian writers had to maintain with the champions of the dominant religions; but it reached its meridian at a later period, when the field of controversy was in the very bosom of Christianity. It was in the schools and libraries of Egypt, Persia, Palestine, and Africa, those great polemics were nursed, who were the glory of the fourth century. Arnobius, Lactantius, Eusebius, Athanasius, Hilary, Basil, the Gregory's, Ambrose, Jerome, Augustin, and Chrysostom.* Unlike the miserable sophists from amongst their countrymen, who had assisted to produce the general debasement, these illustrious men, known as the Fathers of the Christian church, were distinguished as much for their profound views of moral conduct, as for their Christian zeal, and unrivalled erudition. St. Augustine, whose writings are dear to every true scholar, has not disdained, in his great work "De Civitate Dei," to hold up the writings of Cicero as models of human wisdom, although Cicero lived before Christianity was taught. Cicero's celebrated work, "De Republica," was principally known to us by the writings of Augustine, before the recent fortunate discovery of the mutilated original, by professor Mai, in the library of the Vatican. The voluminous and eloquent works of these fathers, have had the greatest influence upon succeeding times. It was unfortunate, however, for letters, that they became entirely obscured by theology. The numerous councils which were held, composed of the most eminent men from all civilized countries, extended the field of argumentation to the most distant points. Their decisions, which tended often to put doctrinal opinions into a still greater state of complication, and which constantly gave birth to new disputes,

* Died A. D. 407.

formed at length the all-absorbing subject of cultivated minds. Science was no more thought of; even jurisprudence but existed in the shade of the ecclesiastical code, and of canon law. Warmed and hurried on by contention, and the pride of opinion, they overlooked the divine character of the precepts of their faith, and too often preferred to look for God in obscure dogmas, and speculative reasonings. In his works they found him not; strangers to natural theology, nature appears to have existed in vain for them. In their search after truth, they went from the unknown to the known, the reverse of that true method, which experience at length has brought us to: for if the past fourteen centuries have disclosed any great truth to man, it is, that God is to be seen in his works, and that the human mind must seek for truth itself, by proceeding from the known to the unknown. To the extinction of all taste for ancient literature, followed the destruction of the superb pagan temples, and their libraries. Fanaticism completed what controversy had begun, and the physical power of the successful faith, was destructively directed against the magnificent monuments of the fallen pagan mythology, and against the ancient classical literature; as was repeated at a later day by Knox, and other ferocious reformers, when they prevailed against the hierarchy of the venerable catholic church. The destruction by fire, of the works of the ancient Greek and Latin writers, was not enough. At a later day, a more curious method was resorted to by the priests, of asserting their power over the fallen literature. Notwithstanding the general proscription of the pagan writers, and which had been carried so far as to induce the council of Carthage to forbid all bishops to read pagan authors, some copies of the most esteemed writers had been preserved; but as the religious poems of St. Gregory, the canticles of St. Augustine, and the effusions of other holy men, were now substituted,—as the habitual poetry of the day,—for the verses of Virgil, Anacreon, Bion, &c., and as the old material, papyrus, became scarce, and parchment was too expensive for many individuals, the contents of the ancient rolls were obliterated, and religious compositions substituted in their place. This practice became still more general in the seventh century, and subsequently to it, when papyrus ceased to be made, in consequence of the destruction of every thing connected with literature, by the Saracens. It was thus that professor Mai discovered the lost republic of Cicero, written over one of the palimpsests in the Vatican.

The fatal consequences of the overthrow of the ancient literature, were soon obvious. The powerful minds of St. Augustine and his compeers, had been alimented, and had grown to maturity, by the writings of Plato, Homer, Sophocles, Cicero, Virgil. The springs being now dried up, the streams ceased to run, and the ancient barrenness prevailed. The periods of Constantine* and Theodosius† were never replaced; and the fifth century is as conspicuous for its imbecility, as the preceding one had been for its intelligence. Eumenius, an orator of the fourth century, said of Cornelius Fronton, the chief of a school of his day, and one of the panegyrists of Antoninus, 'Romanæ eloquentiæ, non secundum, sed alterum, decus;' that he was not the second, but the other ornament of Roman eloquence: meaning that he was equal to Cicero; a fatal proof of his own and of the general ignorance. At this time, the schools were filled with Greek sophists of the worst kind, and the Latin tongue was undergoing a corruption, by the general abasement of mind, and the influx of strangers from distant and barbarous regions, who were gradually becoming masters of the Empire.

Every thing seemed now preparing for the long night which was to fall upon the human mind. The oratorical art consisted in fulsome panegyrics, pronounced before the unblushing presence of the individual to be eulogized. The want of great actions, was supplied by extravagant adulation; the love of flattery was substituted for the love of glory, and of honest commendation. Statues were raised both at Rome and Athens, to a Greek sophist named Proérésius, the one at Rome bearing the inscription,

"Regina Rerum, Roma, Regi eloquentiæ,"

where the only merit belonging either to the man or to the verse, consists in the miserable attempt to substitute for the ancient Roman verse, four capital alliterations. Amongst the grammarians of this dull period, Macrobius‡ deserves to be spoken of with some respect, having in his Saturnalium Conviviorum, left us some agreeable dialogues, containing curious details concerning the mythology, poetry, and history of the ancients. It is Macrobius who has preserved to us that most eloquent passage from

* Died, A. D. 336. † Died, A. D. 394. ‡ Died, A. D. 415.

Cicero's Republic, Somnium Scipionis, perhaps the most splendid thing bequeathed to us by antiquity; where we see how elevated his ideas were, and at the same time how imperfect was his knowledge of astronomical philosophy; a branch of learning Cicero had derived from the Greeks, and which he has here treated of with a splendour of diction, that is inimitable. Towards the close of the fifth century, Marcianus Capella wrote a work of nine books, in a very degraded Latin, entitled the Nuptials of Philosophy and Mercury; in the which,—incidental to a supposed conversation of learned men on the celebration of the Saturnalia,—he treats of the seven sciences, as they were then called, Grammar, Dialectics, Rhetoric, Arithmetic, Geometry, Astronomy, and Music. The poetry of Italy, at this time, does not bear evidence of that extreme inattention to which Latin prose was rapidly falling a victim. The effort which composition requires, and the restraining of expressions within the law of quantity, kept Latin poetry, for a long time, free from the corruptions which had already entered into the prose. The Roman armies were filled with strangers and barbarians, who sought to make themselves understood, by affixing Latin terminations to the words of their rude languages; and the natives, anxious to conciliate the ferocious soldiery, at whose mercy they lay, gradually adopted the jargon, which thus became conventional. Under such circumstances, it requires very few generations, first to disfigure, and then to change a language. The grotesque departure of the corrupt Latin of the dark ages, from that of the Augustan age, and which preceded the modern Italian, is not more remarkable than the transition observable in the dialectical passage from the ancient Anglo-Saxon, to the modern English.

Amongst the poets of this day, the works of Claudian are still held in estimation: had he lived when men were familiar with great actions, he might have been a great poet; but the want of dignity in the subjects he has treated of, has been a great disadvantage to the purity of his language, and the melody of his verse, which are worthy of more refined times. Stilicho,—a successful general of the Emperor Theodosius* the Great, and of his son Honorius,—was the Mecænas of Claudian, who himself was a true friend to his patron; for he celebrated his exploits, wrote

* Died, A. D. 395.

against his enemies, and when he was disgraced by Honorius, he voluntarily retired from the world. Certainly, if great events alone are wanting to inspire writers, these were not wanting, but they were events rarely illustrated by examples of virtue: they arose out of the ruin of a corrupted empire; and nobleness of conduct, as well as the sympathy due to true dignity were wanting to them. The Roman Republic, a prey to the headstrong passions and misrule of a few sanguinary chieftians, (these rapidly and tragically removed by their own turbulent soldiery,) foreign and civil wars, the repeated invasions of the barbarians, the frightful desolations consequent upon them,* and the absence of the pristine Roman virtue and courage, these were the unhappy events presenting themselves to the Roman poets and historians; events least of all calculated to incite generous minds to perpetuate the remembrance, of what every Roman breast could not but revolt at. The Goth Odoacer, having dethroned the last of the western Emperors in the person of Augustulus in 475, was himself driven from the throne in 493 by the Ostrogoth Theodoric. This prince, who had been educated at Constantinople, was, to a certain extent, the protector of letters, although he had never been taught to sign his own name. The manner in which he signed his edicts, is characteristic of himself, and of the age in which he lived. The five first letters of his name were cut through a golden blade, and by drawing his pen through the openings, he produced the letters T, H, E, O, D. The venerable Cassiodorus, who obtained and never abused his confidence, was one of the wisest and best men of his time. Arts and letters were eminently favoured by him, himself, being a writer only second to Boethius, the accomplished author of a work, entitled, "De Consolatione Philosophiæ," written during his imprisonment. Boethius is the last of the Roman writers, now held in any estimation, and was barbarously and unjustly put to death, under the cruelest tortures, by Theodoric: in despite of the high reputation he had acquired, in a glorious reign of thirty years, by this act he has shown that he was intrinsically a barbarian.

Justinian, Emperor of the East, to deliver Italy from the power of the Ostrogoths, sent his general Belisarius there, who achieved

* Alaric and the Goths sacked Rome three days in 409. Pope Leo ransomed it from Attila and the Huns in 452. Six years afterwards Genseric and the Vandals sacked it during fourteen days; and in 475 Odoacer at the head of the Heruli, caused himself to be crowned king of Italy, in the city of Rome.

victories worthy of the ancient Roman renown. Muratori, in his annals of Italy, has shown, that although he had been treated with signal ingratitude by the Emperor, yet that he died honoured, and in possession of great wealth, in 566. The story of 'Date Obolum Belisario,' was an invention of a Greek writer of the twelfth century, named Tzetzes. Narses, the eunuch, finally wrested Italy from the Goths, who had ruled there sixty-four years; and after contending with the Germans and the Franks, whom the hope of booty had drawn into Italy, he died at the age of ninety-five years. The Longobards, another race of barbarians, had now descended into the north of Italy, not with a marauding force, but with their entire nation, aged and young. They established themselves from the Alps to Rome, and in their bloody contests with the Greeks and Franks, they reduced Italy to ruin, and deluged it with blood. Their iron reign lasted from the end of the sixth century, through the seventh, and the greater part of the eighth. During this period, individual safety was the only consideration with men; and whatever of human letters survived this storm, found shelter in the monasteries.

In these consecrated retreats, hallowed even in the eyes of barbarians,—with whom superstition asserts its influence most powerfully,—the wreck of civilization found a refuge. Here contemplative and pious minds, turning with horror from the universal desolation, sought an asylum. It is a remarkable circumstance in human history, that these monastic institutions, which had been so instrumental in the encouragement of that blind fanaticism to which the literature of antiquity had been delivered, should be the direct means of preserving it from total ruin. Every monastery had its library, consisting principally of the works of the fathers, and of the polemic writings which had abounded in the preceding times. To these, in many instances, were added the most celebrated works of the ancients, of which copies had been preserved from the general proscription. Before the art of printing was introduced, it was part of the daily duty of the noviciates, and of the monks, whose time was not devoted to other pursuits, to copy those held in the highest estimation. These copies were of great value, and the abbots were not indifferent to the pecuniary advantages they derived from this source. In the history of the monasteries of the middle ages, those who followed this occupation, were styled antiquaries, or copyists. Cassiodorus, of whom we have before spoken, in his work "De Institut. Divin. Litter." expatiates upon the pleasure he found in this occupation. He enters into a great many curious details, by way of instruction to the monks in his favourite art. He himself furnished drawings for the embellishment of the manuscripts, which he caused to be carefully bound by able workmen. When more than ninety years old, he drew up a treatise on orthography for the use of the monks. Amidst the inestimable benefits which Christianity has conferred upon mankind, this atonement, which the monasteries made to letters for the destruction they formerly had brought upon them, is one, to the value of which, we cannot be insensible.

At Constantinople, the seat of government of the Eastern Empire, letters continued rapidly to decline. Under Justinian,* whose code is well known, Theology became the reigning passion; ecclesiastical literature absorbed the public attention, and words stood in the place of things. His ambition was to lead in theology as in legislation, and he was not scrupulous in substituting physical for moral arguments. At the expence of the lives of a hundred thousand of his subjects, he made war upon the Samaritans of Palestine, a sect so unsettled in their doctrines, that the Pagans considered them to be Jews, the Jews to be schismatics, and the Christians to be idolaters. The theological zeal of this emperor, carried him at length to such refinements in his speculations, that, like the pendulum, which when arrived at one extreme point, is only preparing to return to the other, his opinions oscillated over into heresy; but happily, whilst he was perparing to sustain his errors, by the same means he had used to propagate his orthodoxy, he died.

Pope Gregory the First,† one of the most learned men of his day, but charged with carrying his zeal against Paganism to lengths injurious to ancient literature, observes in one of his letters, (Book 7th, let. 30,) "That there was not in Constantinople, an individual capable of translating accurately from Greek to Latin, or from Latin to Greek."

Nothing could exceed the intellectual darkness that reigned over the greatest part of Europe, when Charlemagne, in 774, passed the Alps, and delivered Italy from the Lombards. At Pavia, he found Peter of Pisa, from whom he received his first

* Flourished, A. D. 540. † A. D. 590.

elementary instruction in grammar; by this means he was prepared for the study of the prevailing learning of the day, under the celebrated Englishman, Alcuin. When it has been stated of this emperor, that he knew not how to write, this is to be understood of his ignorance of the large Roman character. His native tongue, the Tudesque, or German, he was much attached to, and wrote it with ease; but when the large Roman character came again into use, he experienced a difficulty in acquiring it: he caused his signature, therefore, to be engraved upon the pommel of the hilt of his sword. With this he affixed his manual; and on signing, he was wont to say, "I have signed it with the hilt, I will maintain it with the point." Although this illustrious monarch sought, by his example, to render learning popular, yet, surrounded as he was by ecclesiastics, the prejudices against ancient literature still prevailed, and the encouragement which the emperor intended for general learning, was too much diverted to theology. The effort, therefore, to revive human learning, being ill-directed, became abortive, and before the end of the ninth century, Italy and France, torn to pieces by civil wars, were again plunged into anarchy and darkness. It was thus the brilliant period of Charlemagne passed over, without producing any real benefit to science; resembling the aurora borealis, which is not like the aurora of the east, the harbinger of immediate day.

Of the encouragement which learning received about these times from the Saracens, it is not important we should now speak. The caliph Almamon cultivated astronomy, and many other branches of science received a rapid developement from them. Their empire, however, fell to pieces in a comparatively short period. Learning, with them, had been, as with the ancient Romans, a fruit of their conquests. Plants which are raised from the seed, are surer to take root, and to resist the violence of storms, than those which are transplanted in full blossom. Europe, however, is indebted to the Saracens, for the arithmetical characters, and which it is probable, were derived by them from the Greeks.

The tenth century witnessed the continued successive and bloody struggles, for the ruins of the Carlovingian monarchy. The situation of the popes of Rome, who had to contend in turns with the Saracens from Sicily, the Germans, and their own subjects, did not admit of their making any efforts towards enlightening mankind. It was in this last century, that Italy was annexed to the German empire by Otho, a connexion which, unfortunately, she has not yet been able to shake off.

The eleventh century opened upon Europe, at a period when rapine, anarchy, and ignorance, had scarce a lower degree to descend to. The extreme of desolation had overtaken civilized society, and no other movement was left to it, but a re-construction of its elements. It is accordingly this century which is signalized by the Italians, as the commencement of a general renovation; a period, when, from the chaos which succeeded to the ruins of human intelligence, new combinations began to be formed. Amongst the causes which operated powerfully upon the human mind, at this period of general instability of things, and which was well fitted to influence the universal debility of intellect, was the belief,—which had been inculcated through the interested fanaticism of the monks,—that the world was drawing to its end. The period fixed for this astounding event, and which was well calculated for an age abandoned by philosophy, and delivered up to the influence of credulity, was the termination of the tenth century. Men looked forward to the evening of the day, on which they believed the sun was to rise for the last time, either with a stupid indifference, or a sullen despair. Many had endowed the convents largely with their wealth, for masses for their own souls, and for those of their living descendants: the desolation which was to fall upon the whole of mankind at once, took away all the common motives which attach men to property. The most illustrious names, the most magnificent establishments, could no longer be valuable legacies to future generations; for at the conclusion of the thousandth year of the Christian era, all generations were to be destroyed. But when the awful moment, which had been awaited with such inexpressible agitation, had passed away amidst the accustomed benevolences of nature, when the glorious sun rose once more, and ushered in the first day of the eleventh century, men abandoned themselves to a grateful confidence in the permanence of nature, and returned to the gentler influences of hope, both for present and future happiness. The human mind, thus unexpectedly relieved from so deadly a weight, was in the right situation to follow those generous impulses which influence it, when untrammelled by the chains of superstition, and thus became prepared, not only to receive the seeds of useful knowledge, but to cherish and exercise those Christian virtues, which are the true end of all knowledge. Another important occurrence also took place at this period. The house of Saxony became extinct in 1002, at the death of Otho the third, who died in Italy. From this moment the Italians began their struggle for freedom. When the general effort is to emancipate, and not to enslave mankind; when our success is only crowned by being shared with others, when the selfish principle is subdued as far as human weakness permits, then the conflicts with tyranny are truly ennobled, and the most generous sentiments give birth to the most heroic actions. This great moment, then, when the Italians began their contest for freedom, was that also of the beginning of the emancipation of the human mind in the western empire.

Before this era, letters had begun somewhat to revive in the east. During the eighth century, the sanguinary religious quarrels, between the image-worshippers and the Iconoclasts, had led to the destruction of many monuments, both of art and science; but in the ninth, Leo the Sixth, called the philosopher, somewhat revived the love of knowledge, by his example. He was succeeded in the tenth by Constantine Porphyrogenitus, a prince of singular attainments. The revolution, so favourable to letters, which had taken place amongst the Arabians, had in a great measure contributed to the revival of letters in Constantinople. These wild conquerors, fatigued with their own desolations, which had laid waste the schools of Alexandria and others, now entered, with the same zeal, upon the cultivation of the learning of antiquity. The ardour with which they sought to acquire it, taught the Greeks the value of their books, and from copying them for the use of their new customers, they learnt at length to admire them: schools were re-established, and letters and philosophy, were again encouraged. This state of things was further favoured by the schism of the Greek church, which brought the Latins into a constant controversy with that acute nation of sophists. The general tendency to an emancipation of opinions, was also augmented, towards the end of the eleventh century, by the first crusade, which led so many prominent men of the times far from their homes, and by bringing them into contact with such various nations and individuals, could not fail to rouse their attention, to whatever bore upon the institutions or manners of their own country.

It was in the twelfth century, that a state of things arose in Italy which secured to the northern Italians that greatest of all blessings, self-government, and its concomitant advantages.—Grown wise by experience, the inhabitants of the cities of northern Italy, renounced their ferocious antipathies, and formed the celebrated league of Lombardy, against which that active monarch the emperor Frederic Barbarossa, could not prevail. After losing several formidable German armies, which he conducted into Italy, he was finally discomfited in the most signal manner, and was compelled to acknowledge their independence at the peace of Constance, in 1183. The new republics which had thus won their freedom, became distinct schools, where the ancient examples of Roman virtue and patriotism were taught. The science of government was studied, and every branch of knowledge cultivated. Universities were founded, public teachers were honoured, and thus learning, which at the separation of letters from religion, flourished, because it found a liberal home in free Greece; now, when twenty-five hundred years had elapsed, began to grow up in security, under the shade of the Tree of Italian Liberty.

In looking back upon the period thus hastily reviewed, of about one thousand years; we perceive, that natural science, with the exception of the indefatigable labours of Pliny the elder—labours more curious than learned—had been entirely lost sight of. His death was appropriate enough for a naturalist, being suffocated, A. D. 79, whilst observing an eruption at Mount Vesuvius.

However slight this sketch of so important a portion of history is, yet it did not appear proper to the writer of this epitome, to pass over so many ages without observation; ages too, not the less interesting, because their details are less familiarly known, by reason of their being less accessible. The writer will have utterly failed in his intention, if he shall not have interested some of his readers, and if he shall not have convinced all, that solid advances in natural science, cannot be effected, unless we proceed experimentally from the known to the unknown. If in this long period, no progress was made in natural science, it was because there were no experimentalists, and because the studies of men, for the causes assigned, were based upon their own speculative imaginations; whilst nature, with her inexhaustible pages, remained a sealed book to them. We shall see, by and by, what bounds the human mind took, when the characters of that book began to be understood.

(*To be continued.*)

NOTICES OF BIG-BONE LICK,

Including the various explorations that have been made there, the animals to which the remains belong, and the quantity that has been found of each; with a particular account of the great collection of bones discovered in September, 1830. By WILLIAM COOPER, member of the Lyceum of Natural History of New York, of the Academy of Natural Sciences of Philadelphia, the Zoological Society of London, &c.

BIG-BONE LICK, so celebrated for the remains of unknown animals that have been found buried there, is situated in a small valley in Boone county, in the northern part of Kentucky, within two miles of the left bank of the Ohio, about half way down; eighty miles distant, northerly, from Lexington, and twenty south-westerly from Cincinnatti, in Ohio.

By licks are meant, in the western country, springy places, naturally affording salt, in search of which, the various species of herbivorous animals, both wild and domestic, resort to them in great numbers. At Big-bone Lick, the salt is deposited from numerous springs, rising through the soil over a surface of several acres. There are likewise several streams of fresh water, that enter the valley from different sides; and these uniting, form a small river, which, taking a southerly course, discharges itself at the distance of twelve miles, into the Ohio.

The quantity of fossil bones which appear to have been brought together at this place, and deposited within a very small area, is truly wonderful. An authentic account of all that have been found during the last ninety years, such as might enable us to make some estimate of the number of individuals, at least of the larger animals, whose remains were here intermingled, as well as to form some probable conjecture respecting the circumstances under which they perished, and to which they owe their assemblage in this spot, would be at this day most desirable to possess. But it is too late to hope for this. Quantities almost exceeding belief, and of which no record has been kept, have within that period been carried off, and dispersed, no one can now tell whither.

The present communication comprises such information as the writer has been able to glean, of the various explorers of this celebrated place; a notice of the animals which have been found here, and the quantity of remains of each; with a description of the ground and other attendant circumstances that can throw any light upon its theory. This must be, in several particulars, imperfect: and any person who may be in possession of authentic materials relative to this subject, is hereby invited to make them known, or to communicate them to some competent person for that purpose. It is only in this manner that we can expect to supply any of the numerous desiderata in the history of Big-bone Lick.

Chronological Notice of the Explorers of Big-bone Lick.

Longueil, a French officer, seems to have been the first who procured fossil bones at this place. They were brought to him from a morass near the Ohio, by some Indians who belonged to his party. This was in 1739.

Colonel George Croghan, on his passage down the Ohio, in 1765, stopped at Big-bone Lick, and is the first white man who is known to have visited it. His description of the place as it appeared at that time, will be found in another part of this memoir.

General William H. Harrison of Ohio, was there, and obtained many bones in 1795; and the French general Collaud, as nearly as I can ascertain, about the same period.

Dr. Goforth of Cincinnati, was the next. He made large excavations, and found a great quantity of bones, which was about the year 1804; the precise date I have not been able to learn.

He was succeeded by General Clark, the distinguished traveller, who was there in 1806.

The Western Museum Society of Cincinnati, have caused various examinations to be made for bones, and many more have been carried away by travellers and others, within the last twenty-five years.

The author, in company with Mr. I. Cozzens, made a journey to Big-bone Lick in the summer of 1828. We caused several excavations to be made, and collected every thing that seemed likely to add to our stock of information concerning the place.

After all these various explorations, Mr. Benjamin Finnell, who resides here, and had previously made considerable discoveries of bones, undertook another, so recently as the month of September, 1830. It proved one of the most successful that has ever been made.

His example encouraged Mr. William Bullock, now also of Kentucky, to undertake another search immediately after. Mr. Bullock likewise obtained a rich and valuable collection; since which all further operations have been forbidden by the present proprietors of the land.

These various collections will be more particularly noticed, as well as the materials now existing will enable me, when treating of the animals to which the bones respectively belong. But it is much to be regretted, that the intelligent men who have enjoyed the opportunities, have generally omitted to furnish such descriptions as would now be useful for our purpose. We possess no satisfactory account of what was discovered previous to the visit of General Clark; and of those, even, which he obtained, no sufficient description has yet been published. A small part is described by Cuvier in his great work; and a few have also been made known by Dr. Wistar. The remainder is still preserved in this country, and it is to be hoped we shall not be allowed to remain long ignorant of what it consists.

Extinct animals found here, and quantity of remains of each species.

The remains found at Big-bone Lick, belong partly to animals whose species is now extinct, and partly to others, still numerous within the United States territory. Our present inquiries relating principally to the former, the other will not be especially mentioned, except in the case of some which have been included among the cotemporaries of those more ancient quadrupeds. Of these the mastodon being the most extraordinary, and that which furnishes the greater portion, by far, of these remains, first deserves our attention.

1. Great Mastodon. (*Mastodon maximus*,* Cuvier.)

Such is the quantity of bones and teeth of this species of mastodon, that has been disinterred at Big-bone Lick, that although it is the most common of American fossil quadrupeds, and has been found in almost every part of the United States, yet all

* M. Cuvier having finally adopted this name, we shall make use of it, instead of that formerly given, M. giganteum. Vide Oss. Foss. ed. 3. ch. v. p. 527.

that have been discovered elsewhere, would not, united, equal the number obtained at this single locality.

Longueil and Croghan each took but five or six teeth and bones, being as much as their means of transportation at that time permitted.

General Harrison, as he informed several members of the Lyceum of Natural History, when in New York, about three years ago, procured as many as filled thirteen hogsheads, which were sent up the Ohio to Pittsburg; after which he never heard what became of them. General Collard, about the same time, obtained twenty-four pieces.

It is not to be presumed that these bones all belonged to the great mastodon; but I am induced to mention them here, on account of the probability that a majority of them did. In all the collections of bones made here, of which any precise account has been given, these always constitute the great mass. And this, unfortunately, is as much as is now known of all that was removed previous to the exploration made by Dr. Goforth.

Concerning this, our information is likewise very scanty. He states that he got of mastodons' teeth alone,* weighing from twelve to twenty pounds, "as many as a wagon and four horses could draw," besides which were many large tusks and bones, no doubt principally belonging to the same animal. A large part of this collection passed into the hands of Mr. William Bullock, so well known for the services he has rendered to natural history. Mr. Bullock, now residing in this country, I applied to him for information concerning them, when he favoured me with the following reply, dated Nov. 24, 1828.

"In regard to the fossil bones of which you request information, it is about twenty years since I purchased of Thomas Ashe, twelve cases of bones, which I afterwards discovered were collected by Dr. Goforth, a few years previous to the time I bought them. According to Ashe's account, who was present when many of them were collected, they were found several feet below the surface, and under the stratum of graminivorous bones, which you must have observed on the bank of the small river that passes near the spring.

"I had about twenty back teeth, exclusive of perhaps eight

* See his letter to Mr. Jefferson, published in Cramer's Ohio Navigator, 8th ed. pp. 260, 262.

or ten in different jaws, and about ten tusks, among which were those of three different animals. The greatest part of these bones is now in the museum of the college of surgeons in London. A beautiful specimen of the fore part of the head, with all the delicate nasal bones entire, is in the possession of professor Monroe, of Edinburgh; and the late Dr. Blake, an eminent dentist of Dublin, had from me a very interesting collection of teeth in various stages of growth and decomposition."

It will be perceived that the quantity here mentioned by Mr. Bullock is small, in comparison with that which Goforth,—of whose correctness there is no reason to doubt,—states to have been obtained by him. A great part of his collection, therefore, still remains to be accounted for.

The next considerable collection known to have been made here, was by General Clarke, at the instance of Mr. Jefferson. The bones were brought to Washington in 1807, where they were seen by Dr. S. L. Mitchill,* who published a brief notice of them in the eleventh volume of the Medical Repository. They were divided by Mr. Jefferson, according to Dr. Wistar, who selected them, between the American Philosophical Society, and the French Institute. Dr. Mitchill says, there were three parcels made, of which Mr. Jefferson reserved one for himself. However this may be, there are now very few fossil bones preserved at Charlottesville, and it is doubtful whether these are from Big-bone Lick.

Those sent to France are described by Cuvier. They consist of an upper and two under jaws with teeth, five detached teeth, a radius, tibia, and several bones of the feet.

The cabinet of the American Philosophical Society, contains of the mastodon, two or three portions of the cranium, one of them comprising a large part of the alveolar process of a tusk, fourteen or fifteen mutilated jaw bones, upper and under, containing teeth, and from animals of various ages, besides large tusks, and pieces of fossil ivory, in considerable quantity, several vertebræ, and a few bones of the feet. The origin of all these is not certainly known at present; but, though some may have been derived from other localities, it is most probable that the

* Whilst sending this sheet to the press, the Editor has received information of the death of this amiable and most eccentric individual. For forty years he has been a conspicuous friend to natural science, and for a great portion of that time he kept the flag of science waving in this country, when he almost stood alone.

majority consist of those discovered at Big-bone Lick, by General Clarke.

The western museum of Cincinnati, and Letton's museum in the same city, contain many relics of the mastodon, nearly all from Big-bone lick. Together there are not less than one hundred pieces, more than half being grinders, of three and more pairs of points. There is, however, in the latter museum, a lower jaw, which is remarkable for having both branches tolerably complete, though the teeth are wanting.

My researches at Big-bone Lick, procured me about seventy pieces, of which the most considerable were as follows:

Two large, and numerous small fragments of tusks, presumed of mastodon.

A small left lower jaw, with one molar tooth, of four points; being the anterior milk molar. This is from a very young individual, probably the youngest yet discovered, the first milk molar being scarcely at all worn.* I obtained likewise several other interesting portions, including teeth and bones, apparently all belonging to this small head.

Four other large portions of lower jaws, all different, but without teeth.

Thirty tolerably perfect separate molar teeth, besides large fragments of others.†

Seven vertebræ, mutilated, and several portions of ribs.

Two portions of scapulæ.

* The *Tetracaulodon* of the late justly lamented Dr. Godman, appears to me, after a careful examination of his specimen, to be another young individual, also of the common mastodon, but older than mine, the anterior milk molars having begun to fall, after having been used until they were worn down. I have stated my reasons for this opinion, in a paper on the dentary system of the mastodon, which I read to the Lyceum of Natural History, in April, 1830. It appears, however, from recent observations, that the lower tusks, which I suppose all of the species to have possessed in their youth, were in some instances permanent during the advanced age of the animal. But whether this was a sexual characteristic, or merely an individual case of anomaly, of which I have seen other curious examples, *I cannot recognize more than one species of mastodon, among the great quantity of their remains found in the United States, which have come under my observation, those just alluded to, included.*

We are happy to find that Mr. Cooper, who has given this subject so careful an examination, and who has had such rare opportunities of studying the dentition of these animals, agrees with us so thoroughly in the opinion we have always expressed on this subject. Vide Monthly American Journal of Geology, &c. Vol. I. No. 3, p. 141.
EDITOR.

† Among these I include one similar to the tooth, also from Big-bone Lick, described by Dr. Harlan, as having belonged to an extinct species of tapir. That it is a young mastodon's tooth, is evident, I think, from the milk teeth still remaining in the head on which the supposed genus tetracaulodon is founded, as well as from the small jaw above described.

Four humeri, much mutilated, three of them from the left side.

Upper extremity of ulna.

Five carpal, two metacarpal, and one phalangial bone of fore foot.

Large fragment of os innominatum.

Another, comprising the acetabulum.

Lower extremity of left femur.

Patella, tibia, epiphyses, gone.

Calcaneum.

Besides numerous fragments, not requiring especial notice, but like the rest, indicating, by their shattered condition, the violence they were exposed to, before their final deposition at this spot. Some appear to have been a little rubbed, but the broken edges are generally sharp, and the surfaces unscratched.

The bones discovered by Mr. Finnell, in September, 1830, form one of the most interesting series belonging to the mastodon, that has probably ever been assembled. Having taken notes of these, while exhibited in New York this summer, I am enabled to give the following descriptive catalogue, in which I have included such anatomical, and other observations, as appeared to be new or interesting. The first will naturally be

A head, more entire than any previously discovered here or elsewhere. It is still, however, too imperfect to enable me to complete the description of this important part, and it is especially to be regretted, that so much is wanting around the exterior opening of the nostrils, that we can derive no aid from it, in endeavouring to determine with certainty, from the structure of this part, whether or not the mastodon was furnished with a trunk. But enough remains to show, that it differed materially from the elephant's in form. It in fact bears more resemblance, in some respects, though totally different in others, to that of the rhinoceros, particularly in the nearly vertical elevation of the occiput, giving the skull the general form of a pyramid, of which the occiput is the base, and the alveolar processes the summit, there being a gradual and pretty regular slope from between these, nearly to the edge of the occiput. It is, however, much broader and flatter on the top, than in either of these animals.* The following are the principal dimensions.†

	Feet.	In.
From the occiput to the end of the alveolar, from which a part is broken off,	3.	
Breadth over the orbits,	1,	$7\frac{1}{2}$.
Girth lengthwise,	6,	2.
Girth at the occiput,	5,	$7\frac{3}{4}$.
Girth of the two alveoles of tusks at their origin,	3,	$8\frac{1}{2}$.
From the outside of the right anterior molar, to the outside of the left,	1,	$2\frac{1}{2}$.
From the outside of the right posterior, to the left,		$9\frac{1}{2}$.

One tusk was found fixed in the socket, and the fellow lying near it. They are quite round, slender, and very uniform in diameter throughout, as far as they remain, the ends of both being broken off. The anterior molars being gone, and the posterior, which have four pairs of points, being worn by use, show that the animal was quite adult; though from its small size, and the slenderness of the tusks, it was probably a female. The curve of the tusks forms nearly a semicircle. The longer one measures six feet six inches, with a diameter of five inches.

A large single tusk, which, when first found, was quite entire, though brittle from decay. It is very round, tapers gradually to the point, measures in length nine feet two inches, and in circumference at the root, twenty-three and a half inches. It is remarkable for its slightly sigmoid curve.

Eighteen pieces of tusks, from one and a half, to five feet long. These furnish some curious examples of dentition, from various causes. Some appear to have been worn at the point by use, during the life time of the animal, and still retain a high polish. One or two are laterally abraded, in such a manner as to present a perfect section.

A left upper jaw, with part of the socket of a tusk and one grinder.

* This "flatness of the cranium" was first observed by Messrs. Mitchill and Townsend. See their account of the mastodon found at Chester, May 1817, in Mitchill's Cuvier, App. p. 379.

† Owing to the artificial state in which this head is at present exhibited, it is no longer possible to trace the sutures, or describe the separate bones. The general form is nearly all that can be safely described. For the same reason, no figure is now given.

Left upper jaw, with part of socket of tusk, and two molars.

Right upper jaw, with one molar, and an empty socket.

Right upper jaw, with one molar, from a young individual.

Left upper jaw, with one molar, still younger.

Right upper jaw, with one molar, no empty socket, the enamel whitish.

Right and left lower maxillary bones, each with the posterior molar, which is a little worn, perhaps belonging to one jaw.

Chin of a young individual, with a short truncated beak, in which are the vestiges of sockets of caducous incisors, (similar to the tetracaulodon of Godman.) Part of the right branch remains, with a portion of the root of the anterior right molar.

Two other chins with remains of sockets of anterior molars.

Left lower maxillary, with the posterior molar, and an empty socket, and part of the chin.

Right and left lower maxillary bones, forming part of the same jaw. The right is tolerably perfect, and contains the penultimate and posterior molars, with the sockets of one or two others. The left consists only of the posterior half of the jaw, with the posterior molar, which in both is still partly buried in the ascending branch, showing that the individual was not perfectly adult.

Left lower maxillary bone of large size, with one molar, and an empty socket.

Left lower maxillary of a young individual, with two molars of six points, and a germ, also of six points, but entirely buried in the bone, which is fractured in such a manner, as to expose the germ. From this piece we learn how many molars with six points, the mastodon possessed. From young jaws formerly discovered, it was already known that there were two of four points; and the adult and aged specimens make it evident that there was but one of eight or ten points, on each side, above and below. This gives six on each side, or twenty-four in all, as the total number of molars. They were not, however, all in action at the same time. Probably not more than two at once, were in use at any one period of the animal's life, and finally, none but the posterior molar, with four or five pairs of points, and an irregular heel remained in the jaw.

Left lower maxillary, with one molar of six points, and an empty socket before and behind it.

Right lower maxillary, also with one molar, and two empty sockets.

Right lower maxillary, with only the large posterior molar remaining, and much worn, the sockets of the others obliterated: evidently an aged individual.

Right lower maxillary, with the posterior molar, enamel whitish. The enamel is generally, it must be observed, very dark coloured, and sometimes black.

Left lower maxillary, with two molars of six points, posterior half of the jaw wanting. A young individual.*

Seventy-two molar teeth, presenting examples of nearly all the changes they undergo, from the state of a mere germ, of which the mastoid points alone remain, to that of an old and worn out tooth, in which the roots are completely ossified, and remain uninjured; while the crowns are worn down in such a manner, as to leave the bony substance of the tooth bare of enamel, which merely forms a border round the crown.

Of these molar teeth there are of the various kinds,

One with two pairs of points, and an odd shoulder, representing a fifth point, or possibly an indistinct pair.

Thirty-nine, with three pairs of points.

Fourteen, with four pairs of points, and an odd one. Of these ten belong to the upper jaw, and four, I think, to the lower.

Fifteen with five pairs of points, and an odd one, or heel.—These are all lower jaw teeth, the posterior molar.

Two with four pairs, and three small knobs in a row, besides a heel, and lateral tubercular knobs, and

One with five pairs of points, and two knobs, too irregularly placed to form a pair. These three last are also lower posterior molars.

Five atlas bones, with thirty-one other vertebræ, cervical, dorsal and lumbar. A separate spinal process, though incomplete, is twenty inches long; most of them are very much

* Of the fifteen portions of lower jaws here enumerated, the posterior molar remained in eight. In two of these this tooth had four pairs of points, and an odd point or heel, besides; in the six others, there were five pairs of points, with from one to three irregular knobs.

mutilated, and a part may not improbably belong to the elephant.

Fifteen ribs, more or less broken.

Large sacrum, with portions of ossa innominata attached.

Two portions of other sacra.

Five scapulæ, mutilated. Four retain the condyle.

Seven humeri, all mutilated, and very imperfect. One wants the epiphyses, being from a young and small animal. Another consists merely of the condyles, others are no more than the shaft of the bone, with both ends broken off.

Three ulnæ, of various sizes.

A radius, lower end broken off.

Fourteen or fifteen small bones of the fore feet, among which two cuneiform, and other carpal, and several metacarpal.

A very large and nearly entire os innominatum.

Two others, less entire, and appearing to belong together.

Three others, consisting of little more than the acetabulum, with the thyroid foramen.

A femur, nearly entire, thirty-eight inches long.

Four others, more mutilated, some of larger size than the preceding.

Five other considerable portions of the same bone.

A patella.

Very large tibia, twenty-nine inches long.

Three others, smaller.

Another, of a young individual, the epiphyses wanting.

Two astragali.

Four calcanea.

Immediately after Mr. Finnell discontinued, on procuring the bones just described, Mr. Bullock commenced digging near the same spot. He obtained many mastodon bones, as well as others; but as his collection has never been examined by any anatomist, I have not the means of ascertaining which, or how many there were, belonging to this animal. His letters to Mr. Featherstonhaugh mention, among others, "the ruins of a very large head, showing the interior structure in a very beautiful manner, with a large portion of the top of the skull."

II. Fossil Elephant. (*Elephas primigenius.* Blumenbach.)

Grinders belonging to a species of elephant, which, in the opinion of M. Cuvier, do not differ essentially from those of the fossil Siberian, have always formed part of the collections made at Big-bone Lick. Until recently, they had always been found detached, and in small numbers.

It has been also stated that the elephant's teeth found here, were in a great state of decomposition; from which circumstance, and the absence of bones, it has been argued that they were of greater antiquity than the mastodon. But the facts are quite otherwise, as will presently appear.

Remains of elephants, there can be no doubt, formed part of those carried away from this place by General Harrison, and those who preceded him. But what portions, and how many, whether teeth or bones, or both, cannot now be determined. Turner, in 1797, indicated the teeth as different from those of the mastodon, though he did not know what animal they were from.

Goforth states, that he got many teeth of elephants, "some weighing 12lbs." besides tusks, that he supposed were elephants' which is very probable.

Governor Clark brought away several elephants' teeth. Three were sent to France, and most of the remainder are preserved in the cabinet of the American Philosophical Society. But they were all detached molars without any bone, except the lower jaw bones of a young individual mentioned by Wistar, which miscarried on their way from Washington to Philadelphia, and do not appear to have been ever recovered.

Many elephants' teeth, from Big-bone Lick, are shown in the public museum at Cincinnati. They are likewise separate teeth.

Among the teeth that I procured there in the year 1828, were four of elephant, all remarkably sound, and as free from decay as any teeth of mastodon I have ever seen, from Big-bone Lick or elsewhere. Indeed one of them, which was accidentally broke in getting, appears so fresh and sound within, that if I had not seen it taken out of the muddy stream myself, I might have been tempted to suspect some deception, like that mentioned by Cuvier, when a dealer tried to impose upon him by incrusting an African elephants' tooth with marl. Another is an anterior milk molar, like that seen in the head of the Asiatic elephant, figured by Cuvier, pl. IV. f. 5 *h*.

Among the remains disinterred in 1830, was an unusually large proportion belonging to the fossil elephant. In the Finnell collection, I observed the following.

Two very large tusks, forming a pair. The longer, though part of the large end is broken off, still measures 11 feet $10\frac{1}{2}$ inches in length, and 22 inches in circumference. What remains of the other, measures 8 feet 10 inches, the small end being wanting. Both these are very much curved upward, and a little outward, so as almost to form a complete circle. It is chiefly this peculiar curve, which is so commonly observed in the fossil elephant's tusks found in Europe and Siberia, that induces me to refer this pair to the elephant, of which several large heads, as will presently be seen, were found near where they lay.

Right upper maxillary bone of a large individual, with a large and perfect molar, and part of one side of the great socket of a tusk. The tusks just described may not improbably have belonged to this head; as well as the two next mentioned pieces.

Left upper maxillary, with a large molar tooth.

Large molar, with portions of left lower maxillary.

The greater part of the head of a young individual, comprising the jaws, both upper and under, with parts of the skull. The ascending branch is wanting from the left lower jaw, and is broken off in the right, but is preserved. In the upper jaws are two small molars which had been in use, and the same number below, besides a large germ buried in the right branch, which must have been concealed by the gum.

Twenty separate molar teeth, nearly all entire and undecayed.

An atlas, somewhat mutilated and rubbed, as if by rolling.

This is the only bone in the collection that I could determine to my satisfaction to belong to the Elephant. The more perfect large bones of the extremities appeared to be all mastodon's. The shafts of bones, without articulating surfaces, as well as the vertebræ, which are much broken, may have been in part elephant. My opportunities for comparison were not sufficient to enable me to determine this.

The collection formed at the same time, and in the same spot almost, by Mr. Bullock, is likewise very rich in remains of the elephant. In a letter to Mr. Featherstonhaugh, he states, that he commenced digging immediately after Mr. Finnell discontinued, "and on the third day came to a very fine entire (or nearly so,) head of what I suppose to be the Siberian elephant, four feet long, having all the teeth and one tusk in it. It is the finest fossil I have ever seen, and the only one known except that at St. Petersburgh.

Megalonyx. Jefferson. Cuvier.

It was not until recently that any discovery of remains of this animal was known to have been made, besides those dug out of a cave in Virginia, about thirty-five years ago, and described by Mr. Jefferson, in the American Philosophical Transactions.* From the description given by Goforth, of the bones he found at Big-bone Lick, afterwards carried to England, there was reason to suspect, that among them there was some belonging to the megalonyx. But Mr. Bullock states, that there were none among those which came into his possession. The great claw mentioned in Ashe's account, he says, in a letter to Mr. Featherstonhaugh, was no more than a scapula of some animal, filed down to this shape. Until my journey to Ohio, in 1828, I had no positive information of the megalonyx having been found, except in the one instance, above referred to.

Messrs. Drake and Mansfield, in their "Description of Cincinnati, in 1826," mention "bones of the megalonyx," preserved in the Western museum, in that city. Some of these I saw there, and was informed that they had been obtained by Mr. J. D. Clifford, from the White cave, in Kentucky. Besides these, I found in the same museum, a large humerus of megalonyx, discovered at Big-bone Lick, during one of the searches made there, by order of the proprietors.

Mr. Cozzens and myself found also a metacarpal bone at the same place, no doubt belonging to the megalonyx. This bone, with all those in the Cincinnati collection, have been described

* Although caverns are extremely numerous in the limestone region of the United States, and have been often explored in search of nitrous earth, well authenticated instances of fossil bones found in them, are very rare. The following paragraph is extracted from "*A description of Big-bone Cave, in White county, Tennessee, by D. T. Maddox, Esq. Aug.* 17, 1813," contained in an almanac published in the western country.

"My guide now informed me, that in this apartment had been found bones of a remarkable size and figure. He said, they had dug up the talon of a lion, thirteen inches long, the hoof of an elephant, the ribs of the mammoth, and the skull of a giant; but that they were all destroyed."

The "talon of a lion," here mentioned, may have been an ungueal phalanx, or even a claw, of a megalonyx.

and figured by Dr. Harlan, in the Journal of the Academy of Natural Sciences of Philadelphia.

Two additional instances of the occurrence of these remains were thus determined.

Among those found by Mr. Finnell in 1830, are the following portions of the skeleton of a megalonyx.

A right lower maxillary bone, with four molar teeth.* One of these, the anterior molar, is broken in the middle, and the upper half lost. The bone itself is so much mutilated, that barely enough remains to retain the teeth together, showing the violent action it was exposed to, before being buried.

A detached molar tooth in very good preservation. It differs from all the four in the above described jaw, but not so much but that we may easily believe it to be from the upper jaw of the same animal.

A clavicle, probably of the same.

A tibia, of the right side.

In Mr. Bullock's letter to Mr. Featherstonhaugh, already quoted, he gives a sketch of a bone, of which he obtained four similar, during his late search. They are evidently the ungueal phalanges of a megalonyx.

In the description of the megalonyx by Dr. Harlan, above referred to, he has pointed out some differences in the teeth and bones discovered in the United States, which he considers as indicating two species of this genus. But the scanty materials we up to this time possess, do not, in my opinion, authorise us to decide upon specific characters. With respect to the teeth in particular, it is evidently fallacious to rely too much upon slight differences in them, inasmuch as we now see in the jaw lately discovered, that no two of the four are precisely alike, and the first and fourth, are, in fact, as dissimilar in the outline of their crowns, as possible.

Remains of the megalonyx have also been found in South America. They were brought from Brazil, and placed in the collection of Munich, by the travellers, Martins and Spix. A late writer,† in the Annals of Philosophy, is therefore incorrect, in saying that they have occurred only between the parallels of

* Vide Pl. 3, Vol. I. No. 2, Monthly American Journal of Geology, &c.
† Vid. Ferussac Bull. May 1829, p. 275.

30° and 40° N. lat.* From an account recently published by Dr. Wagner, it appears that the Brazilian megalonyx was like many of the remains hitherto discovered in North America, also found in a cave.

Bos Bombifrons. Harlan.

This extinct species, peculiar, so far as is yet known, to this country, was first distinguished, and its characters pointed out, by the late Dr. Wistar of Philadelphia,† in a paper read to the American Philosophical Society, accompanied with a good figure, in 1817 or 1818.

Cuvier, as late as the third edition of his great work, makes no mention of it, although, unlike the three fossil species enumerated by him, it has the advantage of being so well distinguished from all the living species as to be in no danger of being confounded with any of them. Dr. Harlan first assigned it a place in the system under the expressive name of *Bos bombifrons*.‡

The head described by Wistar was obtained at Big-bone Lick by governor Clark, and is preserved in the Philosophical Society's Cabinet.

In the Finnell collection, I found a second head of this species, much in the same state as that figured by Dr. Wistar, or if any thing, rather less complete. Placed by the side of an analogous specimen of the buffalo, in the same collection, the differences were strikingly obvious.

These two heads are the only remains that have been identified as belonging to this species. Dr. Harlan, however, mentions fossil teeth from Big-bone Lick that he thinks most probably belonged to the same.

Bos Pallasii. Dekay.

This species is now first introduced among those whose remains occur at Big-bone Lick. During my stay there in 1828, a mutilated skull, with part of the core of one horn attached, was found in one of the streams near the great spring, where it had been used as a stepping stone, and brought to me. It is now deposited in the Lyceum of Natural History.

A skull similar to this, which was thrown up by an earthquake near New Madrid on the Mississippi, in the year 1812, forms the

* Vid. Ann. Phil. for June 1831, p. 418.
† Vid. Amer. Phil. Trans. vol. 1. new series, p. 375.
‡ Fauna Amer. p. 271.

subject of a paper in the annals of the Lyceum, by my friend Dr. Dekay. On the supposition that it belonged to the same species with some Siberian heads described by Pallas and Ozcretskoosky, he proposes to call it *Bos Pallasii.* Their strong resemblance to the musk ox is admitted by Cuvier and Pallas, and it is equally apparent in the American specimens, of which I have seen a third, from Ohio, besides the two above mentioned. If they should finally prove to be identical with the *Bos moschatus* it would be rendered doubtful, whether they ought properly to be enumerated among the companions of the extinct races, whose remains are deposited at Big-bone Lick.

Kentucky appears to have been for ages the chosen habitation of many species of the bovine family. Besides the buffaloes, that within half a century abounded in that fertile country, we find at Big-bone the remains of two other species, while a fourth is proved to have formerly inhabited the same neighbourhood: the remarkable skull, a portion of which is preserved by the American Philosophical Society, was found within ten miles. It is the *Bos latifrons* of Dr. Harlan, which Cuvier compares with the aurochs, *Bos urus,* of the old continent.

Cervus Americanus. Harlan.

In the paper which we have several times had occasion to refer to, Dr. Wistar describes an imperfect skull of a species of Cervus, which he found among those brought from Big-bone Lick by general Clarke. A careful comparison of it with the two great species of this genus that now inhabit the United States, led him to conclude that it came from an animal different from both these, and larger than either. Dr. Harlan has also described it in his Fauna, with the name of *Cervus americanus.*

Among the smaller bones discovered in 1830 at Big-bone Lick, and since exhibited in this city, are several belonging to one or more species of deer. The greater part, I have no doubt, are recent bones, but among them is a skull so similar to that figured by Dr. Wistar, and, though very large, so different from that of either the moose or elk, that I did not hesitate to refer it to the extinct species. It is not more complete than Dr. Wistar's specimen, and bears the appearance of having been rolled. These are the only instances of the occurrence of this fossil with which I am acquainted.

[*To be Continued.*]

COMMUNICATION FROM THE PRESIDENT OF THE GEOLOGICAL SOCIETY OF LONDON, AND OTHER NATURALISTS.

The editor lays before his readers, with a just pride and entire satisfaction, the following communication, from the President of the Geological Society of London, and other distinguished Naturalists.

London, June 18, 1831.

My Dear Sir,—We, your undersigned friends in England, are happy to learn that you propose to establish a new periodical work in the United States, which, in embracing all subjects connected with the natural history of America, is to be specially devoted to the accumulation of geological facts and phenomena.

Knowing your zeal and ability, we have great hopes that a work so directed, will meet with every encouragement in your country, and we are certain that it cannot but be of service to the cause of science in general.

We shall at all times be desirous of aiding you with any communications in our power, and we subscribe ourselves,

Yours very faithfully,

Roderick Impey Murchison, *President of the Geological Society of London.*

Davies Gilbert, *Vice President Royal Society.*

W. D. Conybeare, F. R. S. F. G. S. &c.

A. Sedgewick, F. R. S. F. G. S. &c. *Fellow of Trinity College, Cambridge.*

Wm. Buckland, D. D. F. R. S. &c. &c. *Christ Church College, Oxford.*

George Bellas Greenough, F. R. S. &c. &c.

Charles Stokes, F. R. S. &c. &c.

P. S.—I cannot refrain in particular on my own part, from expressing the desire which I feel for the appearance of the proposed publication, as likely to conduce, in the most important points, to the effective progress of geology; to ascertain in detail the suite of formations, and the series of organic remains distinguishing them in a new continent, so widely separated from the old, and embracing such a range of various climate: so to compare the phenomena with those of Europe, has ever appeared to me the most material desideratum in geology; for we may be sure that any analogies which are common to localities geographically so distant, and placed under physical conditions so distinct, are, in truth, analogies belonging generally to the whole globe; and thus we shall obtain data adequate for the foundation of a general geological theory.

Well acquainted with the attention you have paid to the formations on this side the Atlantic, I am convinced that the execution of this task, cannot fall into more competent hands.

W. D. Conybeare.

To G. W. Featherstonhaugh, Esq.
Philadelphia.

ANTIQUITIES AND LANGUAGES OF THE MEXICAN INDIANS.

No. 2.—Mythology of the Mexicans.

It appears to be beyond controversy, that the gods of the Pagan mythology were cradled in Egypt. Inachus and Cecrops introduced the Egyptian divinities into Greece, and from Greece they passed to Rome, the mistress of the universe, and the slave of the deities worshipped by the people they had subdued. It is worthy of notice, that Moses, the legislator of the Jewish people, emigrated from Egypt to Palestine, where temples and ceremonies were established, to which some have altogether attributed an Egyptian origin.

Of all the opinions which hitherto have been declared on the subject of the first peopling of our American continent, one which appears the most reasonable, and which is contained within the limits of probability, is that which supposes the Asiatics to have been the first inhabitants of the new world. As it is not my intention to enter upon a question of this nature at present, I shall not allude to the reasons which have induced me to consider this as a well founded opinion, and shall confine myself to treating of the similarity which exists between the Egyptian and Mexican divinities.

If Dupuy and Volney had been acquainted with the mythology of the ancient Mexicans, their investigations respecting Egyptian physiognomy, would have received some aid from that of the Mexican deities. Fortunately, we have reached the age of analysis and comparison, when truth is divested of its shackles, and when conclusions established by the eyes of reason, are most accredited.

The aborigines of Mexico, believed in a supreme being, to whom they gave the name of *Teotl;* a term not far removed from the Greek word Theos, the name in that tongue for God.

To express the essence of the divinity, the Mexicans used the term *Ipalnemoani*, "he who exists through himself;" and also, *Tloquenahuaque*, "he who possesses every thing in himself." What difference is there between these ideas, and those which the Hebrews expressed by the word Jehovah? None! Let it be remembered that the cradle of Moses floated upon the waters of the Nile.

The Mexicans gave to the god of water, the name of *Tlaloc*, and the domain of the Mexican Neptune, they called *Tlalocan*. In *Mictla*, of which I treated in my former letter, the god *Mictlanteuctli* was adored, and the goddess *Mictlancihualt*. *Mictla*, signifies hell. These were the Pluto and Proserpine of the Zapotecan Indians.

The tradition of a deluge, in which perished a great portion of the human race, is familiar to the Mexicans, who gave to the man who saved himself and his family in a canoe, the name of *Teocipactli*, and to his wife that of *Tochiquetzal*. The mountain upon which they landed was called *Colhuacan*: the name of this Mexican Ararat, is yet preserved in a village not far from Mexico. They had a tradition, that the language which had been lost in the deluge, had been taught to the survivors by a dove.

Ometeuctli is the Jupiter Stator of the Mexicans; and *Omecihuatl*, stands in the place of the Venus, of the Pagan mythology.

The sun was adored under the name of *Tonatiuh*, and the moon, by that of *Meztli*. These were the appellations of the pyramids, dedicated to them in the neighbourhood of *Teotihuacan*. The pyramids and the town still exist, and were visited by Humboldt: they were the sepulchres of the Aztecan monarchs. It is impossible to think of the worship to which they were devoted, the uses to which they were put, and especially to their architecture, without recalling to mind the pyramids of Egypt. Besides the pyramids, there were many other sepulchres in *Teotihuacan*. The dead were deposited there, seated with the symbols of their office, and with the emblems of their dignity. The conquerors found many riches in those cemetries. Cortez, in one of his letters, says, that his soldiers found in one of these sepulchres two hundred and forty ounces of gold. The Mexicans were not acquainted with the art of preparing mummies: those of the Peruvians are well known in the United States.

The god *Quetzalcoatl*, was worshipped as the god of the air, throughout the Mexican empire, and his laws declared on the mountain Tzatzipec, the mountain of clamours; the voice of his high priest was supposed to be heard at a distance of three hundred miles. The Mexican Æolus was likewise their Saturn. They had their golden age, which they called *Teojihuitl*, or "the divine year." The same *Quetzatcoatl* was the vulcan of the Indians of Cholula, to whom he taught the art of smelting.

Centeotl, the goddess of maiz, whom the Mexicans also called *Tonacayohua*, "she who feeds us," and protects the fields like Ceres. To her they consecrated the first fruits.

Huitzilopochtli, or Mejitli, [the j pronounced as k,] from whence Mexico took its name, was the god of war, the Mars of the Mexicans.

Tacateuctli, the god who conducts, was the tutelary deity of commerce, the Aztecan Mercury.

Tezcatzoncatl, the god of wine, was not less a favourite with the Mexicans, than Bacchus was with the Egyptians. In the city of Mexico alone, were four hundred priests dedicated to his service.

Mijcoatl, the goddess of the chase, had, like Diana, her temples, as well as her Endymion, named *Amimitl*.

Coatlicuê, or *Coatlanlona*, protected the gardens; the dealers in flowers celebrated the feast of this Flora of the Aztecans, in the spring of the year, in a temple called Topico.

Tzapotlatenan, the goddess of medicine, was the Mexican Apollo, though of a different sex. Besides their Venus the mother of the gods, they had their Venus impudica, and their Venus pronuba; the name of the first was *Macuiljochiquetzalli*. *Teopitoton*, smaller gods, were the penates, of which they had both noble and plebian. The Mexicans acknowledged as deities, the inventors of all the arts, and of useful acquirements. Polytheism was so fertile amongst the Mexicans, that it produced a goddess for the protection of ancient females, named *Slamateuchtli*. Not the deities alone, but the temples, the feasts, the priesthood, and every thing connected with the worship, has a remarkable affinity with Egypt.

The history of the aborigines of America, is yet involved in obscurity; perhaps this may be pierced in an age, when historical facts are sought by many, with as much avidity as gold was looked for in the fifteenth century.

I offer these notices and reflections for the consideration of those who are occupied in the important investigation of the origin and progress of the civilization of mankind. In another letter, I propose to speak of the extraordinary remains of *Palenque*, the Palmira of Mexico. I have the honour to remain, sir, with the most unfeigned respect, A MEXICAN.

ON THE METAMORPHOSIS OF THE YOUNG OF THE COMMON CRAB.

Extract from the Letter of a correspondent, dated London, June 18th, 1831.

"THE prodigious accession of new objects in natural history, especially from the animal kingdom, has placed great temptations in the way, both of young and old naturalists. Like those orators who contend for victory, and not for truth, there are too many individuals who are indifferent to the means by which they acquire their trophies. To have brought forward a new genus or a new species, and then cry, 'exegi monumentum,' if even the immortality does not promise a longer life than 'green peas,' has not been beneath the ambition of some minds, who can see in classification and nomenclature, the great end of all knowledge. Science, which has been somewhat fatigued by naturalists of this class, is now recovering from the dead weight they had become to it; but, like the tail of the tadpole, in its progress to maturity, they are becoming gradually absorbed. The voice of experience is at length listened to; we are already indifferent to conclusions, come they from what quarter they may, which are not obviously deduced from facts; and any man who pretends to belong to the multitudinous host of naturalists, which has sprung up in Europe,—as under the protection of Minerva, men were formerly produced from teeth, sown by Cadmus, in Bœotia,—must be very cautious—if he means to survive—how he skirmishes on his own account. These reflections, which grow out of the past and passing conduct of natural history with us here, may not be inapplicable to the United States, where a great deal of good sense, has to contend with inexperience, and no doubt with sciolism.

That natural history should flourish with you, in the United States, is sincerely to be desired; an additional bond will thus unite two countries, where a common language can best express the progress of the general mind. There is much solicitude here, on the subject of the geology of your country; and you must perceive by the increase of natural history literature, how welcome every new fact will be to us, in any of its branches, from your side of the water. The appearance of your Journal, will, of course, be hailed here by all, and will be indulgently judged by your numerous friends. We are aware how arduous a task you have undertaken, and that but few, at present, will find leisure to assist you. But if you adopt a popular course, you will acquire the confidence of those able to strengthen you, and after a few months there will be no lack of useful correspondents and friends to your undertaking. This has been the career of all the periodicals of this country, which are distinguished for intelligence.

In a country like America, abounding with objects of natural history, the opportunities for indulging in neology, are very great: it is the vice of science. Your conchologists will tire of it, by and by, as others have done, and molluscous architecture,—a subordinate branch,—will become simplified and intelligible. They will be glad, as others have been, to condense their tedious lists, and shut them up into some prominent point, like those nice little nests of boxes we see sometimes. This is already going on in more important branches, and will be extensively done, ere long, in others. Mr. Thompson, author of the 'Zoological Researches and Illustrations in Natural History,' is carrying reform into the crustaceæ, and is showing that many of this class undergo changes, as they advance to maturity, quite as curious as those of insects. He has succeeded in hatching the eggs of the common crab, and the young, instead of being like their papa and mamma, turn out to be the zoéa, which had been raised to the rank of a genus of the modern systems by Bosc, who discovered it in the ocean. When we shall be able to extend this tadpolization to the rest of the decapodous crustacea, a great reformation will be effected in the rotten boroughs of natural history. Mr. Thompson remarks of the metamorphosis of the young crabs, that at the tender period, before any change, they are 'essentially and purely natatory animals, and, no doubt, possessed of corresponding habits, swimming about freely, and without intermission, in search of appropriate food. In their perfect state, the greater number can no longer avail themselves of the power of swimming, but are furnished with pincers and feet, almost solely adapted to crawling, so that they are now under the necessity of confining their excursions in pursuit of prey, within more narrow limits. This curious piece of economy, explains what has ever appeared paradoxical to naturalists, viz. the annual peregrinations of the land crabs to the sea side; which, although acknowledged to be true, by several competent observers, could never before be satisfactorily accounted for."

FORCE OF VAPOUR.

Sir,—By publishing the following extract from Professor Silliman's Elements of Chemistry, and the subjoined notes, you will oblige A Subscriber.

It is stated in Professor Sillman's Elements of Chemistry, pp. 87, 88, and 105, Vol. I. that "The force of vapour formed at the boiling point, is the same in all fluids, and just equals the pressure of the atmosphere, that is, thirty inches of mercury: this law *appears* to be fully established.

"It was also stated, in the same connexion, that the force of vapour is the same for every fluid, at an equal number of degrees above and below its boiling point. Both these laws were originally given on the authority of Mr. Dalton, which was sustained by that of other eminent philosophers. Dr. Turner, in the second edition of his chemistry, (third Amer. p. 61,) says, 'The force of vapour from all liquids is the same, at equal distances above or below the several temperatures at which they boil in the open air. Thus, steam at 200° F., has the same elasticity as the vapour of ether at 85°; the boiling point of the former being 212°, and of the latter, 97°: Biot and Amèdé Berthollet (Biot Traité de Ph. I. 282) have found that this law applies exactly to many other liquids; but some experiments on the oil of turpentine and petroleum, would lead to the conclusion that it was not universal.' Dr. Thompson (on heat and electricity, p. 222,) states, that by subsequent experiments, the second law of Mr. Dalton has not been found to hold good, and that it has been relinquished by its author. At the time when my statement of those laws was written and printed, neither the second English edition of Dr. Turner had appeared, nor the work of Dr. Thompson, nor the eleventh edition of Henry,* in which the correction of the law is thus stated:

"'*The force of vapour from different liquids, varies at the same temperature,*'† and '*the variation of the force of vapour, from all liquids, is the same, for the same variation of temperature, reckoning from vapour of any given force;*' thus, measuring the force of all liquids at the boiling point, by thirty inches of mercury, it is found, that by losing 30° of heat from 212°, the vapour of water loses half its force, and so the vapour of any other liquid, loses half its force, by losing 30° of heat below its boiling point; and so on for any other increment or decrement of heat;‡ this has been experimentally established by Mr. Dalton."—[II. Vol. Addenda, p. 42.]

* Biot, in his Précis Elémentaire de Physique I. 265, a work published about six years before "the second English edition of Dr. Turner had appeared, or the work of Dr. Thompson, or the eleventh edition of Henry," has the following paragraph relative to this supposed law of Dalton:

"Les expériences que fit M. Dalton sur l'alcool, l'ammoniac, et la dissolution de muriate de chaux, lui parurent confirmer également la loi précédente. Toutefois, je dois prevenir que des observations postérieures, faites par divers physiciens, ont détruit l'idée de généraltié, et de rigueur qu'il lui avait attribuée. Le docteur Ure, de Glascow, a publié à ce sujet des recherches dont la précision parait ne guére laisser de doute, et un jeune et habile chimiste francais, M. Despretz, a été conduit par un autre voie aux memes consequences."

† Thus, if water, alcohol, and ether, be exposed to the temperature of 220°, the elasticities will be respectively 34.2, 80.2, 240, in inches of mercury.—True, but why does Mr. Silliman associate this fact with the law in question, as if it formed a part of the latter, and thus make Dr. Henry *appear* to confound things so essentially distinct?—Because the doctor happened to place them on the same page?

‡ Will Mr. Silliman inform us, in what respect the law thus corrected differs from that originally announced by Dalton? and if he admits, as we presume he will, that it differs in no respect, will he also inform us, whether he is speaking seriously or jocosely, when he first lamely *apologizes for admitting into his first volume, an incorrect law, and the next moment repeats identically the same law, with the assurance that it is a modification of the former?* If Mr. Silliman should be disposed to treat the matter seriously, we advise him to examine again the eleventh edition of his Henry; he will find that far from admitting the inaccuracy of the original law of Dalton, Henry does not even notice the fact of its truth having been disputed.

WALSH'S NOTICES OF BRAZIL.

We have selected the following extracts from that very amusing and instructive work, "Notices of Brazil, by the Rev. R. Walsh."

"In Brazil, all journeys are suspended at the Ave Maria, that is, the vespers to the Virgin, that commence after sunset. Instead of a curfew, this period is announced in the country by a very simple and beautiful circumstance. A large beetle (Pelidnota testacea) with silver wings, then issues forth, and announces the hour of vespers, by winding his solemn and sonorous horn. The Brazilians consider that there is something sacred in this coincidence; that the insect is the herald of the Virgin, sent to announce the time of her prayer; and it is for that reason constantly called Escaravelho d'Ave Maria, or the Ave Maria beetle. On the hill of Santa Theresa, I have heard it of an evening, humming round the convent, and joining its harmonious bass to the sweet chant of the nuns within, at their evening service."—Vol. ii. ch. 2.

"The first place where gold was found, was at Riberäo, a small stream which falls into the Rio das Mortes, and here they built an Arayal, or village, called Antonio, near the spot where S. José was afterwards erected.

"The vicinity of this river every where attests the extensive search for gold formerly pursued here, as it was for a length of time considered one of the richest parts of Brazil, from the profusion of precious metal found on its surface. All the banks of the stream are furrowed out in the most extraordinary manner, so as to be altogether unaccountable to one unacquainted with the cause. The whole of the vegetable mould was washed away, and nothing remained but a red earth, cut into square channels, like troughs, with a narrow ridge interposed between them. Above was conducted a head stream of water, let down through these troughs, which were all on an inclined plane. The lighter parts of the clay were washed away, and the gold remained behind. When this has been collected by a process I will hereafter describe, that which remains behind is called pizaräo. It is an inert caput mortuum of stubborn sterility, which no process can afterwards endow with the principles of fertility; so that, in washing out the gold, all the riches of the soil were literally exhausted, and nothing left but a barren and utterly useless surface.

"The whole of the soil with which the soil is impregnated, is supposed to originate in the metalliferous ridges of rock which intersect the country. Here, in its matrix, the metal reposes; but the rains falling in impetuous torrents on their summits, and penetrating through their interior recesses, again ooze from their sides, carrying with them all the lighter parts of the precious metal, as they pass through the veins, and finally deposit them in the soil below, through which they percolate.

"As the great auriferous repertory of the country now stood before me, I was curious to explore it; so we prepared to ascend the ridge. The general face of it was quite perpendicular, and we could no more attempt to climb the part opposite to us, than Dover Cliff; but about three miles to the N. E. of the town, the ridge dips, and leaves a depression considerably lower than the rest, which is accessible. After winding in a zig zag direction up the rocky face, we at length emerged on the summit, and here we saw in perfection the totally new feature of the Brazilian landscape, which we before had contemplated at a distance. In all our journeys from Rio, for more than two hundred miles, we had scarcely seen a stone peeping through the soil. Here we stood upon an immense ridge of rocks, utterly denuded both of wood and grass, stretching their bare and rugged arms in all directions over the country, and forming a prospect strongly contrasted with any we had yet contemplated. This ridgy region, I was told, ramified through the country to an immense extent in a westerly direction, till it was lost in the mato grosso, or vast forests, which extend nearly to the Andes; and these are the great metallic repositories, from whence the whole subjacent soil of the Minas Geräes is impregnated with gold.

"The summit of the ridge was by far the most wild and solitary we had seen in Brazil. It was generally composed of white sand, strewed with nodules of very bright and almost transparent quartz, from the decomposition of which the sand seemed to be formed. Piled up in great disorder were mounds of mica, slate, and large masses of different strata were lying over each other, in an angle considerably inclined, as if they had slipped down in succession from some more elevated place. Towards S. José, the face of the ridge was a perpendicular precipice, five or six hundred feet high, for twelve or fourteen miles; on the other side it descended in a more gradual slope, like a shed from a wall.

"The formation of this serra is generally of mica slate, and a modification of clay, talc, and chlorite slate. There is no granite yet discovered here; but a league and a half on the western side are extensive tracts of it. The beta, or vein, is generally quartz, in which is found gold variously mixed with iron stone, magnetic and titaneous iron, ochre, tellurium, and pyrites, containing gold and silver. The serra extends about twelve miles from east to west."

"We had every day, almost, a thunder storm, and the repercussion from the face of the ridge was so loud, sharp, and distinct, that it seemed as if the hard stone was hit and broken by a number of sledges striking upon it; and certainly if this symptom be any indication of metallic veins, it no where exists so strong as in the serra of S. José."

"For a long time, the only gold in the country was extracted from the clay, through which the rains from this ridge had filtered, leaving behind all the particles of the metal which they carried down. The first mines in the province were pits, called cata, opened by the workmen till they came to the cascalho, or gravel, below. This was broken up with pick-axes, and the contents brought to the river and washed. They were therefore opened as near the banks as possible, and were generally called taboleiros, from the flat tabular surface over them. These primitive workings are every where to be seen, and have given names to places, as Catas Altas.

"The next improvement was to conduct a stream of water to ground known to be impregnated with the metal, and so wash it out on the spot, and these were called lavras; they are seen in abundance on the banks of the Rio das Mortes.

"The third and last was pursuing the metal into the rock itself, and this they attempted by opening superficial trenchments, on the most horizontal surfaces, and pushing them on where they found any indication of gold. This they call talho alberto, or the open cut; and several of these remain in the serra towards S. Joäo del Rey, about ten or twelve feet deep, ramifying in different directions, like the ravines of mountain torrents, which they resemble at first sight; but this, however, also failed, as the Brazilians had neither skill nor capital to proceed deeper, from the clumsiness and deficiency of their operations."

"The mines of Potosi were discovered by a Spaniard, who, in ascending the mountain, seized a bush to assist him; and this giving way, he found the root embossed with particles of silver. A similar circumstance is told of gold in this province. The first Paulistas pulled up tufts of grass in the same manner, and found numerous particles of gold entangled in the roots; and the first washings in search of the metal were from the roots of the herbage at the base of the hills.

"When a quantity of this impure mixture (grains of gold and esmeril) was thus collected, it was laid in the batea, (a bowl,) and here it was dexterously moved from side to side, in a constant ablution of fresh water, till the esmeril (oxide of iron) also passed off, and the heavier gold dust remained alone in the point of the cone. The whole of this was finally deposited in a large copper skillet, placed over a fire on the spot, and stirred till the water evaporated, and nothing remained but dry gold dust, in general of exceedingly minute particles, but frequently appearing in small globules, some as large as a grain of small shot. In this state a magnet was passed through it, to which the particles of iron still mixed with the gold, adhered; and this was continued till the whole was abstracted.

"Sometimes a more scientific process is resorted to. The mixture of dust is put into a bowl, and two ounces of mercury added to two pounds of gold and oxyde. This mass is worked by the hands, into a dough, when the mercury takes up the gold only, which is merely entangled, but not amalgamated, with it. It is then put into a cloth, and a portion of the mercury squeezed out; the remainder is set in a brass vessel, over a fire, and covered with green leaves, which are removed as they become parched. They exhibit small globules of the sublimed mercury on the surface. What remains in the vessel is pure gold, changed in colour to a dull white."

"Our way next morning lay along the edge of one of the most extensive and richest lavras in the country, and from which the place derived its name of dourado or golden. Immediately outside the village is a very large and deep ravine, extending to a considerable distance, and exposing its bowels stained with bright red ochre. This is excavated in soft sand stone, of the consistence of hard clay, and is strongly impregnated with gold, which accumulates in caldeiros, or pits like caldrons. Large masses of gold are sometimes found in these caldeiros. They are indicated by fibres ramifying through the matrix in which they lie; and when pursued from different directions, they terminate in a common nucleus. A lump was found about thirty years ago in this place, which weighed forty pounds."—Vol. 2. ch. 5.

"A large topaz mine, of which our host was the proprietor, lay about a mile from the zancho, and the next morning we visited it. The regions through which we had passed, were generally clay mountains, or granite ridges; we had now entered a new formation, a soft schist of talk, clay, or mica slate, which every where presented its lamellated edges in the ridges, just above the soil. In some places it was hard and solid, as building slate; in others, it was soft and friable, and in various states of decomposition. About fifty years ago, in pushing a road through one of these soft schistic knolls, which stood in their way, they were astonished to see several crystals of topaz tumble out of the soft mass. On this discovery they began to search, and they have now found and opened three large mines in the neighbourhood, within a circle of ten or twelve miles. The mine of Capäo do lana, is an immense circular quarry, the shape of a hollow inverted cone, whose upper circumference is a mile or more. The sloping sides are composed of talk, or mica slate, either green, grey, or blue, and in a state of such decomposition, as to be quite soft, hardly retaining any of its lamellated structure. This is called the corpo da formacäo, or the substance in which the topaz veins are formed. These veins are a white medullary mass, called massa branca, resembling soft chalk, though not calcareous, but is supposed to be some modification of mica. It forms cords as thick as an arm or leg, running for several yards, and ramifying into various smaller branches. This massa branca, is the matrix in which the topaz is imbedded, like a nodule of flint in a lump of chalk.

"Here a number of negroes, with rude knives like peices of iron hoop, were scarifying the ground. When they cut across a white vein, it immediately became visible, and they pursued it, dislodging the topazes which were bedded inside, and handing them to an overseer with a bag."—Vol. ii. ch. 7.

"In the course of my journey I passed over six different surfaces, strikingly distinguished from each other in their aspect, formation, and productions. The first was the Beiramar, the rich plain which extended from the edge of the sea, to the base of the great serra, generally about sixty miles in breadth. This is, with some exceptions, a flat surface, with an alluvial or sandy soil, exceedingly fertile, covered with fazendas, (farms,) and generally well cultivated.

"The next diversity of country was the Serra Acima, the great ridges of clay covered with immense forests of timber. A considerable part of these seem to consist of mounds of earth without any admixture of rock. We saw, in some places, deep sections of the hills, where either a part had fallen away, or it had been cut down. They presented perpendicular faces of earth, some of them near a hundred feet deep, into which the roots of lofty trees had penetrated to an incredible depth, almost realizing the poet's description, that they had extended as far below, as the branches above the surface of the soil. In many of these vast heaps of clay, we could not detect a stone as large as a boy's marble.

"The next variety of surface presented to us was the rocky serras, which rose like huge walls from the surface of the plains, bearing in their bosoms the metalliferous veins, and impregnating all the soil at their bases with the particles of precious ore washed down them. The features of this region were very extraordinary, and had no kind of affinity with the former two. The summits of these naked stony ridges were often surmounted by fantastic protuberances, which the inhabitants imagined had human resemblances. One was called Ita Columi, or the child of stone; and another, Serra da Cava, from its likeness to an enormous visage. From this stony Arabia, we entered into the mato or thicket; low eminences, covered over with copse and brushwood, frequently interspersed with ferns and brambles, resembling similar soil and aspect, in the middle regions of Europe.

Finally, we passed between bristly pikes, and conical mountains of bare granite, ascending to the sky, with well defined forms, and smooth taper surfaces, not having the most distant resemblance to any other objects we had passed."—Vol. 2. ch. 12.

We hope soon to lay a very interesting account before our readers of the now celebrated gold region, in the southern parts of the United States. With some irrelevant exceptions, the Rev'd. Mr. Walsh's able account of the gold country in Brazil, would be an exact mineralogical description of some of the veins in North Carolina. We were exceedingly struck with this resemblance.—Editor.

NOTES ON ILLINOIS.

Our readers, we think, cannot but be pleased with the extract we are about to present them with, from the Illinois Monthly Magazine, for July, 1831. A work so much devoted to the natural history, the manners, customs, and literature of 'the far west,' carries an intrinsic value with it, that will soon be generally appreciated. It speaks volumes for the intelligence of the inhabitants of the western states, that a work so truly American, and so meritoriously conducted, should have appeared amongst them.—Ed.

WILD ANIMALS.

The buffaloe has entirely left us. Before the country was settled, our immense prairies afforded pasturage to large herds of this animal, and the traces of them are still remaining, in the "buffaloe paths" which are to be seen in several parts of the state. These are well beaten tracks, leading generally from the prairies in the interior of the state, to the margins of the large rivers; showing the course of their migrations as they changed their pastures periodically, from the low marshy alluvion, to the dry upland plains. In the heat of summer they would be driven from the latter by prairie flies, in the autumn they would be expelled from the former by the musquitoes; in the spring the grass of the plains would afford abundant pasturage, while the herds could enjoy the warmth of the sun, and snuff the breeze that sweeps so freely over them; in the winter the rich cane of the river banks, which is an evergreen, would furnish food, while the low grounds, thickly covered with brush and forest, would afford protection from the bleak winds. I know few subjects more interesting than the migration of wild animals, connecting, as it does, the singular displays of brute instinct, with a wonderful exhibition of the various supplies which nature has provided for the support of animal life, under an endless variety of circumstances. These paths are narrow, and remarkably direct, showing that the animals travelled in single file through the woods, and pursued the most direct course to their places of destination.

Deer are more abundant than at the first settlement of the country. They increase, to a certain extent, with the population. The reason of this appears to be, that they find protection in the neighbourhood of man, from the beasts of prey that assail them in the wilderness, and from whose attacks their young, particularly, can with difficulty escape. They suffer most from the wolves, who hunt in packs like hounds, and who seldom give up the chase until a deer is taken. We have often sat, on a moonlight summer night, at the door of a log cabin on one of our prairies, and heard the wolves in full chase of a deer, yelling very nearly in the same manner as a pack of hounds. Sometimes the cry would be heard at a great distance over the plain; then it would die away, and again be distinguished at a nearer point, and in another direction—now the full cry would burst upon us from a neighbouring thicket, and we could almost hear the sobs of the exhausted deer; and again it would be borne away and lost in distance. We have passed nearly whole nights in listening to such sounds; and once we saw a deer dash through the yard, and immediately past the door at which we sate, followed by his audacious pursuers, who were but a few yards in his rear.

Immense numbers of deer are killed every year by our hunters, who take them for their hams and skins alone, throwing away the rest of the carcass. Venison hams and hides are important articles of export. The former are purchased from the hunters at 25 cents a pair, the latter at 20 cents a pound. In our villages we purchase, for our tables, the saddle of venison with the hams attached, for 37½ cents, which would be something like one cent a pound.

There are several ways of hunting deer, all of which are equally simple. Most generally the hunter proceeds to the woods on horseback, in the day time, selecting particularly certain hours, which are thought to be most favourable. It is said that during the seasons when the pastures are green, this animal rises from his lair, precisely at the rising of the moon, whether in the day or night; and I suppose the fact to be so, because such is the testimony of experienced hunters. If it be true, it is certainly a curious display of animal instinct. This hour therefore is always kept in view by the hunter, as he rides slowly through the forest, with his rifle on his shoulder, while his keen eye penetrates the surrounding shades. On beholding a deer the hunter slides from his horse, and while the deer is observing the latter, creeps upon him, keeping the largest trees between himself and the object of pursuit, until he gets near enough to fire. An expert woodsman seldom fails to hit his game. It is extremely dangerous to approach a wounded deer. Timid and harmless as this animal is at other times, he no sooner finds himself deprived of the power of flight than he becomes furious, and rushes upon his enemy, making desperate plunges with his sharp horns, and striking and trampling violently with his fore legs, which being extremely muscular, and armed with sharp hoofs, are capable of inflicting very severe wounds. Aware of this circumstance, the hunter approaches him with caution, and either secures his prey by a second shot, where the first has been but partially successful, or, as is more frequently the case, causes his dog to seize the wounded animal, while he watches his own opportunity to stab him with his hunting knife. Sometimes where a noble buck is the victim, and the hunter is impatient or inexperienced, terrible conflicts ensue on such occasions.

Another mode, is to watch at night, in the neighbourhood of the *salt licks*. These are spots where the earth is impregnated with saline particles, or where the salt water oozes through the soil. Deer and other grazing animals frequent such places, and remain for hours licking the earth. The hunter secretes himself here, either in the thick top of a tree, or most generally in a screen erected for the purpose, and artfully concealed like a masked battery, with logs or green boughs. This practice is pursued only in the summer, or early in the autumn, in cloudless nights, when the moon shines brilliantly, and objects may be readily discovered. At the rising of the moon or shortly after, the deer having risen from their beds, approach the lick. Such places are generally denuded of timber, but surrounded by it; and as the animal is about to emerge from the shade into the clear moonlight, he stops, looks cautiously around, and snuffs the air. Then he advances a few steps, and stops again, smells the ground, or raises his expanded nostrils, as if he "snuffed the approach of danger in every tainted breeze." The hunter sits motionless, and almost breathless, waiting until the animal shall get within rifle shot, and until its position in relation to the hunter, and the light, shall be favourable, when he fires with an unerring aim. A few deer only can be thus taken in one night, and after a few nights these timorous animals are driven from the haunts which are thus disturbed.

Another practice is called *driving*, and is only practised in those parts of the country where this kind of game is scarce, and where hunting is pursued as an amusement. A large party is made up, and the hunters ride forth with their dogs. The hunting ground is selected, and as it is pretty well known what tracks are usually taken by the deer when started, an individual is placed at each of those passes, to intercept the retreating animal. The scene of action being thus, in some measure, surrounded, small parties advance with the dogs from different directions, and the startled deer, in flying, most generally pass some of the persons who are concealed, and who fire at them as they pass.

The elk, has disappeared. A few have been seen in late years, and some taken; but it is not known that any remain at this time, within the limits of the state.

The bear is seldom seen. This animal inhabits those parts of the country that are thickly wooded, and delights particularly in cane brakes, where it feeds in the winter on the tender shoots of the young cane. The meat is tender and finely flavoured, and is esteemed a great delicacy.

Wolves are very numerous in every part of the state. There are two kinds: the common, or black wolf, and the prairie wolf. The former is a large fierce animal, and very destructive to sheep, pigs, calves, poultry, and even young colts. They hunt in large packs, and after using every stratagem to circumvent their prey, attack it with remarkable ferocity. Like the Indian, they always endeavour to surprise their victim, and strike the mortal blow without exposing themselves to danger. They seldom attack man, except when asleep or wounded. The largest animals, when wounded, entangled, or otherwise disabled, become their prey, but in general they only attack such as are incapable of resistance. They have been known to lie in wait upon the bank of a stream which the buffaloes were in the habit of crossing, and when one of those unwieldy animals was so unfortunate as to sink in the mire, spring suddenly upon it, and worry it to death, while thus disabled from resistance. Their most common prey is the deer, which they hunt regularly; but all defenceless animals are alike acceptable to their ravenous appetites. When tempted by hunger they approach the farm houses in the night, and snatch their prey from under the very eye of the farmer; and when the latter is absent with his dogs, the wolf is sometimes seen by the females lurking about in mid-day, as if aware of the unprotected state of the family. Our heroic females have sometimes shot them under such circumstances.

The smell of burning assafœtida has a remarkable effect upon this animal. If a fire be made in the woods, and a portion of this drug thrown into it, so as to saturate the atmosphere with the odour, the wolves, if any are within reach of the scent, immediately assemble around, howling in the most mournful manner; and such is the remarkable fascination under which they seem to labour, that they will often suffer themselves to be shot down rather than quit the spot.

Of the very few instances of their attacking human beings, of which we have heard, the following may serve to give some idea of their habits. In very early times, a negro man was passing in the night, in the lower part of Kentucky, from one settlement to another. The distance was several miles, and the country over which he travelled entirely unsettled. In the morning his carcass was found entirely stripped of flesh. Near it lay his axe, covered with blood, and all around the bushes were beaten down, the ground trodden, and the number of foot tracks so great, as to show that the unfortunate victim had fought long and manfully. On pursuing his track it appeared that the wolves had pursued him for a considerable distance, he had often turned upon them and driven them back. Several times they had attacked him, and been repelled, as appeared by the blood and tracks. He had killed some of them, before the final onset, and in the last conflict had destroyed several. His axe was his only weapon.

On another occasion, many years ago, a negro man, was going through the woods, with no companion but his fiddle, when he discovered that a pack of wolves were on his track. They pursued very cautiously, but a few of them would sometimes dash up, and growl, as if impatient for their prey, and then fall back again. As he had several miles to go, he became much alarmed. He sometimes stopped, shouted, drove back his pursuers, and then proceeded. The animals became more and more audacious, and would probably have attacked him, had he not arrived at a deserted cabin, which stood by the way side. Into this he rushed for shelter, and without waiting to shut the door, climbed up and seated himself on the rafters. The wolves dashed in after him, and becoming quite furious, howled, and leaped, and endeavoured with every expression of rage to get to him. The moon was now shining brightly, and Cuff being able to see his enemies, and satisfied of his own safety, began to act on the offensive. Finding the cabin full of them, he crawled down to the top of the door, which he shut and fastened. Then removing some of the loose boards from the roof, scattered them with a tremendous clatter upon such of his foes as remained outside, who soon scampered off, while those in the house began to crouch with fear. He had now a large number of prisoners to stand guard over, until morning; and drawing forth his fiddle, he very good naturedly played for them all night, very much, as he supposed, to their edification and amusement, for like all genuine lovers of music, he imagined that it had power to soften the heart, even of a wolf. On the ensuing day, some of the neighbours assembled and destroyed the captives, with great rejoicings.

The prairie wolf, is a smaller species, which takes its name from its habit of residing entirely upon the open plains. Even when hunted with dogs, it will make circuit after circuit, round the prairie, carefully avoiding the forest, or only dashing into it occasionally when hard pressed, and then returning to the plain. In size and appearance, this animal is midway between the wolf and the fox, and in colour it resembles the latter, being of a very light red. It preys upon poultry, rabbits, young pigs, calves, &c. The most friendly relations subsist between this animal and the common wolf, and they constantly hunt in packs together. Nothing is more common than to see a large black wolf, in company with several prairie wolves. I am well satisfied that the latter is the jackal of Asia.

Several years ago an agricultural society, which was established at the seat of government, offered a large premium to the person who should kill the greatest number of wolves in one year. The legislature at the same time offered a bounty for each wolf scalp that should be taken. The consequence was, that the expenditure for wolf scalps became so great, as to render it necessary to repeal the law. These animals, although still numerous, and troublesome to the farmer, are greatly decreased in number, and are no longer dangerous to man. We know of no instances in late years, of a human being having been attacked by them.

We have the fox, in some places in great numbers; though generally speaking, I think the animal is scarce. It will undoubtedly increase with the population.

The panther and wild-cat are found in our forests. Our open country is not, however, well suited to their shy habits, and they are less frequently seen than in some of the neighbouring states.

The beaver and otter, were once numerous, but are now seldom seen except on our frontiers.

The gopher,* is, as we suppose, a non descript. The name does not occur in books of natural history, nor do we find any animal of a corresponding description. The only account that we have seen of it, is in "Long's Second Expedition." In a residence in this state of eleven years, we have never seen one, nor have we ever conversed with a person who has seen one—we mean, who has seen one near enough to examine it, and to be certain that it was not something else. That such an animal exists is doubtless; but they are very shy and their numbers small. They burrow in the earth, and are supposed to throw up those hillocks which are seen in such vast abundance over our prairies. This is to some extent a mistake, for we know that many of these little mounds are thrown up by craw-fish, and by ants.

The polecat is very destructive to our poultry.

The raccoon and opossum are very numerous, and extremely troublesome to the farmer, as they not only attack his poultry, but plunder his cornfields. They are hunted by boys, and large numbers of them destroyed. The skins of the raccoons pay well for the trouble of taking them, as the fur is in demand.

Rabbits are very abundant, and in some places extremely destructive to the young orchards, and to garden vegetables.

We have the large grey squirrel, and the ground squirrel.

There are no rats, except along the large rivers, where they have landed from the boats.

* The writer of this interesting article, appears not to be aware that the *Gopher* has already been described. It belongs to the class Mammalia, order Rodentia. It was formerly included in the genus Mus, of Linnæus, but Rafinesque has given it the elegant name of 'Geomys.' It is the 'Pseudostoma' of Say, and the Mus Bursarius of Shaw. There is but one species yet known, the *Geomys Bursarius*, or *Earth Rat with Pouches.* It is the size of a rat, of a reddish grey colour, has deep cheek pouches, which open externally, enlarging the sides of the head and neck. When it was first figured in the Transactions of the Linnæan Society, and in Shaw, vol. 2, part 1, these pouches were represented turned inside out, as though it had a bag on each side of the head.—Ed.

SCIENTIFIC MEMORANDA.

Herds of frozen Elephants, Rhinoceros, &c. &c.—In No. VII. of "Bulletin de la Societe Imperiale des Naturalistes de Moscou," there is a letter from M. Hedenstrom, to whom the Russian government had intrusted an expedition for the purpose of tracing geometrically the coasts of the Icy sea, from Lena to Colyma, and of making a description of the isles of the north. He was three years in these remarkable countries, and discovered a new Island, which he named *New Siberia*, because its general appearance is much more savage than that of the old Siberia. In the unchangeable icy crusts of these countries there were found buried thousands of the mammout, (commonly called mammoth,) rhinoceros, buffaloe, and other antediluvian animals. New Siberia is indeed a country full of wonders, but which naturalists can only admire, for it is impossible to study nature there. The ground, frozen and hard as the rock, cannot be dug into; and the summer is too short for the necessary researches.

Mag. of Nat. His. May, 1831, *page* 253.

Voice of Fishes.—It appears that fishes, like many diffident young persons, "don't sing, but will try to do their best." In Loudon's Magazine of Natural History, it is stated by a Mr. Thompson, that "some tench, which I caught in ponds, made a croaking like a frog, for a full half hour, whilst in the basket at my shoulder." Mr. Murray also observes, "when the herring is just caught in the net, and brought into the boat, it utters a shrill cry like the mouse; and I have often heard the long continued 'grunting' or croaking, of the gurnard, after being freed from the hook."

Easy method of destroying Insects, intended for cabinet specimens.—Put a quantity of sal. volatile, or common smelling salts, into a wide mouthed bottle; the insects will die soon after being introduced into it. For the larger moths, it is recommended, first to make a solution of crystallized oxalic acid with a little water; then holding the moth gently on the under side, between the wings, with the finger and thumb of your left hand, dip a sharp pointed quill, without a split, in the solution, run it into the insect between the first pair of legs, and after one or two applications, the moth will be dead.

Elevation of the Morea.—A paper by M. Boblaye, on the geology of the Morea and Egina, offers proofs of the country having been upraised, not by degrees, but by intervals, so sudden, that the land abandoned by the sea, is now in distinct irregular terraces.—*Acad. des Sciences.*

A new Skeleton of the Megatherium.—A perfect skeleton of this rare animal, exceeding in size the splendid specimen preserved in the cabinet of Natural History, in Madrid, has been lately discovered, one hundred and twenty-six miles south of Buenos Ayres. This remarkable specimen of antediluvian* zoology, is now in the possession of Woodbine Parish, Esq. Consul General at Buenos Ayres, who intends to bring it with him to Europe.—*Jameson's Ed. N. P. Journal.*

Geology of India.—Dr. Turnbull Christie, has been appointed to examine the geology of the presidency of Madras. He visits Egypt and Syria on his way, accompanied by an artist to make designs of the various objects in natural history; and carries with him the proper instruments to examine meteorological, and hydrographical phenomena.—*Ibid.*

* We want the evidence of its being antediluvian.—Ed.

TO READERS AND CORRESPONDENTS.

We have received the various communications of 'Crito.' 'R.' 'A Marylander.' 'A student in Geology.' There are also some papers lying on our table without any signature or reference whatever. Our correspondents would find a convenience in affixing some designation to their papers. We wish them to understand, that when it is not expedient to publish a paper, we are desirous of transmitting it to the writer without delay.—Of a paper thus circumstanced, we desire to observe, that we are sensible of the friendly intentions of the writer, that it is well and forcibly written, and has amused us exceedingly; but we must decline the publication of it, at any rate at present. Having taken our full satisfaction, we have not the least desire of returning to a disagreeable subject. We hope henceforward to be permitted to pursue our path in cheerfulness and peace, and shall hold the communication of an unknown friend subject to his instructions.

To 'a student in geology,' we desire to say, that we have not forgotten our pledge to give 'in each number a continuous essay on geology as a science.' By recurring to page 4, of our first number, he will perceive what our intentions are; and that we have been constantly engaged in the execution of them. The 'Epitome of the Progress of Natural Science,' will terminate with the number for November; the rise of the physical sciences and of geology will be then treated of. We shall hereafter come forward, hammer in hand, and endeavour to explain in a transparent manner, the true principles of geology and the general philosophy of natural science. We hope that the earnest we shall give of our sincere desire to advance the knowledge of American geology, will induce many to come to our aid. The developement of the geology of this vast continent, can only be effected by the labours of concurring observers. Whenever they are submitted to us, our correspondents may feel assured, that upon all occasions, they shall not only receive the most ample credit for their contributions, but the assistance of our deliberate judgment. We propose ere long to return to this subject, with a view of pointing out the most expedient manner of effecting so desirable an end.

VESPERTILIO AUDUBONI.

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AN EPITOME OF THE PROGRESS OF NATURAL SCIENCE.

(*Continued from page* 158.)

We have seen how barren history is of every thing relating to natural science, during the long period under consideration in our last number, when the causes were in operation which necessarily retarded every branch of physical science. The revival of these pursuits, not only required the indispensable guarantees of social security, but that they should be preceded by some advances in literature. Towards the end of the dark ages, all the languages of Europe were in a state of change. Languages may be compared to plants, many of which, if not segregated and cultivated by themselves, will mingle and give birth to varieties; by cultivation again, any of those varieties may be made permanent, and brought, as flowers and fruits frequently are, to a state of high perfection. All languages, in the eye of philosophy, are generically the same, since the sounds proceeding from the machinery of the human voice, and all their combinations, are results mechanically produced by a common cause; and the differences observable in uncultivated languages, spoken by people at great geographical distances from each other, may, to a great extent, be considered as modifications, effected by the difference of climate, and often suggested by the uses to which the various objects, found in different parts, are put by human beings. Every physical act differing from another, will necessarily be expressed in a peculiar manner, and it is only under great extensions of society, that any one language at length becomes generally intelligible. Under this view, it cannot be proved that languages are specifically different, unless it can be shown, in the particular case, that the whole machinery of the human voice, is specifically and mechanically different from that which distinguishes the human race. It is in this sense that all languages have an affinity for each other, whilst that affinity, at the same time, by no means either proves or disproves the unity of the human race, any further than comparative anatomy is concerned. There, it is true, we find proofs of unity of design, with occasional modifications of structure. Hence philologists, in examining remote languages, have occasionally found affinities in the speech of barbarous people, with those oriental tongues, which are supposed by many to be the first languages spoken, even in cases where there are no grounds to suppose any ancient connection of the races. Thus affinities have been found in the languages of the Red men of this continent, with the ancient Hebrew. It is true, however, that language materially enables us to trace the connection of races: the modern English tongue can be shown both by etymology, and by records, to have for its basis the Anglo Saxon tongue; this last, the Teutonic, which again may be referred to the Celto-Scythian. Without entering at present into the origin of the Celts, they may be considered, as far as the languages of Christendom are concerned, as a primitive people, who issued upon Europe from the western parts of Asia, and pushed on by successive colonies, soon spread themselves to the extreme borders of the Mediterranean, and northward, to the Baltic ocean, including the islands on the coast. At remote periods new adventurers from Africa and Greece, mingled themselves with these first people, and distinct nations and people grew up amongst them. It was probably in this manner the ancient Latin people arose from an admixture of the old Celtic stock, with adventurers from Greece and Phenicia. When a cultivated race subdues a barbarous one, it usually occurs that the language and its forms, of the first, is imposed upon the last; whilst a barbarous people, when it prevails against a civilized nation, cannot substitute its own tongue, although by mingling itself with, it can effectually corrupt and destroy the other. This took place when the Celts were subsequently subdued in every part of Europe by the Roman arms, when the Latin tongue prevailed over the Celtic, in Gaul and Spain; whilst, when the Roman empire was finally subdued by the Goths, the Roman tongue became subsequently a dead lan guage, and new dialects arose out of the mixture of the barbarous with the civilized. Such was the origin of the Italian, the Spanish, and French languages. Muratori, in his antiquities of Italy, informs us, that as early as the end of the twelfth century, when Godfred, patriarch of Aquileia, pronounced a homily in the Latin tongue, the bishop of Padua, explained it to the people in the *lingua volgare*, or dialect spoken by the mass of the people, meaning the nascent Italian. This, as Tiraboschi, in his History of Italian Literature, observes, probably was spoken long before it was written, as the learned would disdain to write in a dialect only spoken by the vulgar.

But the Italian tongue had already been preceded by the Provençal, a language in which modern poetry, at the dawning of letters in Europe, first appeared. It was then, that poetry produced its usual effect: from the moment of its cultivation, the darkness of the barbarous ages began to disperse; under its influence men began again to draw together, as the beasts are said to have assembled, charmed by the lyre of Orpheus. We must go back one step in history, to glance at the very interesting circumstances under which the Provençal poetry arose, and from a source too much overlooked in the history of the revival of learning.

The empire of the Arabs is dated from the Hegira, or flight of Mahomet, A. D. 622. An empire of this vast extent, and which, within the period of a century from its origin, comprehended Egypt, Persia, Syria, Arabia, Africa, and the greater part of Spain, depended for its existence upon the fanaticism and military spirit, which had inspired the arms of Caled and Amrou. These impulses being wanting, the causes of the dismemberment of this great empire began to operate. Luxury, the schism of Ali and Omar, factions, the civil wars between the followers of these chiefs, and the excommunications of the caliphs of Bagdad, Cairo, and Cordova, fulminated against each other like those of the popes and anti-popes of Rome, present another historical picture of the instability of empires founded by the sword. But in the comparatively short duration of the dominion of the caliphs, the zeal which had led this hot-blooded race to conquest, had, as has been stated at page 156, been directed to the cultivation of the learning of antiquity; and their extraordinary attainments were destined to have a powerful and leading influence upon the revival of letters in Christendom. The house of Abbas, which reigned at Bagdad in the eighth century, produced three illustrious protectors of arts and letters, the caliphs Abou Djafar Manzour, more familiarly called Almanzor; Haroun al Raschid, celebrated in that attractive work, The Arabian Nights; and his son Abdallah Mamoun, or Almamon, conspicuous above the rest as a benefactor to science, and whose name deserves to be transmitted to the lastest posterity. The favourite pursuit of this caliph, who flourished in the early part of the ninth century, was astronomy: numerous observatories were constructed during his reign, in which the measure of a degree of the meridian was taken. Bagdad, the seat of his government, was renowned for its cultivation of the sciences; camels entered its gates loaded with manuscripts, which the munificence of the caliph had collected, and all those productions which were calculated to enlarge the minds of his subjects, were selected and translated into Arabian. Their knowledge of the works of Plato and Aristotle, had been derived from the Greeks, and one of the conditions of the peace, which Almamon imposed upon the Greek emperor Michael the III., was a tribute of works in the Greek tongue. Every branch of knowledge was protected by this sovereign of the Saracens—astronomy, poetry, classics, medicine, and chemistry—he even caused books to be drawn up on the utility of animals, and to be illustrated with figures of beasts, birds, and fishes.

The poetry of the Arabians began at a very early period, favoured by the lively minds, and fertile imaginations, of that free and roving people. There is a collection extant of their old national songs, with remarks upon the manners of the ancient Arabs, entitled Aghány; made by Aboul Faradge Ali, a native of Ispahan, who died A. D. 966. Such was the estimation in which poetry was held, that Mahomet himself was flattered by one of the chapters of the Koran, being judged worthy to be suspended in the temple of Mecca, with seven celebrated poems, that had received that honour. Colleges and schools soon arose in every quarter. Under the Fatimite caliphs, Egypt presented a spectacle it had not known since the days of the Ptolemies; and Fez and Morocco, now plunged in the darkest ignorance, rivalled Egypt in the cultivation of letters. But in no part of the world do the attainments of the Arabians shine with greater lustre than in Spain. Cordova, Grenada, Valencia, Seville, abounded in seminaries of learning. Whilst the rest of Europe was comparatively consigned to the most debasing darkness, the Arabians in Spain had thrown open no less than seventy libraries to the public, enriched with all the knowledge they had so successfully cultivated. This concentration of light beamed in vain for the greater part of Christendom, whose slumbering intellect, was wrapt up in the contemplation of theological subtleties. Yet did the light at length penetrate that dark period; many are the useful inventions we owe to the Arabians, such as cotton and linen paper, as substitutes for the Egyptian papyrus; arithmetical figures, the construction of observatories, of which Europe still retains a model in the famous tower of Seville, in Spain. To them we owe also the process of distillation, and of many analytical branches of chemistry. The use of gunpowder was known to the Moors in the 13th century, masses of stone and iron balls being projected with it, in their wars with the Spaniards. It was near the middle of the fourteenth century before this invention was practised in France. To the Arabians also, have been attributed the knowledge of the mariner's compass, and the pendulum as a measure of time, before they were used by the Europeans. They were likewise the conservators of the works of Hippocrates, Dioscorides, Euclid, Ptolemy, and other luminaries of ancient times; to them, revived Europe was first indebted for the knowledge of the writings of these eminent men. All these writings have truly a constituent place in Arabic literature; for the versions of the Arabians, having been principally made through the Syriac, and in a paraphrastic form, were not literal, as the Latin translations made from the Greek.

They were also exceedingly devoted to music, and amatory poetry. It was thus the exaggerated metaphor of Arabian poetry passed into the Spanish, and which long infected the poetry of that nation. This style is still observed in the east; and although the Orientals have no conception of eloquence not based upon exaggeration, still they have too much good sense to understand it otherwise than figuratively. The French physician Bernier, in his description of the states of the great Mogul, relates the following characteristic anecdote. An Indian poet laureat, addressing a celebrated prince, used the following inflated language. "No sooner dost thou press the sides of thy rapid courser, than the earth trembles; it is agitated, and the eight elephants, those huge pillars of the globe, bend beneath so noble a weight." Bernier, who was present, whispered in the ear of the prince, "Your majesty must generously abstain from riding on horseback, or your poor subjects will suffer too much from these earthquakes." "It is on that account," replied he, entering into the joke, "that I usually travel in a palanquin."

It was in the year 1085, A. D., that Alfonso, the 4th king of Castile, with the aid of many French knights, recovered Toledo from the dominion of the Moors. The inhabitants having submitted to the Spaniards, their gay manners, their customs, their music, their poetry, their colleges, all became familiarly known to the conquerors. From this period may be dated the origin of Spanish letters, and of the Troubadour poetry, which contains no traces of Greek or Latin origin, but in its peculiar style is altogether Arabian. The Provençaux, inhabiting a climate that favoured these oriental manners, soon gave way to the influence of them; to such an extent had they adopted the free manners of the Moors, that they almost realized the romantic stories contained in the Arabian Tales. To do extravagant things in the name of the tender passion, was a true passport to fame. The Abbé Millot, amongst many other anecdotes, relates the following. "Richard of Barbesieu, guilty of infidelity to his mistress, and unable to obtain pardon, retired to the forests, where he built a hut, from which he declared he never would issue, until his mistress had received him into favour. At the end of two years, his companions waited upon the offended lady, when she consented to re-instate him in her graces, upon condition that a hundred knights with a hundred dames, 'S'aimant d'amour,' should present themselves before her, with their hands joined, and on their bended knees should entreat her to pardon him. This was literally performed at the lady's castle, and at the conclusion of this solemn extravagance, she pronounced the pardon of Barbesieu. Manners like these, held up, as they then were, to the imitation of the best classes of society, could never have arisen out of the ferocious, anarchical, and polemical spirit, which, in Europe, preceded this period; and are entirely to be attributed to the mercurial and lively habits of the Saracens, of which the Arabian Nights furnish a more extended picture.

In the early poetry of the Troubadours, we perceive strong traces of the imitation of Arabian verse, and the model of the original form of many of the branches of modern poetry, especially of the amatory verse of Petrarch. At their most brilliant period, the Troubadours frequented all the courts of Europe; and the inhabitants of Italy, whose barbarous language was just passing into the vocal flexibility which now distinguishes it, subsequently imitated the poetic art taught them by the Troubadours, and afterwards formed the Italian language, principally in their poetical exercises, which soon extinguished the language which had served them as a model; for as the French, Spanish, and Italian tongues, arose nearly at the same time, as far as concerns their poetry, the Provençal tongue became thus neglected, and the delirious glory of the Troubadours, which only lasted two centuries, passed away. Nothing more effectually contributed to this, than the establishment of the inquisition at the beginning of the 13th century, which covered their country, especially, with blood and carnage.

Italian poetry first arose in Sicily, towards the end of the 12th century. This island, which had been occupied by the Greeks, the Saracens, and the Normans, and to which the Troubadours had very much resorted, had, at an early period, produced some attempts at poetry, and Frederic the II., born A. D. 1202, grandson of Frederic Barbarossa, to whom the sovereignty of Naples and Sicily belonged, was one of the first poets who wrote in the Sicilian dialect. This monarch, remarkable for his attainments and spirit, which brought him into constant struggles with the Papal power, was the protector of all liberal pursuits, and his court was much resorted to by men who had distinguished themselves in the arts of peace. Natural history was one of his favourite studies. He wrote a treatise on hunting with birds, 'De arte venandi cum avibus,' in the which he not only describes land and water birds, their food and habits, but also their structure, the mechanism of their wings, and their modes of offence and defence. There is an amatory ode of his, in which are many words in a state of transition from the Latin to the Italian, such as, *eo*, abbreviated from the pronoun *ego*, and now become *io*; *meo*, from *meus*, now become *mio*. From this and other contemporaneous productions, it is evident the Italian had assumed its great outlines, and that it was in general use; for poets, especially amatory ones, are not in the habit of expressing their feelings, in a tongue which is not familiar to their cotemporaries.

But it was poetry that first gave life to the vulgar dialect of the people, and led to the cultivation of the new Italian tongue, which soon left the degenerate Latin to the pedantry of theologians and jurists. Nevertheless this poetry, at its origin, was at best but a feeble mass of amatory expressions, without natural feeling, and never directed to high achievements, or to the description of those interesting objects with which Italian nature abounds. The Italians, at the dawning of their written language, sang of pains they never felt, and in quaint conceits, which sprang from the head and not from the heart, celebrated the power of mistresses that never inspired them with real tenderness. This habit of exaggeration seized hold of every thing: hyperbolical flattery stood in the place of honest commendation; the motives of human action being travestied, history became falsified, and men, instead of reasoning from facts to unerring results, still continued the dupes of puerile conceits, and undefined words. Still the beauty and softness of their language, compensated to the Italians for the insubstantiality of their literature, by favouring the developement of their musical powers.

But a poet, who has had no superior, soon arose amongst them, and took away this reproach. Although Sicily gave the signal for the new literature, the Italian cities, Florence, Bologna, Padua, Naples, &c., quickly followed it. Letters and the arts first began to revive in Florence towards the end of the 13th century, where a republican form of government was established, and where judicial astrology was in great credit.

Dante—a familiar abbreviation of Durante, his baptismal name—was born at Florence, A. D. 1265. One of the best educated and most distinguished youths of the city, he, at the age of twenty-five, lost his mistress Beatrice, whom he had loved from his boy-hood. In a collection of his earliest poetry, made by himself soon after her death, in 1290, and which he called Vita Nuova, are found all the interesting circumstances of their early loves; but towards the end, finding that the effort had fallen short of the expression of his deep and wounded feelings, he says, "If God shall continue my days, I hope to say things of her, which have never been said of woman before."* It was to this purpose he consecrated his great poem the Divina Commedia, a production that ranks him with the most illustrious poets that have written in

* Spero di dire di lei, quello che mai non fu detto d'alcuna.

any language. Dante, who had already raised Italian poetry from its feebleness, but who, in compositions which have barely survived him, had sought reputation through the Latin language; now reached the heights of fame, through one of the dialects of the vulgar tongue of Italy, whilst it was yet unformed, and with which he has invested with so much force, grace, and truth, every thing that is horrible and every thing that is beautiful. His factious countrymen the Florentines, after razing his house to the ground, confiscating his property, and leaving him to die, A. D. 1321, under a foreign government, instituted in 1373 a professorship at the expense of the state, to lecture upon, and expound this poem.

In one particular, the Divina Commedia gives Dante precedence over all poets, for it is the apotheosis of the woman he so deeply loved; every part of it bears testimony that it was she who inspired him, and that she was present to his imagination from the beginning to the end of his sublime production. It is impossible to read all the evidences of his attachment to Beatrice, which began at the very early age of nine years, without being deeply affected with the tenderness and truth of which so great a mind was capable, and which honour human nature so much. The ruin which had fallen upon the fortunes of Dante, was a consequence of the factions which, at this time, raged in every independent state of Italy. The independence of the northern cities, was, in many instances, only the prelude to civil wars. Their liberties were generally intrusted to some principal citizen, and who having tasted the sweets of power, often sought to perpetuate the possession of them. Thus every city nourished two factions, which, ranging themselves, subsequently, in the interests of the German emperors and the popes, took the designations of Ghibellines and Guelphs, from two rival German houses, the popes being the protectors of these last.

This rivalry amongst the cities, which was fostered by the unsettled limitations of territory, was highly favourable to the useful and ornamental arts, through the ostentatious manner in which it sought to exhibit itself. Each city strove to outdo the other in the extent and magnificence of its public buildings; the citizens, too, partook of this spirit of emulation, and vied with each other in the grandeur of their palaces. At this moment nothing strikes the traveller in Italy more than the unusual number of extensive edifices in Florence, Genoa, and other cities, standing in 'majestic amplitude,' and whose harmony of proportion and ornament, as the late lord Byron has most poetically expressed it, "affect the mind, as if it were inaudible music." These palaces were so many castles in the midst of a city; for the factions which so often divided the cities, raged frequently from the opposite sides of the streets; and many of their edifices, as their exterior denotes, were constructed for purposes of defence. Nor has the 13th century its architecture alone to boast of, it being still more illustrious for the revival of painting under Giotto and Cimabue, both of them celebrated by Dante. These artists have left productions, which, notwithstanding the general hardness of outline peculiar to the art at this period, breathe the genius and grace of that great school of painting, of which they were the founders. Although the power of the Italian princes, had been raised at the expence of many of the privileges of the people, still their authority was beneficently exercised in favour of letters and the arts. The Visconti at Milan, the Carrara at Padua, the Gonzaga at Mantua, and the family of Este at Ferrara, were all patrons of merit. To their courts, eminent men—banished by the turbulence of the times from their own country, or travelling from voluntary motives,—resorted; and there they were entertained in the most hospitable and munificent manner. Men of letters were especially honoured, and the most important embassies frequently entrusted to them. Such was the court of Verona, under the great Cane della Scala, the patron of Dante, in his exile. Yet honoured as he was, there was a bitterness in his dependent state, that his lofty mind revolted at. "You do not know," he wrote to a friend, "how hard it is to eat another man's bread." It was this invincible feeling, that dissolved the connection between him and the princes of the house of Scala. His pride never abandoned him, and his growing dissatisfaction ended, perhaps, by indisposing them against him. "What is the reason," said one of them, before a number of his courtiers, to him, "that many people prefer the stupidest buffoon about the court, to yourself, who have so much genius and wisdom?" Dante proudly replied, "that ought not to surprise you, who know that friendships are the result of mutual sympathies, and affinities of character."

The great poem of Dante, had probably much influence in reviving the taste for classical literature. In the universities and colleges of Padua, Bologna, and other cities, where the seven arts, as they are still called, were taught, to the exclusion of that literature; the Greek and Roman writers were comparatively unknown; but the Divina Commedia, of which Virgil, the model of Dante, is one of the principal characters, necessarily awakened the public attention to the writings of the Roman poet; and thus the classics, which had been so long overlooked, at the middle of the 14th century, were sought after with the greatest avidity, and by no one more than Petrarch, to whom Italian literature and learning owe so much. Such was the state of ignorance in one of the most celebrated universities, Bologna, that, as it is related in one of the familiar letters of Petrarch, one of the professors writing to him on the subject of the ancient writers, supposed Plato and Cicero to have been poets; had never heard of Nævius and Plautus, and believed that Ennius and Statius, who lived two hundred and seventy years apart, were cotemporaries.

Having brought this epitome down to the 14th century, when literature was once more cherished, and the seeds of learning securely planted in various countries,—until that greatest of all discoveries, the art of printing, effected in the next century, had placed a barrier against the future obscuration of the general intellect—we shall, in our next number, take up the History and Progress of Geology and Comparative Anatomy. In the mean time we conclude this imperfect sketch, with the following summary of the leading features of the long period we have been reviewing, as far as they concern the progress of human intellect, from the first dawnings of civilization.

1. It has been shown that the only satisfactory channel, whereby we can trace the progress of authentic antiquity, is through the Greeks, with whom science sprung up, consequent upon their intercourse with Egypt.
2. That this intercourse was nearly cotemporary with the period of Moses, the Hebrew lawgiver, who was brought up from his infancy by the Egyptian priests, and instructed by them in their knowledge.
3. That the first philosophical period known to us, arose about fifteen centuries before the Christian era, when the Egyptians first carried their letters—the type of our own alphabet—into

Greece; and that the leading cause of the cultivation of the philosophical arts, was the freedom of opinion, which the Greeks—not controlled by the theocracy of Egypt—were able to indulge in.

4. That this freedom of opinion produced an extraordinary developement of human powers, seeing that the names of Homer, Pythagoras, Æschylus, Pindar, Zeuxis, Sophocles, Plato, Euripides, Phidias, Aristotle, Demosthenes, and others, are accounted the most illustrious of the human family, at this day.
5. That the military power of the Romans, ended by extinguishing their freedom, and brought about the ruin of letters and the arts; that anarchy, having left to men no motive of action, but individual preservation, all love of country became extinct; and Rome, once the mistress of the world, fell, without dignity, before hordes of undisciplined barbarians.
6. That notwithstanding the learning of the ancients had nearly become a victim to the fanaticism of the early professors of christianity, still we are indebted to the monasteries for the preservation—in the darkest days of Europe—for what we now possess of it.
7. That we are greatly indebted to the Mahometans—a people whose name has been a reproach in the ears of christians—for the revival of human learning.
8. That nations, like individuals, are weak in proportion as they are ignorant, and that their memories are most honoured, when they have advanced the arts and sciences.
9. That when nations give themselves up to obscure dogmas, and speculative reasonings; when they reason from the unknown to the known, nature is a sealed book, and God is unseen of them.

Lastly, We know from our own experience, that the mechanical arts most minister to the enjoyment of men, when nature and nature's laws, are most studied by them; and that in that study there is more exquisite enjoyment than in any other occupation, seeing that the human mind is exceedingly elevated, in the contemplation of the power, and wisdom, of the Author of creation.

To these conclusions we should add with regret, if the dawn of a better state of things were not rising, that at a period when the most arbitrary government in Europe is cultivating astronomy with the most brilliant success, *there is not a single Public Observatory in the United States of America:* and whilst geology and other branches of natural history, are cherished and taught in every public institution, devoted to education, in Europe; there is not, as far as we are informed—with one exception—an officiating professor of these attractive and useful branches of knowledge, in any of the universities or colleges of this country.

(*To be continued.*)

NOTICES OF BIG-BONE LICK,

Including the various explorations that have been made there, the animals to which the remains belong, and the quantity that has been found of each; with a particular account of the great collection of bones discovered in September, 1830. By WILLIAM COOPER, member of the Lyceum of Natural History of New York, of the Academy of Natural Sciences of Philadelphia, the Zoological Society of London, &c.

(*Continued from page* 174.)

THE six species of animals, of whose remains the preceding catalogue has been given, comprise all of those, found at Big-bone Lick, that in my judgment have a well established claim to be considered fossil, either as being now extinct, entirely, or under the same latitudes, or because they are found associated with the extinct species.

How many individuals there must have been, to have furnished these remains, is an inquiry, not only curious in itself, but which bears upon some speculations regarding the phenomena of their accumulation. Although it can no longer be precisely determined, some approximation may still be made. With this view, I have attempted an estimate from the following data:

The total number of grinders possessed by the mastodon from infancy to old age, as I have elsewhere shown, was twenty-four; of which there were sixteen with three or more pairs of points.

The greatest number of those existing together in the head, and, though not in use, sufficiently ossified to be preserved fossil, was twelve.

The number existing and in use at the maturity of the species, was eight.

At last in old age there remained but four, as in the Elephant.

Supposing each individual to have been of mature age, neither very old, nor very young, (though examples of both have cocurred here, and may balance each other,) the fair average number of grinders to be allowed him, is, therefore, eight.

The whole number of teeth in the Finnell collection with not less than three pairs of points, is, including those in the jaws ninety-four; which, with twenty-six similar, brought by me from the same place, makes one hundred and twenty. This, divided by eight, gives fifteen as the least number of individuals that could have furnished the teeth, contained in these two collections alone.

To these are to be added, all that have been removed by Harrison, Goforth, Clarke, Bullock, the citizens of Cincinnati, and very many others; besides some, that, it is to be presumed, still remain in the bed.* If six or seven times the number are allowed for all these, it would certainly not exceed the probability. In fact I should be more inclined to say ten or twenty times as many; and were big-Bone Lick on the top of a mountain, we might be tempted to think, that the whole race had retreated hither, to escape some general inundation.

The number of individual elephants, might be conjectured in the same manner. They appear to have been to the mastodon, about as one to five. The smaller quadrupeds are probably fewer than might have been obtained, if more care had been used to collect and preserve them. In the following table, which is intended chiefly to show the proportions the several species appear to bear to each other, I have put down no more of these, than are known to have been found.

SPECIES.	NO. OF INDIVIDUALS.
Mastodon maximus,	100
Elephas primigenius,	20
Megalonyx Jeffersonii,	1
Bos bombifrons	2
—— *Pallasii,*	1
Cervus americanus,	2

It is true that the remains of several other animals besides those just enumerated, occur abundantly at Big-bone Lick; and

* Mr. Bullock, however, who has been at much pains and expense to determine this, is of opinion "that all the strata near the Salt Lick of Big Bone, that contain animal remains have been examined." See letter to Mr. Featherstonhaugh.

I have myself, collected the bones of three or four more at this place; the horse, the bear, the buffalo, and two or three species of deer, have been recorded among the fossil animals. But none of these appear to me to merit that epithet in the geological sense of the word.

Except the first, they are all animals indigenous to the country, and there would be nothing surprising in finding their bones near the surface, or even, sometimes, at the depth of several feet, when it is recollected how often the ground has been disturbed by repeated diggings. Bear's bones from this locality, I have never seen, nor indeed of any carnivorous animal, which I consider a remarkable circumstance. Antlers, jaws, and other remains of Cervus canadensis, C. virginianus, C. alces, and perhaps C. tarandus, are not very rare. I think I have observed among the collections made at Big-bone Lick, traces of each of these. But they bear no proportion to those of the buffalo, whose bones are dispersed through the alluvial soil, or strewn over the surface in great abundance. The buffalo in modern times, as perhaps the mastodon in past ages, seems to have nearly monopolized this favourite haunt to himself. With the horse, the case is different, inasmuch as this animal is generally believed not to have been an aboriginal inhabitant of this continent.* But it is not at all necessary to suppose that he was so, to account for the simple circumstance of finding a few of his bones at this place. Within a few yards of the spot where the excavations of last September were made, are the vestiges of a fort, and several wells, the work of the first settlers of Kentucky, about forty or fifty years ago. They doubtless brought horses with them, some of which may have died here, and their bones might easily have become more or less covered with earth in a place where wells were dug, and the ground tilled, as it has been here, for many years past. Nothing in regard to this point can be argued from the state of preservation of any remains found at Big-bone Lick. I have now before me a tooth of a megalonyx found here, apparently as sound and fresh as any of the recent horse or buffalo.

If any well identified remains of the horse had been found associated in the same bed, with those of the extinct animals, in spots well known not to have been previously disturbed, we could not refuse to admit their equal antiquity with the rest. But I do

* Our author will find many individuals, entertaining a different opinion.—Ed.

not think that this point has been sufficiently made out. I saw nothing in support of it myself, nor have I met with any person who could answer for such a fact, from his own careful observation. In the case of those recently exhibited in this city, one of the proprietors who assisted in disinterring them, acknowledged to me, that the horses' bones were generally near the surface, although part of a skull was found at the depth of twelve or fifteen feet; but that they were all separated from the great bones, which lay at the depth of twenty two feet, and *in a different kind of soil.* Mr. Bullock, it is true, states that "the bones of the horse were found at various depths, from five to twenty feet, indiscriminately with the other bones."

When the report printed in the first number of this Journal was presented to the Lyceum of New York, I was inclined to a different opinion, having been led to suppose that all the bones and teeth exhibited as fossil, had been found lying promiscuously together. But finding, upon stricter inquiry, that this was not the case, and that part at least of those belonging to the horse were undoubtedly recent, I consider it best to wait for more certain evidence before admitting the existence of an ancient race of this genus upon our continent. It is not a new thing, however, to hear of fossil remains of horses in this country. The first printed notice of them, as far as I am aware, is contained in Mitchill's "Catalogue of Organic Remains," pp. 7 and 8. They consist of a vertebra and several teeth found in New Jersey. In the collection of the Lyceum are likewise others, represented as fossil, from other American localities, but I know not upon what evidence.

On the Position of the Organic Remains at Big-bone Lick.

Nearly in the centre of the valley in which the great bone licks are situated, as may be seen by the map,* is a fountain, called by the inhabitants the Gum Spring. It is the most copious, and the most distinguished for the peculiar properties of its waters of all that the valley contains. Opposite to this is a small island, formed by the division of one of the two principal branches of Big-bone creek, at its north-east point, one arm passing by the great spring, where it unites with the other branch, while the main body continues round the south side of the island, at the

* See pl. 5, vol. I. No. 4, Monthly Journal of Geology, &c.

south-west point of which they all unite their waters to form Big-bone creek.

The fossil bones have all been found on the east and south-east sides of the Gum Spring, either along the western branch of the creek, about the point opposite the spring, or on the island; but always, except in a very few instances, within fifty or sixty yards of this spring. Within so small an area has been gathered the extraordinary quantity of which I have endeavoured to convey some idea in the preceding pages. Many excavations have been made in other parts of the valley, some in search of bones and others for salt water. At what is called the Big Lick, where a number of lime springs form a small miry spot like that at the Gum Spring, and about one hundred and fifty yards from it, a well has even been dug, and the soil examined to the depth of twenty-five or thirty feet, without any bones being met with. Yet here there would be the greatest probability of finding them if any where besides the spot described.

It appears from various accounts, that at the period of the first settlement of the country the great bones were either lying on the surface of the ground, or so near it as to be obtained with very little labour. It is even said that they were so numerous on the surface about fifty years ago, that a person might walk over the lick by stepping from one to another, without touching the ground.

Croghan gives the following short description of this place as he found it about twenty years previous to the occupation of the country by the whites. It is extracted from his manuscript journal of a voyage down the Ohio, now in the possession of Mr. Featherstonhaugh.

"30th, (May 1765.) We passed the great Miami river about 30 miles from the little river of that name, and in the evening arrived at the place where the elephants' bones are found, where we encamped, intending to take a view of the place next morning. This day we came about 70 miles.

"31st. Early in the morning we went to the great lick where these bones are only found, about four miles from the river on the south-east side. In our way we passed through a fine timbered clear wood. We came to a road which the buffaloes have beaten, spacious enough for two wagons to go abreast, and leading straight into the lick. It appears that there are vast quantities of these bones lying five or six feet under ground, which we discovered in the bank at the edge of the lick. We found here two tusks above six feet long, we carried one, with some other bones, to our boats and set off. This day we proceeded down the river about 80 miles."

According to General Collaud, as quoted by Cuvier, the bones lay about four feet deep. General Harrison and Governor Clarke have never given any information on this head that I am aware of.

Goforth relates, " we dug through several layers of small bones in a stiff blue clay, such as deer, elk, buffalo and bear, in great numbers, many much broken, below which was a stratum of gravel and salt water, in which we found the large bones, some nearly eleven feet deep in the ground, though they were also found on the surface."

So recently as the summer of 1828, when I visted this place, bones of the larger animals were still to be found close to the surface, or in the bed of the stream near the great spring. Some of these, it was evident, had been previously disturbed, and therefore no longer occupied their ancient position. But some teeth which I obtained were so large and so finely preserved, that they certainly would not have been left if they had been sooner discovered. These lay in a very low place, within less than two feet of the surface, and near the edge of the stream on the east of the Gum Spring.

The bones discovered in 1830, by Messrs. Finnell and Bullock, were found under somewhat different circumstances from those just described. The following particulars, gathered from one of the proprietors who was present at their disinterment, and corroborated by the letters of Mr. Bullock, may be relied on.

They were procured on the north side of the island, a little east of the great spring, and about fifty or sixty yards from it. The pit or well, originally dug by Mr. Finnell, was nine feet wide and about twenty-five deep. Mr. Bullock, thinking Mr. Finnell had not thoroughly examined it, afterwards re-opened and enlarged it in width and depth, and found many bones; all, however, on the same level, and none deeper. The great bones were first met with at the depth of twenty-two feet, lying in a bed of about three feet in thickness. The two great heads of mastodon, and the large elephants' head found by Mr. Bullock, were lying near together. Below them, were three of the large tusks, and intermingled with all these a large quantity of teeth and bones, of various animals. "They altogether formed," says Mr. Bullock, "a heterogeneous mass, lying horizontally, mixed with angular and waterworn pieces of limestone of various sizes, which contain marine shells, and rounded specimens of quartzose and other pebbles, as well as fragments of cane, small, unknown to me, and also fragments of broken fresh-water shells, much resembling those now living in the neighbourhood." I have been moreover informed, that immediately beneath the great bones, the workmen came to a bed of stiff blue clay, in which, except at its surface, no bones were found. This agrees with my own observations and all the accounts I have heard, except Goforth's, according to whom, the great bones were partly found beneath the blue clay. I saw, it is true, the entire skeleton of a buffalo, with part of two others, dug out of the blue clay, where it is found immediately at the surface. But there were no remains of the extinct animals, either with these or under the clay, which I saw penetrated down to a dry stony layer of a kind of marl. The buffaloes appeared to have sunk or been trampled into the clay, while soft from the effects of rain or floods.

The great inequality of the ground near the spring, is the principal cause why some were obliged to dig twenty-two feet before finding bones of the large species, while others met with them at eleven, four, two feet, or even less. The surface of the island, for example, is much higher than that of the point, on the north of it; and this, than the bed of the stream; so that by digging two feet in one place, we would reach the same level that we would by digging twenty feet, not many yards further off.

The position of the bones, fossil and recent, such as I have determined it from the comparison of the foregoing accounts, with my own observations made at the place, shall be now described.

The substratum of the neighbouring country, is a limestone, abounding in organic remains. This appears at the surface on the sides and tops of the hills, and along the banks of the great rivers. From it must have been derived the fragments mentioned in Mr. Bullock's account, as found accompanying the great bones. But at this lick, the valley is filled up to the depth of not less, generally, than thirty feet, with unconsolidated beds of earth of various kinds. The uppermost of these consists of a light yellow clay, which, apparently, is no more than the soil brought down from the higher grounds, by rains and land floods. In this yellow earth are found, along the water courses, at various depths, the bones of buffaloes and other modern animals, many broken, but often quite entire.

Beneath this alluvial bed, is another thinner layer of a different kind of soil, presenting much of the character of a sediment, from a marsh or river. It is more gravelly, darker colored, softer, and contains remains of reedy plants, smaller than the cane so abundant in some parts of Kentucky, and shells of fresh water mollusca. It appears to be, in short, what is meant by diluvium, as distinguished from the alluvium, which forms the bed above it.* In this layer, resting upon, and sometimes partially imbedded in a stratum of blue clay of a very compact and tenacious kind, are deposited the bones of the extinct species. Originally near the surface, they have been gradually covered by the accumulation of alluvial matter above them.

The depth of this alluvium is, however, variable. In some places it is very thin, and in others is liable to be entirely washed away by the inundations which are common here at some seasons of the year. When this takes place, the blue clay is left bare, and the bones exposed on the surface. It is in such situations, and along the banks and bed of the streams, that they have been found nearly or quite uncovered. The Gum Spring, as may be seen by the map, is in the lowest part of the valley, near where the torrents from the surrounding hills meet, before they find a common outlet. The eastern branch of the stream, a few years ago, forced itself a new channel on the north side, of what thereby became the island, and united with the western, opposite the spring, instead of their former confluence at the south-western point. In this new channel I found several finely preserved teeth and bones of the extinct animals.

The side of the island which forms the south bank of the stream, opposite the spring, is steep, and much elevated above the surface on the other side, the yellow alluvial soil having accumulated to a great height. Consequently, the bones which were found here in 1830, were deeply buried, as has been de-

* The difference between it and the upper layer is so obvious, even to the workmen, who have been employed in digging here, that they have, with propriety, denominated it, the "bone soil;" and this distinction is recognised whenever they meet with it, even in places where it does not contain bones.

scribed, but were, notwithstanding, on a level with those previously obtained in the low grounds to the north of them.

On the Theory of Big-bone Lick.

It is natural, at the first view, to suppose that the herds of elephants and mastodons were attracted hither by the salt, which they probably found as agreeable a condiment as the modern herbivorous animals; and that, like many of these, they died at the spot where their remains have been discovered. Such is the opinion of the present inhabitants, as well as of most persons who visit the place; the sound condition of the bones, being naturally attributed to the antiseptic properties of the water of the adjacent springs. There can be no doubt of the conservative quality of these; and it is highly probable that without it, the bones would scarcely have remained till now so free from decay as we find them. But they might easily have been preserved, at least for a considerable period, like those of which so many instances have occurred both in Europe and America, without this aid. Moreover, it may be well doubted whether these salt springs formerly existed here. Bones are not always found at salt licks, even in Kentucky. There have been other instances besides this; but the exceptions are, I believe, much more numerous. In New York I have never heard of fossil bones being discovered at Onondaga, or any other of the numerous salines of this state; although not at too great a distance from the Wallkill, where these relics abound, to have been beyond the range of the same animals.*

At the same time, however, I can readily admit, that they inhabited the neighbouring country, and that a few, perhaps, were at the spot, or dispersed through the surrounding woods and marshes, when the catastrophe occurred, which seems to have extinguished their race.

Some of the appearances which the bones exhibit, have been alluded to in the course of our previous descriptions; very few, indeed, if any, even of the smallest, were found without some mark of their having been subjected to violent action. Unlike those of which so many have been discovered in New York and

* Part of an elephant's tooth, preserved in the Museum of the Albany Institute, and said to have been found somewhere along the line of the Erie canal, is the only instance within my knowledge of fossil remains of these animals from that part of our state.

New Jersey, where the animals seem to have perished quietly on the spot where their remains are found, the parts belonging to each individual lying near each other, and sometimes entire skeletons without a bone displaced,* the frames of those found at Big-bone Lick, seem rather to have been torn asunder, and intermixed in the most promiscuous disorder, before they were permitted to find here a place of rest. It is rare to meet with a single bone of the large animals, or of those smaller ones, that accompany them, that is not more or less bruised or broken. Of all the under jaws brought from this place, I have seen but one, in which at least one side was not wanting; and in this the teeth were all gone. This cannot be ascribed to brittleness from decay; for, as is well known, the bones found here are remarkably hard and solid. Still they are much less entire than those found in the state of New York, whose texture is generally impaired by decomposition. Some of those, which I collected at Big-bone Lick, have their cancelli entirely filled with stony matter, by which their weight and hardness are much increased. But generally, they look like fresh bones; and the fact of their retaining gelatine, which I have verified, is well known.

Mr. Bullock says, in his account of those discovered last year, which were too deeply buried to leave room to suspect that they had been ever before disturbed, since they were brought to the spot where he found them, "many of the bones are much waterworn and broken; scarcely any that are not so, more or less. Some large fragments of the tusks of the elephant are worn quite flat and smooth, as if they had lain half buried in a water course, and worn down by the action from above." In fact, the mere circumstance of finding so large a number of detached teeth as has been often found, lying together within a small compass, is alone sufficient to prove that the owners did not perish where these lie. In that case, the teeth would have remained in the respective heads, and have, consequently, occupied a much larger space. The teeth of buffaloes, which there is every reason to believe died from time to time at or near the spot, are never met with in heads separated from the bones, as is the case with those of the elephant and mastodon.

It has been attempted to account for the heaping up of the bones and teeth found last autumn, which it is said formed a sort

* See Annals, Lyceum of N. Y. vol. I. p. 143.

of pyramid, with three great tusks encircling its base, and surmounted by the great head discovered by Mr. Finnell, by ascribing it to the aborigines, who, it was supposed, may have amused themselves by piling them up in this manner. In that case, it must have been done in some very remote age, to allow time for two distinct beds of soil to have accumulated over them to the height of twenty-five feet, and in a place where these operations are carried on upon so small a scale. But some allowance must be made for the effects of the imagination in those who thought they saw such appearances of order in this ancient charnel house, which, if it really existed, it would be difficult to verify under such circumstances.

Similar heaps of fossil bones of elephants and other extinct animals, have been discovered, in several parts of Europe, though it has not been pretended, that they were brought together in this manner. Indeed the human race has been supposed, not to have inhabited the same countries at the epoch of the deposition of these bones. One instance occurred at Selburg, near Canstadt on the Necker, in 1816, where was discovered "a group of thirteen tusks and some molar teeth, of elephants, heaped close upon each other, as if they had been packed artificially."* Another was at Thiede in Brunswick, in the same year, where a congeries of tusks, teeth, and bones, belonging to the elephant, rhinoceros, horse, ox, and stag, was found in a heap, of ten feet square. There were no less than eleven tusks of elephants, some being of the largest size ever discovered. The appearances they presented, as described by Dr. Buckland, were altogether so strikingly similar to those observed in the pit dug at Big-bone Lick, that it is no more than reasonable to ascribe them to the same cause.

But, at the same time, that we find so much reason to suppose that the great bones, as well as those of the other extinct species, have been brought hither, since the death of the animals, and probably by the agency of water, it does not seem probable that they have been transported from a very great distance. Most of the appearances they afford, seem to indicate sudden and violent, but not long continued action. Even the thickest and strongest bones are found, broken short off into several truncheons, but the edges and angles of the fractures are commonly sharp, and not rounded, as much rotting would have made them. The

* Buckland Relig. Diluv. p. 180.

grinders are found entire, with broken, but undecayed portions of bone entangled between their roots. Such as appear rubbed, or waterworn, may be those that have been washed out of their ancient bed, in modern times, or may have been the remains of individuals that died before the general destruction. The laterally worn tusks, already described, perhaps belonged to some of these; and this abrasion may have been slowly effected, before the comminution of the others took place, and by different means. If, during some general inundation, a whirlpool had formed in this valley, from which, after much violent collision, these bones were deposited, the heads, teeth, and tusks, and other hard and heavy parts settling down together, where is now the great spring, many of the remarkable circumstances we have noted, would be explained. Dr. Buckland, in endeavouring to account for the similar accumulations of various teeth, and bones found in Germany, says "they were most probably drifted together by eddies, in the diluvian waters."* I had not observed this passage, when I was led to account in the same manner, for the pile at Big-bone Lick; which I mention, merely to show how naturally this idea suggests itself.

I do not venture to say any thing with regard to the period at which this event may be supposed to have taken place. The natural phenomena do not furnish data sufficient to enable us to fix upon this with any degree of precision. I will merely observe, that it must be referred as far back as we can conceive it possible for animal substances to be preserved under the circumstances described.

Enough has been established, however, to authorize us to conclude, that the region which borders the Ohio was formerly inhabited by different animals from those which have peopled it from the earliest times of which we possess any account.

Two of these, the mastodon and megalonyx, belonged to genera now unknown, but having much affinity to some that still inhabit the torrid zone. The former, though allied to the elephants, was materially different in the teeth and some other particulars, indicating a considerable difference in habits. The other was allied to the sloths, and their co-ordinate genera, but was greatly superior in size to any species now living.

Buckland p. 181.

A third belonged to a very natural genus, of which two species exist in the warm regions of the old continent; but this was specifically different from both, and, as regards America, the genus even is entirely extinct.

There were likewise others which belong to the same genera with some now naturally inhabitants of the same region. These are two species of bos, and one of cervus.

There is no evidence of any animals of the carnivorous order having accompanied them.

They appear to have perished by the agency of water, which, after transporting their remains a moderate distance, deposited them in a mass where they have since been found.

They were succeeded, after an interval, by the species which now inhabit the country.

DESCRIPTION OF VESPERTILIO AUDUBONI, A NEW SPECIES OF BAT.

By Richard Harlan, M. D.

Of the numerous creatures which attract our admiration, or excite our fears, the greater part display their appetites, or develope their instincts, during the day time only; especially—with few exceptions—all those remarkable for beauty of plumage, and vocal melody. Predacious animals are chiefly distinguished for their nocturnal habits; and ideas of rapine, terror and blood, are ever associated with the tiger, the hyena, and the wolf. Among the feathered tribes, the *owl* and the *bat*, also companions of darkness, are shunned by many, as horrible objects, and full of ill-omen. Haunted castles, ruined battlements, and noisome caverns, are the chosen abodes of these nocturnal marauders, and it is to such associations that these animals are indebted for the unamiable character they have obtained. The prejudices conceived against that portion of these animals, with which we are familiar, are founded entirely upon these their habits; for small quadrupeds, reptiles and fish, constitute the food of the first, whilst insects and fruit suffice for the other. It is at the close of the day, when the hum of nature is beginning to subside, that the patient *bat* steals from his dark retreat, and spreads his leathery wings in search of his food.

The new species of this little flying quadruped, which we are now about to notice, belongs to a very large and respectable family. In the days of Linnæus, they all—from their appearance at twilight—went by the family name of *Vespertilio.* They further belong to the order *Carnivora,* their teeth being constructed for masticating flesh; though some—and in this they resemble ourselves—are also fond of fruit. In one important point, the whole race has a common character, in their organ of flight. The bones of the fingers are extremely elongated, and united by a membrane, which is continued down the side of the body; and extending on the leg as far as the tarsus, also unites the legs and tail. Agreeing so universally in this particular, they form a very natural family, under the appropriate term, Cheiroptera, constructed from two Greek words, signifying *hand and wing.*

The vespertilio are again divided into Genera and *Species,*—divisions which are grounded on certain peculiarities of dental structure, and various developements of the brachial, digital, and interfemoral appendages, with other modifications of the organs of progression. These genera include species which are discovered in every habitable part of the globe, of various magnitudes, from the size of a half grown cat, to that of a half grown mouse.

Of this numerous family only three genera, of modern authors, inhabit the United States, viz. Rhinopoma, Vespertilio, and Taphozous. Seven species, exclusive of the present, are all that have been hitherto discovered in North America.

The following concise notice of the species, at present known to inhabit the United States, is offered by way of comparison:

Genus.—Rhinopoma.—Superior incisors, separate from each other; nose, long, surmounted by a membrane; tail, long, enveloped at base.

Species 1st. *R. Caroliniensis,* (Geoffroy, or Vespertilio of Linneus.)
Is recognized by its brown pelage, and long and thick tail; it is two inches in length, of which the tail occupies more than one inch; the inferior half of the tail, free of the interfemoral membrane.—Inhabits South Carolina, according to Geoffroy.

Genus.—Vespertilio—(Linn. Cuv. Geoff.)—Dental formula, various; superior incisors generally separated into pairs; nose and lower lip, simple; wing membranes, extensive.

Species 2d. *V. Caroliniensis.*—Geoff. Ann. du. Mus. d'Hist. Nat. tom. 8, pl. 47.

This species is of a chesnut brown colour above, and yellowish beneath—the ears are simple, oblong, and of the size of the head, with their exterior surface sparsely hairy; auriculum cordiform; extreme point of the tail free. Inhabits the vicinity of Charleston, S. C.

Species 3d. *V. Noveboracensis.*—Penn. Synop. p. 367, Linn. Vulgo, *New York Bat.*

Characterized by its short and rounded ears.—Nose, short and pointed; pelage, brown above, pale beneath; a white spot at the base of the wings; tail, wholly enveloped in the interfemoral membrane; total length, tail inclusive, two inches five tenths; spread of the wings, ten inches. Inhabit New York and neighbouring states. A living specimen lately presented to us, taken near Camden, New Jersey.

Species 4th. *V. Pruinosus,* Say.—Vide Long's Exp. to the Rocky Mountains, Vol. 1, p. 167.

Mr. T. Say who noticed this species, when on the exploring expedition under Lieut. Col. (then Major) S. H. Long, has thus distinguished it:—ears broad, not so long as the head, hairy on their external side, more than half their length; auriculum, obtuse at tip, and arcuated; pelage, hairy above, ferruginous about the sacrum, dull yellowish white on the throat: interfemoral membrane covered with fur; length, nearly four inches and a half. Inhabits the western states, and western Pennsylvania.

Species 5th. *V. Arquatus,* Say.—Long's Exp. ut supra.

Head, large; ears, rather shorter, with the posterior edge obtusely emarginated; auriculum arcuated; interfemoral membrane naked, including the tail to one half the penultimate joint; total length, five inches; expansion of wings, thirteen inches. Inhabits the western states.

Species 6th. *V. Subulatus,* Say.—Long's Exp. Vol. 2, p. 65.

This species is the nearest allied to the Vespertilio Caroliniensis, of Geoffroy, from which, however, it differs in colour, form of the auriculum, and in other particulars. Mr. Say observed it in the distant territories. A specimen was subsequently presented to the Academy of Natural Science, from the White mountains, New Hampshire.

Genus.—Taphozous—(Geoff.)—Without incisor teeth in the upper jaw. Nose, simple; upper lip, very thick; ears, moderate.

Species 7th. *T. Rufus.* Figured in Wilson's Ornithology, Vol. vi.
Red Bat of Pennsylvania.

With this little animal we are all familiar. The city and its vicinity abound in them. The body is of a reddish cream colour; membranes of a dusky red; auricule slender, rounded at the extremity, and situated internally. Total length four inches; spread of the wings twelve inches.

Like other vespertilio, they enjoy the crepusculum, and are fond of insects, which they seize on the wing. The female has been known to manifest the strongest maternal affection; a young lad having caught two young bats of this species, was in the act of bearing them off to the Philadelphia Museum, at mid-day;—being watched by the mother, she followed him through the streets, fluttering round him, and eventually settled on his bosom, preferring captivity, to freedom with the loss of her progeny.

Species 8th.—Vespertilio *Auduboni.*—Pl. 6.

We propose to dedicate this new species, to our valuable friend, the justly celebrated naturalist J. J. Audubon, as a small tribute of respect to his eminent talents, and the highly important services he has rendered science. The drawing which accompanies this paper, is from his inimitable pencil.

This species was first observed, during the summer of 1829, when an individual female flew into the apartment of the late Dr. Hammersly, then one of the resident physicians of the Pennsylvania hospital: on the subsequent evening a male individual, of the same species, was also taken in the same manner. In August 1830, a very fine specimen was brought to the Academy of Natural Sciences, and Mr. Audubon informs me that the species has very recently been observed in New York.

Natural characters of the species.—General colour black, sprinkled with gray above and beneath; ears black and naked; auriculum, short and broad or obtusely triangular; interfemoral membrane, sparsely hairy; last joint of the tail free: two incisors, with notched crowns, on each side of the canine teeth of the upper jaw, with a broad intervening space without teeth.

Dimensions—Total length 3 inches 7 tenths; tail 1.7; length of ear 0.5 breadth of ear 0.4; length of leg 1.7; spread of wings 10.7. inhabit Pennsylvania and New York, and probably the southern states–Cab. of Acad. Nat. Sc. Philad.

HABIT OF CLIMBING OF THE RATTLE-SNAKE.

Extract of a letter, from COL. ABERT, of the U. S. Topographical Engineers, to DR. HARLAN, of Philadelphia.

I HAVE, within a few days, had the pleasure of conversing with your friend, the distinguished ornithologist, Mr. John James Audubon, a gentleman whose fame and enterprise, seem at present to occupy the anxious solicitude of both Europe and America; each of which countries appears to rival the other, by distinguishing him with academic honours. And if our country cannot claim the merit of having taken the lead in this honourable struggle, it can at least claim that of hailing Mr. Audubon as a citizen, and a native, and of furnishing him with those objects which appear so early to have attracted his attention and study; and upon which his glowing and unrivalled pencil has bestowed so enduring a life.

His enthusiasm in the pursuit of his favourite study, has led him to plan a new expedition into the hitherto unexplored regions of our continent; and his object in visiting our city, was to obtain letters of hospitality and protection, to all our frontier establishments. It gives me great pleasure to say, that he has met with the most kind and patronising reception; and that all the high functionaries of our government, animated by that zeal in favour of the sciences which distinguishes intelligent minds, have readily, and with pleasure, afforded to him the letters and papers of protection which he required.

He gratified us with a view of the truly splendid illustrations of American birds, which compose his first volume of plates, and left us yesterday morning, in order to prosecute his hazardous and interesting enterprise.

His plan is first to examine the peninsula of Florida; then the regions west of the Mississippi, Mexico, and, if possible, to penetrate into California. He also contemplates crossing the Rocky mountains, and pursuing the Columbia river to its mouth, and thinks that he will be absent from us about two years. He is full of the most interesting anecdotes of the habits of animals, the result of his personal observations, when alone and in the wilderness, where undisturbed nature is found in all her grandeur, simplicity, and originality. I urged him to give these to the public, in the course of his publications: he said that he probably might, but that city naturalists were so unused to observing the habits of animals, where alone they could be observed to advantage, that he must yet wait, till some other adventurer had witnessed similar scenes. But how few are there, who, to the necessary enterprise, add qualifications requisite for such pursuits, and how long may we not, therefore, wait for such corroboration. I hope he will yet abandon this feeling of delicacy, and in his concluding volume, enrich our knowledge of animals by the many interesting facts of their habits, which he has on record. With so intelligent a mind, controlled by sound judgment and great moral and physical courage, it appears to me an injustice to our own understanding, to doubt the anecdotes which he relates of his own observation. I would as soon think of doubting the existence of the new birds he delineates, because he has not done what was impossible for him to do under the circumstances in which he was placed—preserved their skins, and deposited them in our museums.

Now, I have been informed, that some of our learned city gentlemen, have doubted the truth of his representation of the rattle-snake attacking a mocking-bird's nest, from an opinion that the rattle-snake does not climb. An opinion, by the way, more common in our cities, than with the hunters in the wilds, in which this reptile is generally found.

But as I am possessed of some facts on this subject, which prove that the rattle-snake does climb, I will, in justice to Mr. Audubon, relate them to you.

1st. When Lieut. Swift of our army, was engaged on a survey in Florida, in 1826; his attention was suddenly called to a group of his men, within about 100 feet from where he stood. They had just killed a snake, which the men assured him, they had seen seize a grey-squirrel on the limb of a tree, about fifteen feet from the ground, and fall to the earth with it. When Lieut. Swift had arrived at the place, the snake was already killed, and much mangled. He did not examine it for the rattles, but his Florida hunters, who are as familiar with the appearance of the rattle-snake, as we are with that of the chicken, told him, that it was a rattle-snake.

2d. General Jessup, the Quarter-Master General of our army, assured me in conversation a day or two since, that he had seen the rattle-snake upon bushes, and particularly stated one case, in which he had seen a snake of that kind up a papaw* tree. He also added, that in one of his excursions in the woods of the west, he had actually witnessed a scene similar to that represented by Mr. Audubon, of birds defending their nests against a snake. But he does not recollect whether in this instance, it was a rattle-snake or not.

3d. General Gibson, the Commissary General of our army, has also assured me that he has seen the rattle-snake upon bushes, and upon the top rail of fences. He likewise stated a case in which he saw a rattle-snake in the fork of a tree, about eight feet from the ground, coiled and at rest. The tree stood by itself, and the diameter of its trunk was upwards of one foot. He knocked the snake out of the fork and killed it.

I could cite many other cases, but I prefer limiting myself to these, as I am personally acquainted with the gentlemen named, and received the stories from their own mouths.

Now after these facts, I cannot suppose that any reasonable man will doubt the ability of the rattle-snake to climb. Both generals Jessup and Gibson are well acquainted with this snake, are good observers, and fond of the woods. The latter particularly so, being now one of our most expert sportsmen, and has been during his life, stationed in almost every state of our union. He is also particularly attentive to the habits of the animals, which in the course of his amusement, he seeks either to obtain or to avoid. I have been often delighted with his anecdotes on these subjects, and have more than once made the reflection, of how much information might be obtained by the naturalist if he would consult the intelligent and observing sportsman. In fact, if the naturalist does not, at times, make the dog his companion, and the woods his home, there are many of the works of nature which will be to him as a sealed book.

Washington, Oct. 21, 1831.

* Porcella Triloba.—Ed.

METEOROLOGICAL OBSERVATIONS.

Kept at Wilmington, Del., by Henry Gibbons, M. D. with Prefatory Remarks.

Meteorology, is a branch of science, which, hitherto, in this country, has not received its proper share of attention. It is true, that many observations on temperature, and the incidents of the weather, are daily made and published; but the task of the observer mostly ends with the mere collection of those facts. In this, as in other departments of Natural Science, facts are principally useful as they lead to inferences—to *principles.* We should not only gather them with industry and precision, but we should arrange and compare them, so as to exhibit, as nearly as possible, their relation to each other, and draw from them every corollary which is consistent with sound reasoning. For example, I find, by examining the register of the weather, so as to ascertain the relation between electrical phenomena and the weight of the atmosphere, that a thundergust seldom occurs, unless the barometer has sunk below a certain point. I also discover, that an aurora borealis is mostly followed, within a week, by easterly winds, and very frequently by a storm from the same quarter. I further observe, that this phenomenon was exhibited thirteen times in the summer and autumn of 1830, but only five times in the corresponding seasons of the present year. From this, I infer that the frequent or rarer appearance of the northern lights, may possibly furnish some index of the severity or mildness of the subsequent winter.—Were the considerations I have presented, carefully kept in view, the science of meteorology might become extremely useful, in its application to the foretelling of atmospheric changes.

So far as I have had an opportunity of examining, the greater part of the tables of temperature, contained in the public journals of the United States, at least of the middle states, are more or less deficient or erroneous, owing to an improper situation of the thermometer, from which the observations are taken, the improper time of making the observations, or some other cause. Very generally, these tables exhibit an annual temperature, several degrees higher than the correct average. The thermometer is probably suspended where there is not a free circulation of air, or in a place exposed to the reflected rays of the sun. Hence we often find in the newspapers accounts of temperature exceeding 100° of Fahrenheit; whereas, the real temperature of the climate of the northern and middle states, seldom, if ever, reaches 98°. Experience has shown that the mean temperature of the day, is very nearly ascertained by taking the mean of two observations, the one made at sun-rise, which is the coolest period, and the other at noon, or rather an hour or two after, which is the warmest period. This plan will be adopted in finding the monthly mean given in the following tables, or monthly summaries. The observation taken in the evening, will, therefore, not be used in estimating the general average.

In regard to the winds, I have deviated from the common practice of classing them merely according to their direction, choosing rather to arrange them with reference to their general character. The first class, called *Northerly*, comprises such winds as flow from between the W. N. W., and N. N. E. points of the horizon, including those two points. They have always the same general character, being dry, and in the winter, cold. The second class, *Easterly*, embraces those which set in from N. E. to S. S. E. inclusive, which are damp, and often rainy and attended with storms. The other class, *Southerly*, consists of southerly and westerly winds, always warm, and in the summer dry, but accompanied with rain in the winter.

The number of clear days in a month, does not always represent the proportion of clear weather in the same time; for many of the days not entirely clear, may have been partially so. Hence I have added the *proportion of clear weather* in each month, in which, such days as were partly clear have been regarded.—The remaining parts of the summary will explain themselves.

In order to commence with the beginning of a season, the month of June is first given, although the "Journal of Geology," &c. was not commenced until the next month. The sixth number of the Journal will contain three summaries, concluding with October, and each succeeding number will contain the summary for the second month preceding its publication. At the close of the year, a yearly summary will be furnished.

Meteorological Summary, for June, 1831.

Average at sun-rise,	*Thermom.*	64°.20	*Barom.*	29.89 inches.
" at mid-day,		79°.67		29.84 "
" at 10 P. M.		68°.60		29.84 "

Monthly average,	*Thermom.*	71°.93	*Barom.*	29.86 inches.
Maximum,		88°.		30.10 "
Minimum,		47°.		29.67 "
Range,		41°.		.43 "

Warmest day, (2nd) 79°. Coldest day, (24th) 57°.

Proportion of clear weather,	17 days.
" of cloudy "	13 "
Whole days clear,	14 "
Days on which rain fell,	7 "
Depth of rain,	2 inches.
Northerly winds prevailed,	6 days.
Easterly " "	10 "
Southerly, (S. to W.)	14 "

An aurora, on the 10th, followed by changeable weather, and easterly winds; a dry month; very warm at the commencement, then cool, warm again in the middle, and again cool in the latter part; winds light and variable; clouds electrified in the latter *half of the month;* no easterly storms.

Meteorological Summary, for July, 1831.

Average at sun-rise,	*Thermom.*	67°.13	*Barom.*	29.89 inches.
" at mid-day,		80°.35		29.85 "
" at 10 P. M.		69°.58		29.84 "
Monthly average,		73°.74		29.87 "
Maximum,		87°.		30.17 "
Minimum,		53°.		29.53 "
Range,		34°.		.64 "

Warmest day, (23d) 80°½. Coldest day, (11th) 61°.

Proportion of clear weather,	20 days.
" of cloudy "	11 "
Whole days clear,	16 "
Days on which rain fell,	13 "
Depth of rain,	12.07 inches.
Northerly winds prevailed,	9 days.
Easterly " "	6 "
Southerly, (S. to W.)	16 "

Auroras on the 4th, 5th, and 10th, followed by variable weather, and that on the 10th by easterly winds. A very brilliant one was seen in Massachusetts, on the 31st, but was not visible at Wilmington. A very wet month; rains heavy; nine inches fell on the first nine days; three inches fell on the ninth, in less than an hour, producing almost a deluge, and causing a higher fresh in the Brandywine than had been for twenty-five years, except the ice freshet of 1822; much grain injured by the continued damp weather. The first half of the month mostly cool, the remainder warm, though not *hot* weather. Winds generally light, and very changeable. Electrical clouds and thunder storms frequent; clouds nearly all electric. No easterly storms.

OBITUARY.

We intended before this to have paid a passing tribute to the departed worth we are now about to commemorate, and to have given a more extended and biographical notice, in two of the instances; but we have not, even at this moment, received the details requisite for our purpose. The recent decease of two well known friends to natural history, has reminded us of a duty, that we now, imperfectly, but most sincerely, perform.

The late Zaccheus Collins, one of the Vice Presidents of the American philosophical society, was born in Philadelphia, August 26, 1764. He was a member of the society of Friends, and married January 30, 1794. Mr. Collins's devotion to the general advancement of science, and especially to those important branches, botany, and mineralogy,—in which he was a conspicuous proficient,—was a leading cause of the diffusion of that love of natural science, which distinguishes his native city. He has, for this reason, always possessed the sincere and respectful attachment of all those who have cultivated natural history. But as a citizen, his claims to the public affection and confidence, rested upon a broader basis: for he took an interest in every thing that affected the welfare of our species, and was an active and a generous philanthropist. As an evidence of the universal estimation in which he was held, and of the honourable tenor of his life, we notice the following, from among the various benevolent and learned societies of which he was a member, and the period when he became their associate.

Pennsylvania society for promoting the abolition of slavery, October 1792.
Society for the institution and support of First day or Sunday schools, March 1795.
A life contributor to the Pennsylvania Hospital, March 1795.

A life contributor to the Philadelphia Dispensary, December 1802.
American Philosophical Society, July 1804.
Humane Society of Philadelphia, July 1805.
Philadelphia Society for promoting Agriculture, May 1805.
Pennsylvania Academy of Fine Arts, May 1809.
Academy of Natural Sciences, (Vice President at his death,) March 1815.
Honorary Member of the Lyceum of Natural History, New York, July 1817.
Honorary Member of the Massachusetts Horticultural Society, June 1829.
Chosen President of the Pennsylvania Horticultural Society, November 1828.

He died in Philadelphia, June 12th 1831, of paralysis.

Samuel Latham Mitchill, M. D. was, in every sense of the word, one of the most untiring friends that ever Natural History possessed in any country. We understand that his friend Dr. Ackerly, the depositary of his valuable papers, is preparing a biography of him, at the request of the Lyceum of Natural History of New York, of which he was the first President. His writings have been so various, and he has enriched with his papers so many periodicals, that at present we shall make no particular reference, except to his well known memoir, on the New York fishes. We know of no American scientific name that has been more extensively and advantageously diffused, both abroad and at home, than the name of Mitchill. We sincerely offer this slight tribute to his memory; it is due to the worth of one whom we knew well, and of whom it is impossible to think, without a lively remembrance of his truly amiable and benevolent character. He died on the 7th of September, at the city of New York, in the 68th year of his age.

Solomon W. Conrad, was a learned and much respected member of the Society of Friends; he was Professor of Botany in the University of Pennsylvania, a member of the American Philosophical Society, and of the Academy of Natural Sciences of Philadelphia. He died on the 8th October, 1831, of phthysis pulmonalis, in the fifty-second year of his age.

Nicholas Collin, D. D., Rector of the Swedish Churches in Pennsylvania, came to America about the year 1771. This venerable pastor informed one of our friends sometime ago, that before he left his native country, Sweden, he was a pupil of

Linneus; and that, on taking leave of him to embark for America, that illustrious naturalist fell on his neck, and kissing him, bade him not to forget the great cause of Natural History, in that extensive field to which he was bound. He also stated, that he had, at various times, sent to Sweden, nearly all the American forest trees that promised to stand the climate, and that immense numbers of them now flourished there. Dr. Collin, in 1793, published some opinions on the subject of Yellow Fever, which were opposed to those of the late Dr. Rush. He was proud of his attainments as a linguist, and was a man of much worth and learning. We do not know what his age was at his decease, but it must have been very advanced, as he had reached manhood before he left Sweden, and had resided here sixty years. He died in Philadelphia, October 8th, 1831

SCIENTIFIC AND GENERAL MEMORANDA.

Audubon's Expedition to California, the Rocky Mountains, &c.—We are authorized to state, that information of the progress of Mr. Aududon will be given, from time to time, to the scientific world, in the pages of this Journal.

We are gratified in being able to state, that he was received in the most cordial manner, at Washington, and that the distinguished gentlemen in authority there, have given him such letters to the military posts on the frontiers, as will assure him the aid and protection his personal safety may require. We anticipate the most interesting reconnoisances, both geological and zoological, from this enterprising naturalist, who is accompanied by Mr. Lehman, as an assistant draftsman, and by an assistant collector, who came with him from Europe. In a recent letter from Virginia, he says, "The weather is pretty cool, and the land birds all gone south: I intend to push for the Floridas, to overtake the fellows ere they cross the Gulf."—*Editor.*

Volcano in the Mediterranean.—A letter from the Commander of H. B. M. sloop of war Rapid dated Malta, July 22, contains the following:—"On the 18th of July, 1831, at 4 P. M., the town of Marsala bearing, by compass, E. half N. nine miles, I observed from on board his Majesty's sloop Rapid, under my command, a high irregular column of very white smoke or steam, bearing S. by E. I steered for it, and continued to do so till 8, 15, P. M., when, having gone about thirty miles by the reckoning, I saw flashes of brilliant light mingled with the smoke, which was still distinctly visible by the light of the moon.

"In a few minutes the whole column became black and larger; almost immediately afterwards several successive eruptions of lurid fire rose up amidst the smoke; they subsided, and the column then became gradually white again. As we seemed to near it fast, I shortened sail and hove to till day-light, that I might ascertain its exact position. During the night the changes from white to black with flashes, and the eruption of fire, continued at irregular intervals, varying from half an hour to an hour. At day-light, I again steered towards it, and about 5 A. M., when the smoke had for a moment cleared away at the base, I saw a small hillock of a dark colour a few feet above the sea. This was soon hidden again, and was only visible through the smoke, at the intervals between the more violent eruptions.

The volcano was in a constant state of activity, and appeared to be discharging dust and stones with vast volumes of steam. At 7, 30, the rushing noise of the eruptions was heard. At nine, being distant from it about two miles, and the water being much discoloured with dark objects at the surface, in various places, I hove to and went in a boat to sound round and examine. I rowed towards it, keeping on the weather side and sounding, but got no bottom till within twenty yards of the western side, where I had eighteen fathoms soft bottom; this was the only sounding obtained, except from the brig, one mile true north from the centre of the island, where the depth was one hundred and thirty fathoms soft dark brown mud.

The crater (for it was now evident that such was its form,) seemed to be composed of fine cinders and mud of a dark brown colour. Within it was to be seen, in the intervals between the eruptions, a mixture of muddy water, steam, and cinders dashing up and down, and occasionally running into the sea over the edge of the crater; which I found, on rowing round, to be broken down to the level of the sea, on the W. S. W. side, for the space of ten or twelve yards. Here I obtained a better view of the interior, which appeared to be filled with muddy water, violently agitated, from which showers of hot stones or cinders were constantly shooting up a few yards, and falling into it again; but the great quantities of steam that constantly rose from it, prevented my seeing the whole crater.

"A considerable stream of muddy water flowed outward through the opening, and mingled with that of the sea, caused the discoloration that had been observed before. I could not approach near enough to observe its temperature, but that of the sea, within ten or twelve yards of it, was only one degree higher than the average, and to leeward of the island, in the direction of the current (which ran to the eastward) no difference could be perceived, even when the water was most discoloured; however, as a 'mirage' played above, near its source, it was probably hot there. The dark objects on the surface of the sea proved to be patches of small floating cinders. The island, or crater, appeared to be seventy or eighty yards in its external diameter, and the lip, as thin as it could be, consistent with its height, which might be twenty feet above the sea in the highest, and six feet in the lowest part, leaving the rest for the diameter of the area within. These details could only be observed in the intervals between the great eruptions, some of which I witnessed from the boat.—No words can describe their sublime grandeur: their progress was generally as follows:—After the volcano had emitted for some time its usual quantities of white steam, suddenly the whole aperture was filled with an enormous mass of hot cinders and dust, rushing upwards to the height of some hundred feet, with a loud roaring noise, then falling into the sea on all sides with a still louder noise, arising, in part, perhaps, from the formation of prodigious quantities of steam, which instantly took place. This steam was at first of a brown colour, having embodied a great deal of dust; as it rose gradually, recovered its pure white colour, depositing the dust in the shape of a shower of muddy rain.—While this was being accomplished, renewed eruptions of hot cinders and dust were quickly succeeding each other, while forked lightning, accompanied by rattling thunder, darted about in all directions, within the column, now darkened with dust and greatly increased in volume, and distorted by sudden gusts and whirlwinds. The latter were most frequent on the lee sides, where they often made imperfect water spouts of curious shapes. On one occasion, some of the steam reached the boat; it smelt a little of sulphur, and the mud it left, became a gritty sparkling dark brown powder when dry. None of the stones or cinders thrown out, appeared more than half a foot in diameter, and most of them, much smaller.

"From the time when the volcano was first seen, till after I left it, the barometer did not fall or rise; the sympiesometer underwent frequent, but not important changes, and the temperature of the sea did not bespeak any unusual influence.

"After sunset, on the 18th, soundings were tried for every hour, to the average depth of eighty fathoms—no bottom. The wind was N. W., the weather serene.

"On the forenoon of the 19th, with the centre of the volcano bearing by compass, S. by W. $\frac{3}{4}$ W. one mile distant, good sights, for the chronometer gave the long. 12 deg. 41, E.; and at noon, on the same day, when it bore W. by N. $\frac{1}{2}$ N. by compass, the meridian altitude of the sun gave the latitude 37 deg. 7 min. 30 sec. N.; an amplitude of the sun, the same morning, gave the variation of $1\frac{1}{2}$ point westerly. It is worthy of remark, that on the 28th of June last, at 9, 30, P. M., when passing near the same spot, in company with the Britannia, several shocks of an earthquake were felt in both ships. (Signed)

"C. H. Swinburne, Commander."

Discovery of Rionium (*Vanadium*) *in Scotland.*—In the Journal of the Royal Institution of Great Britain, for August, 1831, it is stated, "Mr. James T. W. Johnston, has discovered Vanadium in Scotland, in a mineral from Wanlockhead, resembling in appearance, an arseniate of lead; and it is a remarkable circumstance, that this new substance has been discovered by three different persons—Professor Del Rio, Professor Seftstrom, and Mr. Johnston—in three different countries, Mexico, Sweden, and Scotland, *nearly at the same time*, and without any knowledge, on the part of one, of what the others had done."

By referring to page sixty-nine of our Journal, in the August number, it will be seen that Professor Del Rio discovered this mineral about *twenty-nine years* before it attracted the attention of any Europen mineralogist; and that he consented to withdraw the name he had given to it, out of deference to the opinions of Messrs. Humboldt and Descotils. All, however, admit it now to have been a new mineral; but so long a period has passed over, since Professor Del Rio made the discovery, that his particular merit in the matter is quite obscured, and seems in danger of being forgotten. We were glad to see the following passage in Dr. Brewster's Journal for July, 1831, from the pen of Mr. J. T. W. Johnston. "It is time that the northern fashion of naming metals after the barbarous deities of their forefathers, should be exploded." We have before expressed the same sentiment, and trust that the claim of Professor Del Rio, being now made good, it will be excused on our part—since the signal must be set from some quarter—that we have, upon this occasion, taken the lead in giving it the appropriate name of *Rionium.*—Ed.

Supposed Tides of the North American Lakes.—In Silliman's Journal, for July, 1831, is a very satisfactory paper by Major Henry Whiting, U. S. army, on this subject, with a "table of observations on the rise and fall of the lake at Green Bay, made by Gov. Cass, in 1828." The extensive circulation of that Journal, diminishes our regret at not having room for its insertion. This table, where the day of the month, the time of the day, the course of the wind, the strength of the wind, and height of the water, have distinct columns, and which commences July 15, 1828, and ends August 29th, comprehends one hundred and eighty observations. In this paper, planetary influences are stated to have no observable appreciable effect, on the alleged changes of elevation in the waters of these lakes, whether periodical or irregular; the which are probably connected with the causes alluded to, towards the end of Gov. Cass's letter. We refer our readers, interested in the subject, to this valuable paper.

Petrified Forest.—The following remarkable account, in a letter from G. H. Crossman, to Lieut. B. Walker, both of the U. S. army, is taken from the Illinois Magazine.

Jefferson Barracks, May 1, 1830.

Dear Sir,—It affords me much pleasure to comply with your request, with regard to the "Petrified Forest."

You ask for a "memoir" on the subject, but you must be satisfied with the following attempt to give you merely the "facts" as they came within my own observation, without venturing a single speculation beyond the effects produced. I wish rather to leave the subject in abler hands than mine; and if I can aid, in any way, to solve the problem, by a statement of simple facts, (well known, however, to most of the officers attached to the Yellow Stone expedition,) I shall feel more than compensated for any time I shall devote to the subject.

The enclosed specimen was broken off from one of the many large stumps and limbs of trees, found near Yellow Stone River, and brought away by some one of the officers attached to the Yellow Stone expedition in 1815.

The most remarkable facts, perhaps, with regard to these petrifactions, of what was once a forest of thick timber, are their location and abundance. For a distance of twenty or thirty miles, over an open high prairie, upon the west bank of the Missouri river, and a few miles below its junction with the Yellow Stone, near latitude 48°, these remains are more abundant.

The topography of this section of the country is hilly, and much broken into deep ravines and hollows. On the sides and summits of the hills, at an elevation of several hundred feet (estimated three hundred) above the present level of the river, and an estimated height (for we have no instruments) of some thousand feet above the ocean, the earth's face is literally covered with stumps, roots, and limbs of petrified trees; presenting the appearance of a "Petrified Forest," broken and thrown down by some powerful convulsion of nature, and scattered in all directions in innumerable fragments.

Some of the trees appear to have broken off, in falling, close to their root; while others stand at an elevation of some feet above the surface. Many of the stumps are of a large size; I measured one of them, in company with Surgeon Gale of the United States army, and found it to be upwards of fifteen feet in circumference.

The following is a description of the Mexican Pyramids, alluded to at page 177 of our last number.—Ed.

Pyramids of Teotihuacan in Mexico.—At a recent meeting of the London Geographical Society, a communication was read from lieut. Glennie, descriptive of these interesting memorials. The village of Teotihuacan is in lat. 19 deg. 43 min., N. and in long. 98 deg. 51 min. W.: the variation of the needle being 9 deg. 49 min. E. The village is elevated 7,492 feet above the level of the sea. The pyramids are distant about a mile and a half from it: the largest is 727 feet square at its base, and 221 feet high, with two of its sides parallel to the meridian. A rampart of about thirty feet in height surrounds this pyramid, at the distance of 350 feet from its base, on the north side of which are the remains of a flight of steps, with a road leading from them in a northerly direction, covered with a white cement. The remains of steps were also found on the pyramids, which were covered with the same sort of white cement, as well as broad terraces extending across the sides.

The number of pyramids surrounding the large one, was estimated by Mr. Glennie at above two hundred, varying in their dimensions. They are all constructed with volcanic stones, and plaster from the adjacent soil, all coated with white cement, and the ground between their bases seems formerly to have been occupied as streets, being also covered with the same sort of cement. One of the smaller pyramids was covered with a kind of broken pottery, ornamented with curious figures and devices; and in the neighbourhood of these edifices abundance of small figures were found, such as heads, arms, legs, &c. moulded in clay, and hardened by fire.

"*Remarkable conduct of a Horse.*—Mr. Israel Abrahams, in the vicinity of this town, has a horse that will of his own accord, pump a sufficiency of water for all the other horses on the farm. We have witnessed him, when turned loose into the barn-yard, go directly to the pump, take the handle between his teeth, and throw the water with as much force, and almost as much regularity, as a man would, until he would pump enough for his companions and himself, when he would drink, and deliberately retire. No pains were ever taken, or means used, to learn him a business which proves a great accommodation to himself, and relieves his owner of considerable labor."—*Centreville* (*Ind.*) *Times.*

Destruction of Weeds in Garden Walks, &c.—Take 100lbs. of water, 20lbs. of quick lime, and 2lbs. of flour of sulphur; boil them in an iron vessel, and after it is settled, draw the clear part off. When diluted as may be required, and paved and other walks well sprinkled with the preparation, no weeds, it is stated, will appear for many years.—*Recueil Ind.*

Protection of Firemen.—The Marchese Origo, of Rome, has devised a cheap and effective mode of protecting firemen. Their articles of dress are dipped in a solution of alumine and sulphate of lime; and when dry, are saturated with soap water. Firemen thus equipped have remained a quarter of an hour, exposed to an intense heat, without being in the least injured. These dresses do not cost more than ten dollars each. Flames may be extinguished also, by playing on them with a common engine, with a solution of sulphate of alumine, and common clay.

New Method of Multiplying Dahlias.—Some dahlias belonging to M. Jacquemin, having been injured by the wind, in the first days of June, and some branches broken off, he placed them in the ground, in hopes of developing the flower. This did not take place; the vegetation languished, but the plants appeared good, and being carefully taken up, were found furnished with tubercles. Hence a new means of multiplying these flowers, and the illustration of a curious physiological fact.—*Jour. Roy. Inst.*

Smell of Paint Removed.—The offensive smell of oil cloths, varnishes, and paints, are said to be removed by chloric fumigation in a close room.

Remedy against Flies.—The odour of the oil of laurel is not disagreeable, and the stalls of butchers rubbed with it, are said not to be frequented with flies. The frames of glasses and pictures might be preserved in this way.

Want of Forethought in the Lower Animals.—The Barbary ape, (Macacus Sylvanus, Lac^e^.) which, though a native of Africa, has established a colony on the Rock of Gibraltar. Here it is occasionally so cold in winter, that these poor apes are fain to huddle about any chance fire that may be lighted out of doors and left burning; but though they are seen sitting close to the dying embers, they have never been known to add a single chip of fuel to continue the fire.—*Scott. Intell. Phila.* iv. 1.

Snakes in the Water.—Extract of a letter from a correspondent:—" I will relate to you a curious fact, about the water-snake, told to me by General G. He said, that fishing one day in a small stream for trout, he observed a water-snake lying on a bush over the stream, under which some chubs were swimming. He watched the snake, and saw it fall or plunge into the water from the bush, and seize a chub."

We have a still more curious story on this subject. A friend, who resides where he has constant opportunities of making observations, states that he one day observed a snake in the midst of a schoole of these small fish; and that as soon as he had seized one, he directed his course to the land, and having, by a jerk, thrown the fish there, he returned and repeated the operation several times.—Ed.

Maternal Tenderness in a Sparrow.—A sparrow, which had built her nest on the thatch-roof of a house, was observed to continue her regular visits long after the time when the young birds had taken their flight. This unusual circumstance continued throughout the year; and in the winter, a gentleman who had all along observed her, determined on investigating its cause. He therefore mounted a ladder, and found one of the young ones detained a prisoner, by means of a string of worsted, which formed part of the nest, having become accidentally twisted round its leg. Being thus incapacitated from procuring its own subsistence, it had been fed and sustained by the continued exertions of its mother.—*Raleigh Register.*

Mexican domestic Bees. (*Melipona Beechei.*)—Some curious anecdotes are related by the possessors as to the manners of these bees, one of which deserves to be recorded. They assert, that at the entrance of each hive a sentinel is placed to watch the outgoings and incomings of his fellows, and that this sentinel is relieved at the expiration of twenty-four hours, when another assumes his post and duties, for the same period. At all times a single bee was seen occupying the hole leading to the nest, who, on the approach of another, withdrew himself within a small cavity apparently made for this purpose, on the left hand side of the aperture, and thus allowed the passage of the individual entering or quitting the hive, the sentinel constantly resuming his station immediately after the passage had been effected. Many attempts were made to mark him, by introducing a pencil tipped with paint; but he constantly eluded the aim taken. With the paint thus attempted to be applied to the bee, the margin of the opening was soiled, and the sentinel, as soon as he was free from the annoyance he suffered from the thrusts repeatedly made at his body, approached the foreign substance to taste it, and evidently disliking the material, he withdrew into the hive. A troop of bees was soon observed to advance, towards the place, each individual bearing a small particle of wax, or of propolis, in his mandibles, which he deposited in his turn upon the soiled part of the wood. The little labourers then returned to the hive, and repeated the operation until a small pile rose above the blemished part, and consequently relieved the inhabitants from the annoyance.—*Beechey's Voyage.*

On preventing the Discharge of a Bullet from a Gun by the finger.—At the sitting of the Helvetic Society of Natural Sciences of the 20th July 1830. A letter was read from Dr. Flachin of Yverdun, relative to an experiment before mentioned to the society, in which the ball was prevented from leaving the bottom of a musket when the gunpowder was fired, simply by putting the ramrod upon the ball, and the end of the finger upon the ramrod. He supposes the effect may be explained by the circumstance, that near the charge, the ball has a very small velocity compared to that impressed upon it by the expansive force of the gases of the fired gunpowder, when exerted during the whole of the time in which it is passing along the barrel. It is well known that the effect thus accumulated is the reason why long pieces carry further than short ones, and why the breath of a man, which cannot exert a pressure of more than a quarter of an atmosphere, may, by means of a tube, throw a ball to the distance of sixty steps. The experiment requires great care, especially as to the strength of the piece, which is liable to burst in the performance of the experiment.—*Journal of Royal Institution.*

Penetrativeness of Fluids.—Dr. J. K. Mitchell's paper on this subject, is republished in the number for August 1831, of "the Journal of the Royal Institution of Great Britain," with the following observation: "The generality and importance of this paper is such, that we think it quite impossible to convey an idea of it by an abstract, and feel ourselves bound to bring it before our English readers at full length."

Modes of obtaining the Skeletons of small Animals.—Ants, if animals are put into their hill, will leave their skeletons in a fine state of preparation. To obtain the skeletons of small fishes, tadpoles are very serviceable. Take a jar of pondwater, with a few of these future frogs, both large and small, and suspend the fish in the water by the head and tail, with threads, fastened at a point above. The smaller Tadpoles will effectually clean the bones, in places inaccessible to the larger ones.

MR. R. C. TAYLOR'S FOSSILS.

We recommend in the strongest manner to the public, the valuable cabinet now offered for sale. Dr. Harlan, of Philadelphia, is authorised to dispose of it for the proprietor.—Ed.

A concise abstract of the contents of a *Cabinet of British Organic Remains*, more particularly of Tertiary Fossil Shells; designed to illustrate the principal English Geological Formations, and selected from their respective localities, during a period of twenty-five years, by Richard C. Taylor, Fellow of the Geological Society of London, and Associate Fellow of the Society of Civil Engineers of London.

The greater portion of these specimens are fixed, upon the improved plan, on blocks, covered with tinted paper. Labels, attached to the foot of each block, exhibit the generic and specific name of each shell, arranged according to Sowerby's Mineral Conchology, and referring to the tables or figures in that work: further, these labels describe the locality, the formation, and in many instances, the separate portions or known subdivisions of each formation characterised by peculiar fossils.

In Geological arrangement, the collection commences with English Diluvium, so called, and proceeds downwards, by sections, from the most recent deposit to the oldest, which contains organic remains. It is by no means meant to convey that the suit is entire. Far otherwise. Nor is there yet formed a complete series, although several have reached more than ten times the magnitude of the one in question.

Strictly speaking, it illustrates the principal English formations, examined by, and best known to the collector: yet is sufficiently ample to form a valuable standard for comparing, and, perhaps, identifying contemporaneous deposits, in points so remote from each other as England and America; and is probably the most authentic and complete series that has yet been introduced into the United States.

In conchological classification the Univalves, the Bivalves, and Compound Shells are separated in distinct drawers, and reference to any individual or species is further facilitated under this arrangement, by an alphabetical nomenclature.

On the whole, it may be asserted, that the extreme beauty and accuracy displayed in this arrangement, constitute the principal value of the Cabinet.

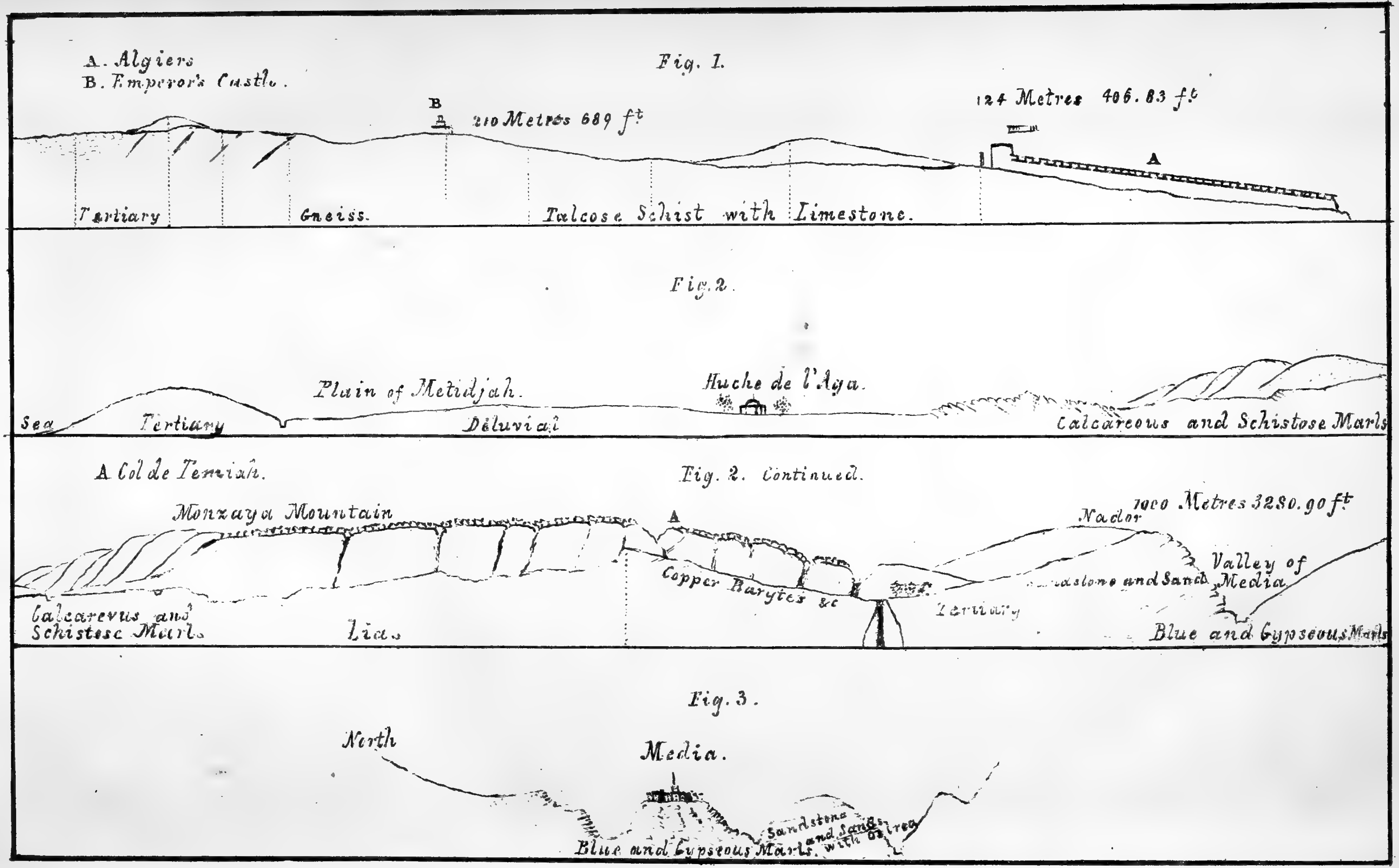
This collection has benefited by the repeated examinations of English Professors and naturalists of celebrity, who kindly afforded their aid in case of uncertainty. It comprises also a small illustrative series of recent shells and zoophites, collected for comparison, together with a few of the most remarkable French and Italian Tertiary Fossils. These foreign and recent shells were named under the kind inspection of Mr. J. D. C. Sowerby.

The entire collection comprises about five thousand specimens, of which about four thousand five hundred are fossils. Some of the more fragile tertiary shells were injured during the voyage, but the greater part of these are replaced by duplicates brought over for that purpose. As a piece of ornamental furniture, this cabinet is calculated to form a splendid addition even to the drawing-room of the man of taste. It is constructed of beautiful carved wood, French polished, in three principal divisions; contains eighty-three drawers; each having external indices, and blocks and trays made to fit accurately within; besides possessing the unusual advantage of glass covers to most of the drawers.

The proprietor was strongly urged by his scientific friends, both American and English, to introduce this collection into the United States. It is chiefly in consideration of the great risk attending its removal to his present residence, west of the Alleghenies, that, after a year's deliberation, he has determined to offer it for sale in Philadelphia, whose scientific citizens stand pre-eminent in their attachment to Geological investigation.

Drawer, No.		Alphabetical Ord.	No. of Specim.
1	Diluvium. Shells and Zoophites,		20
2	Diluvium. Shells in sandstone,		
3	Diluvium. Eschinites and Ammonites,		
4	Italian Diluvium. Pectens,		15
5	French Diluvium. Univalves,		45
6	French Diluvium. Bivalves,		40
7	Upper fresh-water, Isle of Wight, mixed Shells,		170
8	Upper Marine formation, Isle of Wight, mixed,		190
9	Lower fresh water, I. of Wight, mixed,		85
10	Lower fresh-water, Hordwell Cliff, Univalves,		140
11	Lower fresh-water, Hordwell Cliff, Bivalves,		55
12	Crag of Suffolk, Zoophites,		25
13	Crag of Suffolk, Sponges,		15
14	Crag of Suffolk, Sponges,		15
15	Crag of Suffolk, Animal Remains and Echinites,		150
16	Crag of Suffolk, Shells, Univalves,	A to C	125
17	Crag of Suffolk, Shells, Univalves,	C to M	70
18	Crag of Suffolk, Shells, Univalves,	M to N	80
19	Crag of Suffolk, Shells, Univalves,	O to T	90
20	Crag of Suffolk, Shells, Univalves,	T to V	20
21	Crag of Suffolk, Shells, Bivalves,	A to M	150
22	Crag of Suffolk, Shells, Bivalves,	M to O	90
23	Crag of Suffolk, Shells, Bivalves,	P to S	85
24	Crag of Suffolk, Shells, Bivalves,	S to V	130
25	Sheppy Clay, Vegetables and Fruits,		125
26	Sheppy Clay, Testacea in casts,		650
27	Sheppy Clay, Crustacea and Fishes,		120
28	London Clay, Testacea, Univalves,	A to F	85
29	London Clay, Testacea, Univalves,	F to M	60
30	London Clay, Testacea, Univalves,	M to R	130
31	London Clay, Testacea, Univalves,	S to V	125
32	London Clay, Testacea, Bivalves,	A to O	150
33	London Clay, Testacea, Bivalves,	O to V	90
34	London Clay, Testacea, Bivalves,	V	100
35	Plastic Clay, I. of Wight, &c. Testacea,		45
36	Plastic Clay, Woolwich beds, Testacea,		130
37	Plastic Clay,		20
38	Upper Chalk, Trimingham in Norfolk, mixed,		40
39	Upper Chalk, Norwich, mixed,		65
40	Lower Chalk, W. Norfolk, mixed,		70
41	Fire-stone and Upper Green-sand, Wiltshire,		70
42	Upper Green-sand of Wiltshire,		15
43	Upper Green-sand, Blackdown and Hildown, Casts,		75
			3970

Drawer, No.		No. of Specim.
	Brought over	3970
44	Upper Green-sand, Blackdown and Hildown,	40
45	Gault of Falkestone,	100
46	Upper Ferruginous Sands of Kent, &c.	80
47		
48	Weald Clay, Isle of Wight, and Weald of Kent,	35
49	Lower Ferruginous Sands, Hastings,	50
50	Lower Ferruginous Sands, Isle of Wight, &c.	20
51	Farringdon Sands. Sponges,	10
52		
53		
54		
55	Pisolite of Malton,	20
56	Calcareous Grit of Yorkshire,	10
57		
58	Oxford Clay, Bedfordshire,	25
59	Cornbrash, Midland Counties,	5
60		
61		
62		
63	Recent Corallines & Zoophites,	50
64	Shells resembling recent Marine, 350 feet above the sea, in Lancashire,	50
65	Great Oolite, Midland Co's.,	15
66	Great Oolite, Coteswald Hills,	75
67	Inferior Oolites, Cotesw. Hills,	65
68	Recent shells, named by Mr Sowerby,	30
69	Recent Shells, Marine,	200
70	Recent Shells, Land and Fresh-water,	150
71	Magnesian Limestone (and American,)	15
72	Lias, Gloucestershire, &c.	40
73	Alden Shale, Whitby,	50
74	Coal measures, Various,	35
75	Coal measures, South Wales,	20
76	Mountain Limestone, Derbyshire and Wales,	50
77	Mountain Limestone, High Peake and Ebton,	30
78	Mountain and Coal Measures,	15
79	Mountain, Dudley, &c.	20
80	Transition Limestone,	5
81	Sundry specimens,	
		5280



SECTIONS OF THE GEOLOGY OF ALGIERS.

THE

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AN EPITOME OF THE PROGRESS OF NATURAL SCIENCE.

(*Concluded from page* 158.)

Although the nature of the universe began at an early period to attract the attention of philosophic minds, and individuals from time to time appeared, to advance the knowledge of the laws which govern the motions of the earth, as well as of its geometrical relations; yet it was reserved for the nineteenth century to produce a school of learned, acute, and disinterested men, incessantly directing the energy of their minds to the study of the structure and the ancient history of this globe. The universities of Oxford and Cambridge, which, during the past ages, had nurtured so many of those great minds which have enlarged the boundaries of physical science, have been the first to cherish geology. At the first of these Roger Bacon, in the thirteenth century, might, perhaps, but for the influence* of the scholastic bigotry of the day, have left a renown behind him, only second to that of the immortal

* The following anecdote was related to us at Oxford, in 1827, by a venerable clergyman, who had been connected with the university about sixty years.

"When Blackstone prepared to deliver his law lectures, he too was considered an innovator, and was made to feel, in various ways, the influence of the established opinions. In an introductory lecture of his, which unfortunately has not been published, he turned the tables very successfully upon his opponents, by the following sally:—'In those scholastic days, when the inquisitive and original mind of Roger Bacon was directed to the investigation of the laws of nature, the theological animus conspired against him, and he was accused of holding communion with evil spirits. Upon a particular occasion, when he intended to exhibit some curious experiments to a few select friends, the secret having got out, the whole town and all the colleges of this university, were in an uproar. Priests, and fellows, and students, were seen flying about in every direction, with their gowns streaming behind them, and screaming out, 'No conjurer, no conjurer!' The cry of no conjurer resounded from hall to hall, Newton. The important contributions which Professors Buckland and Sedgewick have made to this, the most attractive science of modern times, can never be forgotten by those who commemorate its early history, and the great and beneficial impulse which it has received from that school, of which they are among the chief ornaments. But that we may the more intelligently bring that early history before our readers, we shall, in conformity with the plan hitherto pursued, rapidly notice the successive steps, by which the study of physical science has been promoted from the earliest times; by which means the true causes of the retardment and advance of a branch of knowledge, will more conspicuously and profitably appear; which, as has been remarked by Mr. Lyell, stands in that relation to the physical sciences, which general history does to the moral.

In the early pages of this Epitome, we have adverted to the ancient cosmogonies, and to the rise of philosophy in Greece. Pythagoras, who flourished near five hundred years B. C., appears to have had very just ideas of the true theory of the solar system; he even proved that the earth was not an extended plane, but that it had a curvature. The elementary principles of geometry, from the necessity of the case, became known to men in the infancy of society, and Pythagoras is the most celebrated of the ancient geometricians; but the geometrical analysis, or the art of finding unknown quantities, by their relation to quantities that are known, became familiar to the Greeks at a later day. Although mathematics did not begin to flourish in Greece until philosophy and the arts had reached their height, yet geometry was well known there, before the period of those great mathematicians Euclid and Archimedes, who flourished about the third century B. C. Amongst the great astronomers of that time was Aristarchus, who taught the true solar theory; and Hipparchus, who flourished about one hundred and forty-two years B. C., was so familiar with the heavens, that he undertook the enumeration of the stars. The ancients were familiar with the mechanical powers, sufficiently to have used them on a great scale, yet until

from cell to cell. At a later day Galileo was condemned by men, whose names are now only remembered as parts of the rubbish upon which the pedestal of his fame is raised. And in our own times there are men who seek to raise the cry of 'No conjurer' against me. I tell you, you will soon find out, these good people are no conjurers themselves."

the period of Archimedes, the principles and laws of mechanics were not laid down. His treatise on Equilibria contains an exposition of these principles. He demonstrates that masses have a common point of pressure, the centre of gravity; and shows how that centre may be found in all bodies. It was he that laid the foundation of all the inventions, which have constituted the triumph of mechanics: the machines by which he caused so protracted a defence of Syracuse against the Romans, seem, even in our day, to belong to the romance of mechanical history. When we reflect upon the causes which retard or advance knowledge, we cannot but trace the one either to an abasement of the public mind, or the other to the influence of general education, which prepares the public mind to receive and cherish its seeds. Had Archimedes lived in an intelligent age, the principles of his great discoveries, which concerned both solid and fluid bodies, would have received a more extensive application long ere our own times, and in many things we should have been anticipated by our ancestors; but although a few continued to walk in the light of his great mind, the science of statics became, as it were, stationary after his death. The same observation may be made also, in relation to the genius of Pythagoras, especially in that branch of pneumatics which relates to the theory of sound, and to which he was the first to apply the rules of arithmetical and geometrical science. The doctrine of musical chords, and their analysis into vibrations of equal and unequal spaces of time; his transfer of this harmonic scale to the motions of the heavenly bodies, which, by a grandeur of thought belonging only to a genius of the highest order, he supposed to produce sounds of the most inconceivable harmony, by impinging on the ether through which they moved, evince how much knowledge and enjoyment mankind has been deprived of, by the protracted inquiries into these the true principles of the theory of musical science.

There are two natural agents, which, from time immemorial, have interfered with the industry and the social existence of man. Of the deluges which have at repeated intervals partially overwhelmed the surface of the earth, we have abundant evidence in practical geology, as well as in the traditions of all nations; and although similar traditions of the destructive effects of volcanic power, have been less powerfully impressed upon succeeding generations, on account of its less extensive operation, still we have in geology the most conclusive evidence of the crust of the earth having been penetrated, in every country, by the most surprising masses of mineral matter in the state of igneous fusion. Devastations of this character are less fatal to life than aqueous deluges, which afford less time for escape, and are not so easily forgotten as those which do not sweep away whole generations. It is not wonderful that we know so little of the effects produced by volcanoes in ancient times, or of the periods when they prevailed, since even the eruptions of Skapta Jokul, in Iceland, in 1783, are only known to the curious. Yet we are told, that those Icelandic lavas, spread into broad lakes of fire, sometimes from twelve to fifteen miles wide, and one hundred feet deep.

That this planet has at all times been subject to scourgings both from water and fire, is most true. The ancients believed in alternate catastrophes of this kind. The Egyptians, especially, considered them to be punitive and purifying visitations from the gods; an opinion adopted by the Stoics. The cataclysm, or deluge, swept away all organized bodies; and the ecpyrosis, or conflagration, consumed the globe itself. This doctrine has even been continued by the founders of our holy religion, who have taught that the Noachic deluge was inflicted upon the world, on account of the sins of man, and that the next punitive visitation is to be from fire. These opinions acquired greater force among the ancients by the observations they could not avoid making of fossil marine remains, buried at great elevations and distances from the ocean. Various conjectures were offered to account for this class of phenomena. The celebrated geographer, Strabo, whose extensive travels had brought the geological phenomena of many countries under his notice, and especially those attendant upon earthquakes, was the first to assert the reasonable opinion, which obtains in our day, that islands, as well as continents and seas, are sometimes elevated from below, and sometimes depressed. This is one of the many instances of a great mind having put mankind upon the right track in vain. Strabo died in the year 25 of our era, and eighteen hundred years had elapsed before this announcement of subterranean dynamics was generally recognized by geologists. In vain too, had the true solar theory been taught by Aristarchus, in the third century before Christ; near eighteen centuries elapsed before it was revived by Copernicus. During the greater part of this period, and at a time when classical literature was falling into decay, the Ptolemaic system arose, which was universally received. Ptolemy flourished about one hundred and forty years after Christ, and made his system accord with external appearances, supposing the earth to be the immoveable centre, and the sun and planets to revolve round it. This deceptive theory, which coincided with the figurative language used in the old Testament, was received as of divine authority; until Galileo, in the seventeenth century, finally overthrew it, in despite of the persecutions of the inquisition and the power of the church.

Until the period when the Saracens began to cultivate letters, scarce any further progress was made in natural science, if we except the labours of Galen as an anatomist, who died A. D. 193. They were much addicted to the study of the virtues of plants, and their physicians Al Rasi, Ibn Sina, and Ibn Rosch, have been held in honour by the Europeans under the names of Razes, Avicenna, and Averroes; but they added nothing to the knowledge of anatomy; for the prejudices which the Koran had created against dissection were powerful, as it denounced as unclean all who touched the corpse of any dead animal. The Saracens were, however, well acquainted with the writings of Galen, and there is sufficient evidence that it is through their channel the Europeans first returned to the study of anatomy; for many of the technical terms used upon its revival in Europe, are derived from the Arabic tongue; such as *Nucha*, the nape of the neck; *Meri*, the diaphragm; *Sumach*, the umbilical region; *Myrach*, the abdomen; *Siphax*, the peritoneum; and *Zirbus*, the omentum. These terms were retained by Mondino de Luzzi, his pupil Achillini, and the other European anatomists, until the revival of learning led to the study of the ancient Greek writers. Their passion for astronomy was favourable to the cultivation of arithmetic and algebra, their knowledge of which, they derived, according to Playfair, from India. The monk Gerbert, afterwards pope Sylvester 2d, had studied with the Saracens in Spain, and introduced the knowledge of algebra into christian Europe, towards the latter end of the tenth century. In mechanical science they were great proficients. As early as A. D. 799, Haroun Alraschid sent a magnificent *Clepsydra*, or water-clock, to the Emperor Charlemagne, of a remarkable construction. Chemistry, as an analytical branch of experimental philosophy, owes its origin to the Arabians: the transmutation of base metals into gold, and the composition of a medicine that could confer immortality, were favourite pursuits of this ingenious and romantic people.

When the rays of Arabian science were reflected upon Europe, ingenious and learned men began to arise there. Among the most eminent is Roger Bacon, an Englishman, born A. D. 1214. He was a man of universal knowledge, and being a great alchemist, he was charged by the bigotry of his cotemporaries with being a necromancer. Had a mind like friar Bacon's been left untrammelled, and experimental philosophy been encouraged instead of repressed, the greatest progress might have been made in physical science; but the general ignorance was too great, and the influence of the scholastic school too powerful. We cannot help contrasting here the attainments of Bacon as we have spoken of them, with those of the celebrated Thomas Aquinas, born A. D. 1224, the glory of the scholastics and theologians, known by the name of "the angelical doctor." In metaphysical and speculative discussions he was without a rival; but as to physical experiments, he denounced them, upon all occasions, as the result of necromancy. An amusing anecdote is related of this holy man, who after his death was beatified. Being induced to go and see a curious automaton figure, which uttered sounds, as if in reply to questions put to it; this far famed and holy champion of the church, fell into a prodigious fright, and rage, and lifting up his staff broke it in pieces, rejoicing that he had overcome the devil.

The Italians were among the first to cultivate those sciences which the Saracens had given to Europe. Bologna became a great medical school. In 1315, Mondino de Luzzi conducted dissections there, and became a celebrated anatomist. He followed Galen implicitly, and used the Arabic terms. Luzzi only used human subjects, a mode of illustration against which strong prejudices were entertained. His book was the text book of the anatomical schools for a century.

The influence of the scholastic school began now to decline. Remarkable chiefly for speculative absurdities, discussed in an unintelligible language, and for a corrupted theology defended by the misunderstood logic and metaphysics of the ancients; the practice of demonstrating truth by facts, which was now becoming more general, was in the end fatal to it. The schoolmen sought, not for truth, but for victory, by an ingenious and verbose sophistry, the great accomplishment of the day, and which was called dialectic skill. It was by such means christianity became corrupted, and an acrimonious spirit generated, which has been felt to our day. But the time was approaching when the ecclesiastical domination was to be put on the defensive; great minds were arising. Occam and Richard of Swinehead, at Oxford, and above all, Wickliffe, who, by his translation of the scriptures, gave a death blow to the scholastic system.

The fifteenth century abounds in great men and great events. The learned Greeks, whom the fortune of war had driven from their own country, had contributed greatly to break down the bigotry of the times, by giving Latin versions of ancient Greek works. The love of literature was revived, and correct criticism was substituted for false logic. Men began to think, and to study the ancient tongues, and thus the first step was taken towards a reformation in religion, by enabling men to read the scriptures in the original languages. Erasmus, Luther, and Melancthon arose, lights that could not be obscured. Erasmus did much, by the keenness of his satire, to subvert the sophistry of the schoolmen; his wit was excellent, his erudition great, and his industry untiring; though he continued a papist, no one contributed more by his conversation and writings to reclaim mankind from the delusions and ignorance of the monks, among whom he had passed a great part of his youth. About 1440 the art of printing was first made known to Europe; this art, as we see by the printed books of that period, was almost perfected as soon as discovered. This was also the age of Cosmo de Medici, of the celebrated Regio Montanus, and of Copernicus. This last philosopher, who was born A. D. 1472, began to doubt the Ptolemaic System about 1507. His work "Astronomia Instaurata," in which the true solar system is given, was not published, from excess of caution, until 1543. It was dedicated to the pope, and he died, perhaps fortunately, the day the first printed copy was delivered to him. This theory, however, the Cardinal Nicholas de Cusa had in vain attempted to revive about 1445, A. D.

The prejudices against using human subjects still continued in Italy, and Berenger of Carpi, a professor of surgery of the university of Bologna, delivered, in 1502, a private course of lectures over the body of a pig. He afterwards devoted himself to anatomy, and became very celebrated. In France the same prejudices existed, and Gonthier, in whose school Vesalius, Eustachius, Fallopius,—and probably Michael Servetus of famous memory, the original discoverer of the circulation of the blood, and the victim of the brutal bigotry of the Calvinists—studied, taught the elements of the science, principally by dissection of the lower animals. But the successful individuals in animal anatomy, were Rondelet of Montpelier, and Belon of Mans. The first had studied with Gonthier. He published at Lyons, in 1554, a natural history of fishes in eighteen books, in which both the zoological and zootomical characters of these animals are given. In this book, written in the infancy of zoology, he includes all the inhabitants of the waters, whether fish, cetacea and amphibious mammalia, chelonia, (turtles,) mollusca or crustacea; whilst at the same time he draws a line between those which breathe by gills, and those which breathe by lungs. This work is distinguished for the detail, as well as the ability with which he pursues his physiological inquiries.—This great animal anatomist died in 1566.

His cotemporary Belon of Mans, also wrote a natural history, "des Estranges Poissons Marins," distinguished for the minuteness of his anatomical and physiological observations. But his work "L'Histoire de la Nature des Oyseaux," published at Paris in 1555, illustrated with spirited wood cuts, is exceedingly curious, and replete with observations of a truly original character, for ornithological anatomy became for the first time a science in his hands. He was a great enthusiast, and had travelled in Greece, Arabia, India, and Egypt, devoting himself to natural history. In his quaint manner, he says,* "No animal ever fell into my hands, that I did not dissect it, as soon as it was in my power. Whence it came that I have examined the internal parts of two hundred different species of birds. It is not strange, therefore, if I am able to describe the bones of birds, and to figure them so accurately."

* "One ne tumba animal entre nos mains, veu qu'il fut en notre puissance, duquel n'ayons fait anatomie. Dequoy est advenu qu'ayons regardé les intericures parties de deux cents diverses especes d'oyseaux. L'on ne doit done trouver estrange si nous des crivons maintenant les os des oyseaux, et les portrayons si exactment."—L'Histoire de la Nature des Oyseaux. A Paris 1555. Liv. I. chap. xii.

The sixteenth century was, above all, distinguished by the reformation of religion. Luther had declared that neither religion or philosophy could be reformed, until the scholastic system, and the metaphysical theology of the schools, were utterly abolished; and he lived to witness the greatest triumph of which man ever was the hero. He died A. D. 1546, fifteen years before the birth of the celebrated Lord Bacon, as great a reformer in intellectual philosophy, as Luther had been in religion. This great philosopher taught that the qualities of bodies became known only by experiment, and that the way to arrive at truth, is to proceed step by step from what we know, till we arrive at results governed by principles of universal application; thus seeking the unknown by aid of the known. Strong as he was in experimental philosophy, and prophetic as his enlightened views were respecting future examinations of the powers of nature, yet it is as a profound logician Lord Bacon stands unrivalled. No man ever saw more distinctly how truth was to be found, nor pursued it more steadily. His great mind disdained to occupy itself with the relations of words with themselves, but applied its powers to the philosophical relation between words and things. About the same time, also, Galileo was born. His "Dialogues of the System of the World," made public about A. D. 1613, were received by men of science—and this was the age of Bacon, Kepler, Napier, &c.—with enthusiasm. They produced the final overthrow of the false system then taught, although he was twice thrown into the dungeons of the inquisition, and his book publicly burnt. Professor Scarpellini informed Mr. Lyell, at Rome, that the edicts against Galileo and the Copernican system, were finally repealed in 1818, at the instance of Pius 7th.

During this progress in the higher branches of physical science, the fossil organic remains found in almost every quarter, were too curious a phenomenon to escape the attention of inquiring minds. Some excavation made at Verona, in Italy, in 1517, for the purpose of repairing the city, had drawn the public attention to certain petrifactions which abound there. The easiest way, and indeed the safest, to account for their being found buried beneath the surface, was by referring them to the action of the Noachian deluge, and was, of course, adopted by the majority. Some, however, referred them to a "plastic force," which could give organic forms to stones. Fracastoro boldly declared his opinion, that the fossil shells had not only belonged to living animals, but that the Noachic deluge had no agency in bringing them there. Fallopio, a professor of anatomy at Padua, even taught that some Elephants' tusks, dug up at Puglia, were earthy concretions. Mercati, who, in 1574, published some figures of fossils preserved in the museum of the Vatican, declared that they owed their forms to the influence of the heavenly bodies. In 1580, Palissy, a French writer, "On the origin of springs from rain water," was the first, according to Fontenelle, to declare in Paris, that organic remains had once been vitalized. The Italians, however, in the 17th century, continued to lead in geological inquiries, and Colonna and Steno, although they conceded the position of fossil remains to be owing to the Noachic deluge, contended for their previous existence. In like manner, the interesting work of Scilla, a Sicilian painter, on the fossils of Calabria, published in 1670, with engravings, is a mixture of sound opinions, restrained by what he thought due to popular prejudice. Quirini, in a work on fossil testacea, in 1676, contended that the deluge could not have brought fossils into the situation in which some of them were found, and was the first to doubt its universality. In England, in 1677, Dr. Plot, in his "Natural History of Oxfordshire," attributed fossils to the 'plastic virtue' before spoken of. Lister, the conchologist, in 1678, thought them either "terriginous," or representing extinct animals.

Robert Hooke, M. D. in his "Discourse of Earthquakes," written in 1688, expresses many opinions, which obtain at this time. Speaking of organic remains found at great elevations, he says, they might have been raised there by those earthquakes "which have turned plains into mountains," &c., &c.; he therefore was opposed to the hypothesis which accounted for fossils by the deluge. Ray, an able naturalist, and cotemporary with Hooke, placed a barrier in the way of his own vigorous mind, and of his sound views of physical science, by conceding to the prevailing theological opinions. Another cotemporary, Woodward, who by founding a chair at Cambridge—now filled by the Rev. Adam Sedgewick—has indirectly a claim to be considered a benefactor to geological science, entertained the most extravagant notions of the flood, teaching that the whole solid fabric of the globe had been dissolved in it, and that the strata were the result of the general deposition. Burnet, towards the close of the seventeenth century, produced a romance under the title of "The Sacred Theory of the Earth, and of all the general changes which it hath already undergone, or is to undergo, till the consummation of all things." This work, which was so highly praised by some of his cotemporaries, is a mere extravagant and theoretical fallacy; but such was the prejudice of the theologians of that day, that those who in geological matters did not acknowledge the agency of the Noachic deluge in every thing, were exposed to the imputation of infidelity. Whiston followed Burnet in his adherence to the general interpretation of the scripture account of the deluge, which he supposed to have been occasioned by the near approach of a comet. Even the great Newton did not escape these fanatics; for Hutchinson, in 1724, published his "Moses's Principia," in which he insisted that the Scriptures contained a perfect system of natural philosophy, and for which reason he and his followers objected to the theory of gravitation. Leibnitz, who claimed to be the inventor of the differential calculus, ten years after Newton had discovered the method of fluxions, so important to the precision necessary in carrying on astronomical calculations, published his Protogæa, in 1680. He supposed the planet to have originally been a burning mass, and that it had been cooling ever since the creation, and that the oceans were formed by the vapours which had condensed during that cooling. This hypothesis of this great mathematician was partially adopted by Buffon, De Luc, and others. Buffon's Natural History appeared in 1740. The hypothetical reasonings of this eloquent writer gave offence, and at the instance of the faculty of the Sorbonne, he retracted all his opinions which were deemed to be in opposition to the Mosaic account. Towards the middle of the eighteenth century, Italy produced many writers who speculated on fossils, Vallisneri, Moro, and Targioni. A Carmelite friar named Generelli, is distinguished for his judicious opinions at this time. For a spirited sketch of the progress of geological inquiry, in Italy, at this period, we refer our readers to Mr. Lyell's "Principles of Geology," an eloquent modern work, in the possession of every naturalist. The Italians were greatly excited to this study, by the fossils in the sub-appenine formations, which lie on the flanks of the older rocks, and by the vast quantities of remains of extinct quadrupeds found in the plains of their country, and which some writers referred to the period of the ancient Romans and of Hannibal, as Mr. Rankin, in his extravagant writings, pretends still to think.

The order of superposition of beds, began now to be understood. Ardusino and Lehman, in 1759, both recognized the distinction between primary, secondary, and tertiary rocks. In 1760, the Rev. John Michell, Woodwardian professor at Cambridge, wrote an admirable essay in the Philosophical Transactions, on the cause and phenomena of Earthquakes, suggested by the great earthquake at Lisbon, five years before. In 1762, Fuchsel, a physician of Rudelstadt, in Germany, published his "Historia Terræ et Maris." He was a practical geologist, and is the first who described the Muschelkalk, a bed peculiar to Germany, in Europe, but which we have some reason to think has its equivalent here. The name of this excellent observer has been but recently brought forward.* The classification made by Werner, and published 1787, appears to be far short of the progress already made by Fuschel. Raspe, in 1763, in an able work, called the attention of naturalists to the new Islands that from time to time had appeared, urging them to study nature "in the act of parturition." In 1766, Brander published his Fossilia Hantoniensia, with excellent figures of the tertiary shells. In 1780, Soldani produced some able papers, on the comparative position of undisturbed fossils, with that of recent Testacea and Zoophytes. He also first observed that the beds of the Parisian basin were alternate deposits of marine and fresh water strata.

About this time Pallas, a distinguished Russian naturalist, announced the order of superposition of the lower beds in the Silesian chains, which was further illustrated by the observations of the celebrated Saussure in the Alps: he aided greatly in reducing to a regular study, the specification of beds, and the grouping of them into formations. Hitherto, geological phenomena had been considered rather as curious subjects for discussion, than as having a bearing upon each other of a high philosophical character. Important steps had been taken towards opening the consideration of the structure of the planet, in a way worthy of so lofty a subject; but the effort having been made in an insulated and detached manner, had not concentrated to a point. It was reserved for the celebrated German mineralogist, Werner, to draw the

* See M. Keferstein's Memoir. Journal de Geologie, Oct. 1830. p. 191.

attention of mankind to the subject, by one of those splendid generalizations, which, being apparently founded on observation, was for a long time implicitly received.

Werner, in 1775, was appointed Professor of Mineralogy, in the school of Mines, at Freyberg in Saxony. Familiar with the regular succession of rocks, as well by the labours of his predecessors, as by his own observations, he had—without being original in his views in relation to superposition—the great merit of pointing out the application of particular phenomena, to the purposes of mining. An eloquent enthusiast, and skilled in mineralogy, he soon raised up a brilliant school, to which men of genius resorted from distant countries. His opinions were received as oracular, and disseminated over Europe. To the school of Werner we owe some of the most distinguished mineralogists. It is probable that the success he met with as a mineralogist, was the principal cause of his failure as a geologist, for his illustrations were drawn from Freyberg and its immediate vicinity. He therefore imagined a system which had scarce any other basis than the limited phenomena around him, and with an amount of observation, that in these days would scarce exceed the personal investigations due to an ordinary memoir in the geological transactions, declared—what the united labours of the most gifted and practical geologists of the present day, have not ventured to do—the law of the structure of the planet. He taught that the universal crust of the earth was formed of beds successively precipitated from a common menstruum, in the which he included the whole class of intrusive rocks, now universally recognized to be of igneous origin. Nothing has been more fatal to his reputation, in Germany, as a geologist, than the manner in which he overlooked the igneous nature of the rocks in his own vicinity, where porphyry—which he included in his primitive rocks—not only sends from below its jets and dikes through the secondary rocks, but overlies the strata of the coal formation in mass. His flötz rocks too, which he represented as universally horizontal, are, even in the Hartz mountains—close to his type—very highly inclined; so that his partizans found themselves either obliged to renounce his system, or to contend for the possibility of entire formations being at the same time horizontal and perpendicular. This too, when Arduino, Desmaretz, Collini, Faujas, and especially his countryman Raspe, all of whom preceded him, had fully shown the agreement of trap rocks with volcanic products. Werner, therefore, who could not be ignorant of these facts, availing himself of his influence, preferred, as it would seem, to sustain an hypothesis based upon his own inventive imagination, to the truths which nature taught, and which had been very ably brought forward. This substitution of his hypothesis had for a long period, the effect of suppressing the truth, and of retarding the advancement of geological knowledge.

Whilst in Europe the influence of Werner's geological theory has entirely passed away, it is due to the memory of that great mineralogist to say, that the progress in mineralogical knowledge is to be attributed to the school he formed; and that the very awakening which geological science has received, arose from the boldness of his hypothesis, the enthusiasm with which it was maintained by him and his disciples, and the inquiries it provoked. Those who obstinately explained all phenomena by the doctrine of aqueous precipitates, soon received the designation of *Neptunists*, in opposition to that of *Vulcanists*, which was given to the other side, and of whom Hutton, the cotemporary of Werner, was the most conspicuous member. He was a man of unwearied activity and application, who examined for himself, and who sought to account for all geological phenomena by the reasonable action of known natural agents. In 1788, he published his "Theory of the Earth." He presents the earth to us as a pure self-acting machine, operating eternal degradations and renewals. Continents worn down by external circumstances, their ruins carried by streams into the oceans, there consolidated by subterranean heat and pressure, to be again raised up by subterranean power. Satisfied that trap rocks were of igneous origin, and finding that the phenomena of veins and dykes belonging to it, were common to the granite, he came to the conclusion, that the primary rocks were not formed from aqueous deposites, but from mineral matter in a state of igneous fusion. To this opinion, the geological theory has been for some time steadily tending: but that part of his doctrine which implies that all the changes which have taken place in the globe, have been the result of causes co-efficient with all time, and that the energy of subterranean power, as far as the whole globe is concerned, has at all times been uniform, is deemed insufficient by the greater portion of accredited geologists; who neither admit the inconceivable immensity of time involved in the theory, nor the uniformity of action alluded to; seeing that the proofs are co-extensive with investigations made in the most distant parts of the globe, that until the period of the lower secondary rocks, the evidences of an immeasurable and peculiar subterranean power, form the most obvious of all the geological phenomena; and from which we may, in conjunction with other important branches, infer the future establishment of a geological theory of a progressive character, rather than one of uniform mutations.

For a long time the opinions of Hutton were injurious to the advancement of sound geological knowledge; for though he was much nearer the truth than his Wernerian adversaries, still, inferences were raised, which gave occasion to the imputation of atheistical tendency, and thus an alliance was formed between the Wernerians and the theologico-geologists, who were less concerned for the safety of science, than for the Mosaic account of the creation and the Noachic deluge; and thus, with many, geology was brought into disrepute. But the controversies and illiberalities to which these conflicting opinions gave rise, are now happily buried, never to be revived, as long as the spirit which now prevails, of reasoning from facts alone, shall have authority in science.

About the time that Hutton's published opinions were bringing their attacks upon him, a young man named William Smith, born in 1769, a native of Churchill, in Oxfordshire, who followed the profession of a mineral and land surveyor, was, unaided, silently laying down the foundations of true geological knowledge. Fossils had been the playthings of his childhood, and when at a mature age he recognized them imbedded in the rocks he was traversing, they received more than ordinary attention from him. He not only learned to distinguish them wherever he found them, but the rocks in which they were imbedded, however remotely they might be situated; for he found that particular fossils were peculiar to rocks that observed an uniform succession to each other as to superposition. These discoveries led him to examine with more attention than had hitherto been done, the range and extent of the successive deposites, with their general line of dip. In this manner he proceeded from step to step, until he had examined extensive territorial surfaces, and had satisfied himself that the order of succession of the rocks was never inverted, and *that the true way to identify them was by their imbedded fossils.* Thus did an unaided, and unpretending individual, arrive, by his own sagacity, and laborious investigations, at the great fundamental truths of the geological structure of the planet, in a much clearer manner than all the older geologists, Werner included. His 'Tabular View of the British Strata,' was published in 1790; and in 1815 he published his great Geological Map of England, which drew from D'Aubisson, one of Werner's most celebrated pupils, the following distinguished tribute of admiration—"*that what many celebrated mineralogists had accomplished for a small part of Germany in the course of half a century, had been effected by a single individual for the whole of England.*"*

The intemperance with which the controversies between the Neptunists and Vulcanists had been carried on, at length fatigued all parties, and a re-action took place, of the most beneficial character: a spirit of caution grew up, which rejected hypothesis of every kind. The lovers of nature began, as it were, by common consent, to atone to her for the neglect she had received by the past indulgence in so much speculative imagination. Men began now to collect facts with great activity and scrupulousness. The Geological Society of London, was established in 1807, for the purpose of multiplying and recording those facts. Its success has been complete; it has rescued geology from every unfriendly prejudice, and has raised up a school of eminent men, who, by their disinterested and active labours, have made Geology the most attractive and popular of all the sciences. In 1830, the French naturalists, many of whose names we shall have occasion to mention hereafter with all praise, perceiving the usefulness of the Geological Society of London, and the influence which it was acquiring in Europe, established one in Paris, under the title of "Societé Geologique de France."

In this hasty sketch we have not ventured to speak of the labours of Cuvier, and of the extent of the obligations which natural history is under to him. Those labours are too extensive, too minute, and of too universal a character; his opinions too remarkable for the judgment and sagacity of their author, to permit any other expression of his merits, than that he is to this age what Aristotle was to his own.

We wish, in concluding this epitome, we could say that the

* See July number, page 29.

impulse which practical geology once received in this country from William Maclure had been continued. We look with confidence to the future.

THE JOURNAL OF COL. CROGHAN.

After the peace of 1763, Col. Croghan was sent by the British government to explore the country adjacent to the Ohio river, and to conciliate the Indian nations, who had hitherto acted with the French. As the Editor possesses the original journal kept during this interesting expedition, he has thought it would be gratifying to his readers to transfer it to his pages. The present inhabitants of that fertile territory, will no doubt be pleased with this document, which describes so minutely, their now highly cultivated and populous country, when it knew no dominion but that of the Indians, and the *fera natura* of the forests, and waters. The list of the tribes of Indians in the northern parts of North America is both curious and valuable. Col. Croghan was, perhaps, the first European, or even white man, who personally visited Big-bone Lick, now become an object of so much interest to naturalists, and which is here noticed.

The Editor will esteem himself much obliged to any of his readers, who will favour him with documents of a similar character, and which have not yet been published. Ed.

May 15*th*, 1765. I set off from Fort Pitt with two batteaux, and encamped at Chartier's Island, in the Ohio, three miles below Fort Pitt.

16th. Being joined by the deputies of the Senecas, Shawnesse, and Delawares, that were to accompany me, we set off at 7 o'clock in the morning, and at 10 o'clock arrived at the Log's Town, an old settlement of the Shawnesse, about seventeen miles from Fort Pitt, where we put ashore, and viewed the remains of that village, which was situated on a high bank, on the south side of the Ohio river, a fine fertile country round it. At 11 o'clock we re-embarked and proceeded down the Ohio to the mouth of Big Beaver Creek, about ten miles below the Log's Town: this creek empties itself between two fine rich bottoms, a mile wide on each side from the banks of the river to the highlands.

About a mile below the mouth of Beaver Creek we passed an old settlement of the Delawares, where the French, in 1756, built a town for that nation. On the north side of the river some of the stone chimneys are yet remaining; here the highlands come close to the banks, and continue so for about five miles. After which we passed several spacious bottoms on each side of the river, and came to Little Beaver Creek, about fifteen miles below Big Beaver Creek. A number of small rivulets fall into the river on each side. From thence we sailed to Yellow creek, being about fifteen miles from the last mentioned creek; here and there the hills come close to the banks of the river on each side, but where there are bottoms, they are very large, and well watered; numbers of small rivulets running through them, falling into the Ohio on both sides. We encamped on the river bank, and find a great part of the trees in the bottoms are covered with grape vines. This day we passed by eleven islands, one of which being about seven miles long. For the most part of the way we made this day, the banks of the river are high and steep. The course of the Ohio from Fort Pitt to the mouth of Beaver Creek inclines to the north-west; from thence to the two creeks partly due west.

17th. At 6 o'clock in the morning we embarked, and were delighted with the prospect of a fine open country on each side of the river as we passed down. We came to a place called the Two Creeks, about fifteen miles from Yellow Creek, where we put to shore; here the Senecas have a village on a high bank, on the north side of the river; the chief of this village offered me his service to go with me to the Illinois, which I could not refuse for fear of giving him offence, although I had a sufficient number of deputies with me already. From thence we proceeded down the river, passed many large, rich, and fine bottoms; the highlands being at a considerable distance from the river banks, till we came to the Buffalo Creek, being about ten miles below the Seneca village; and from Buffalo Creek we proceeded down the river to Fat Meat Creek, about thirty miles. The face of the country appears much like what we met with before; large, rich, and well watered bottoms, then succeeded by the hills pinching close on the river; these bottoms, on the north side, appear rather low, and consequently subject to inundations, in the spring of the year, when there never fails to be high freshes in the Ohio, owing to the melting of the snows. This day we passed by ten fine islands, though the greatest part of them are small. They lay much higher out of the water than the mainland, and of course less subject to be flooded by the freshes. At night we encamped near an Indian village. The general course of the river from the Two Creeks to Fat Meat Creek inclines to the south-west.

18th. At 6 o'clock, A. M. we set off in our batteaux; the country on both sides of the river appears delightful; the hills are several miles from the river banks, and consequently the bottoms large; the soil, timber, and banks of the river, much like those we have before described; about fifty miles below the Fat Meat Creek, we enter the long reach, where the river runs a straight course for twenty miles, and makes a delightful prospect; the banks continue high; the country on both sides, level, rich, and well watered. At the lower end of the reach we encamped. This day we passed nine islands, some of which are large, and lay high out of the water.

19th. We decamped at six in the morning, and sailed to a place called the Three Islands, being about fifteen miles from our last encampment; here the highlands come close to the river banks, and the bottoms for the most part—till we come to the Muskingum (or Elk) river—are but narrow: this river empties itself into the Ohio about fifteen miles below the Three Islands; the banks of the river continue steep, and the country is level for several miles back from the river. The course of the river from Fat Meat Creek to Elk River, is about south-west and by south. We proceeded down the river about fifteen miles, to the mouth of Little Conhawa River, with little or no alteration in the face of the country; here we encamped in a fine rich bottom, after having passed fourteen islands, some of them large, and mostly lying high out of the water. Here buffaloes, bears, turkeys, with all other kinds of wild game are extremely plenty. A good hunter, without much fatigue to himself, could here supply daily one hundred men with meat. The course of the Ohio, from Elk River to Little Conhawa, is about south.

20th. At six in the morning we embarked in our boats, and proceeded down to the mouth of Hochocken or Bottle River, where we were obliged to encamp, having a strong head wind against us. We made but twenty miles this day, and passed by five very fine islands; the country the whole way being rich and level, with high and steep banks to the rivers. From here I despatched an Indian to the Plains of Scioto, with a letter to the French traders from the Illinois residing there, amongst the Shawnesse, requiring them to come and join me at the mouth of Scioto, in order to proceed with me to their own country, and take the oaths of allegiance to his Britannic Majesty, as they were now become his subjects, and had no right to trade there without license. At the same time, I sent messages to the Shawnesse Indians to oblige the French to come to me in case of refusal.

21st. We embarked at half past 8 o'clock in the morning, and sailed to a place called the Big Bend, about thirty-five miles below Bottle River. The course of the Ohio, from Little Conhawa River to Big Bend, is about south-west by south. The country hereabouts abounds with buffaloe, bears, deer, and all sorts of wild game, in such plenty, that we killed out of our boats as much as we wanted. We proceeded down the river to the Buffalo Bottom, about ten miles from the beginning of the Big Bend, where we encamped. The country on both sides of the river, much the same as we passed the day before. This day we passed nine islands, all lying high out of the water.

22d. At half an hour past 5 o'clock, set off and sailed to a place, called the Alum Hill, so called from the great quantity of that mineral found there by the Indians; this place lays about ten miles from Buffalo Bottom; thence we sailed to the mouth of Great Conhawa River, being ten miles from the Alum Hill. The course of the river, from the Great Bend to this place, is mostly west; from hence we proceeded down to Little Guyondott River, where we encamped, about thirty miles from Great Conhawa; the country still fine and level; the banks of the river high, with abundance of creeks and rivulets falling into it. This day we passed six fine islands. In the evening one of our Indians discovered three Cherokees near our encampment, which obliged our Indians to keep out a good guard the first part of the night. Our party being pretty strong, I imagine the Cherokees were afraid to attack us, and so ran off.

23d. Decamped about five in the morning, and arrived at Big Guyondott, twenty miles from our last encampment: the country as of yesterday; from hence we proceeded down to Sandy River, being twenty miles further; thence to the mouth of Scioto, about forty miles from the last mentioned river. The general course of the river, from Great Conhawa to this place, inclines to the south-west. The soil rich, the country level, and the banks of the river high. The soil on the banks of Scioto, for a vast distance up the country, is prodigious rich, the bottoms very wide, and in the spring of the year, many of them are flooded, so that the river appears to be two or three miles wide. Bears, deer, turkeys, and most sorts of wild game, are very plenty on the banks of this river. On the Ohio, just below the mouth of Scioto, on a high bank, near forty feet, formerly stood the Shawnesse town, called the Lower Town, which was all carried away, except three or four houses, by a great flood in the Scioto. I was in the town at the time, though the banks of the Ohio were so high, the water was nine feet on the top, which obliged the whole town to take to their canoes, and move with their effects to the hills. The Shawnesse afterwards built their town on the opposite side of the river, which, during the French war, they abandoned, for fear of the Virginians, and removed to the plains on Scioto. The Ohio is about one hundred yards wider here than at Fort Pitt, which is but a small augmentation, considering the great number of rivers and creeks, that fall into it during the course of four hundred and twenty miles; and as it deepens but very little, I imagine the waters sink, though there is no visible appearance of it. In general all the lands on the Scioto River, as well as the bottoms on Ohio, are too rich for any thing but hemp, flax, or Indian corn.

24th, 25th, and 26th. Stayed at the mouth of Scioto, waiting for the Shawnesse and French traders, who arrived here on the evening of the 26th, in consequence of the message I sent them from Hochocken, or Bottle Creek.

27th. The Indians requested me to stay this day, which I could not refuse.

28th. We set off: passing down the Ohio, the country on both sides the river level; the banks continue high. This day we came sixty miles; passed no islands. The river being wider and deeper, we drove all night.

29th. We came to the little Miame River, having proceeded sixty miles last night.

30th. We passed the great Miame River, about thirty miles from the little river of that name, *and in the evening arrived at the place where the elephants' bones are found*, where we encamped, intending to take a view of the place next morning. This day we came about seventy miles. The country on both sides level, and rich bottoms well watered.

31st. *Early in the morning we went to the great Lick, where those bones are only found, about four miles from the river, on the south-east side. In our way we passed through a fine timbered clear wood; we came into a large road which the buffaloes have beaten, spacious enough for two wagons to go abreast, and leading straight into the Lick.* It appears that there are vast quantities of these bones lying five or six feet under ground, which we discovered in the bank, at the edge of the Lick. We found here two tusks above six feet long; we carried one, with some other bones, to our boats, and set off. This day we proceeded down the river about eighty miles, through a country much the same as already described, since we passed the Scioto. In this day's journey we passed the mouth of the River Kentucky, or Holsten's River.

June 1st. We arrived within a mile of the Falls of Ohio, where we encamped, after coming about fifty miles this day.

2d. Early in the morning we embarked, and passed the Falls. The river being very low we were obliged to lighten our boats, and pass on the north side of a little island, which lays in the middle of the river. In general, what is called the Fall here, is no more than rapids; and in the least fresh, a batteau of any size may come and go on each side without any risk. This day we proceeded sixty miles, in the course of which we passed Pidgeon River. The country pretty high on each side of the River Ohio.

3d. In the forepart of this day's course, we passed high lands; about midday we came to a fine, flat, and level country, called by the Indians the Low Lands; no hills to be seen. We came about eighty miles this day, and encamped.

4th. We came to a place called the Five Islands; these islands are very long, and succeed one another in a chain; the country still flat and level, the soil exceedingly rich, and well watered. The high lands are at least fifty miles from the banks of the Ohio. In this day's course we passed about ninety miles, the current being very strong.

5th. Having passed the Five Islands, we came to a place called the Owl River. Came about forty miles this day. The country the same as yesterday.

6th. We arrived at the mouth of the Ouabache, where we found a breast-work erected, supposed to be done by the Indians. The mouth of this river is about two hundred yards wide, and in its course runs through one of the finest countries in the world, the lands being exceedingly rich, and well watered; here hemp might be raised in immense quantities. All the bottoms, and almost the whole country abounds with great plenty of the white and red mulberry tree. These trees are to be found in great plenty, in all places between the mouth of Scioto and the Ouabache: the soil of the latter affords this tree in plenty as far as Ouicatonon, and some few on the Miame River. Several large fine islands lie in the Ohio, opposite the mouth of the Ouabache, the banks of which are high, and consequently free from inundations; hence we proceeded down the river about six miles to encamp, as I judged some Indians were sent to way-lay us, and came to a place called the Old Shawnesse Village, some of that nation having formerly lived there. In this day's proceedings we came about seventy-six miles. The general course of the river, from Scioto to this place, is south-west.

7th. We stayed here, and despatched two Indians to the Illinois by land, with letters to Lord Frazer, an English officer, who had been sent there from Fort Pitt, and Monsieur St. Ange, the French commanding officer at Fort Chartres, and some speeches to the Indians there, letting them know of my arrival here; that peace was made between us and the Six Nations, Delawares, and Shawnesse, and of my having a number of deputies of those nations along with me, to conclude matters with them also on my arrival there. This day one of my men went into the woods and lost himself.

8th. At day-break we were attacked by a party of Indians, consisting of eighty warriors of the Kiccapoos and Musquattimes, who killed two of my men and three Indians, wounded myself and all the rest of my party, except two white men and one Indian; then made myself and all the white men prisoners, plundering us of every thing we had. A deputy of the Shawnesse who was shot through the thigh, having concealed himself in the woods for a few minutes after he was wounded—not knowing but they were southern Indians, who are always at war with the northward Indians—after discovering what nation they were, came up to them and made a very bold speech, telling them that the whole northward Indians would join in taking revenge for the insult and murder of their people; this alarmed those savages very much, who began excusing themselves, saying their fathers, the French, had spirited them up, telling them that the Indians were coming with a body of southern Indians to take their country from them, and enslave them; that it was this that induced them to commit this outrage. After dividing the plunder, (they left great part of the heaviest effects behind, not being able to carry them,) they set off with us to their village at Ouattonon, in a great hurry, being in dread of a pursuit from a large party of Indians they suspected were coming after me. Our course was through a thick woody country, crossing a great many swamps, morasses, and beaver ponds. We travelled this day about forty-two miles.

9th. An hour before day we set out on our march; passed through thick woods, some high lands, and small savannahs, badly watered. Travelled this day about thirty miles.

10th. We set out very early in the morning, and marched through a high country, extremely well timbered, for three hours; then came to a branch of the Ouabache, which we crossed. The remainder of this day we travelled through fine rich bottoms, overgrown with reeds, which make the best pasture in the world, the young reeds being preferable to sheaf oats. Here is great plenty of wild game of all kinds. Came this day about twenty-eight, or thirty miles.

11th. At day-break we set off, making our way through a thin woodland, interspersed with savannahs. I suffered extremely by reason of the excessive heat of the weather, and scarcity of water; the little springs and runs being dried up. Travelled this day about thirty miles.

12th. We passed through some large savannahs and clear woods; in the afternoon we came to the Ouabache; then marched along it through a prodigious rich bottom, overgrown with reeds and wild hemp; all this bottom is well watered, and an exceeding fine hunting ground. Came this day about thirty miles.

13th. About an hour before day we set out; travelled through such bottoms as of yesterday, and through some large meadows, where no trees, for several miles together, are to be seen. Buffaloes, deer, and bears are here in great plenty. We travelled about twenty-six miles this day.

14th. The country we travelled through this day, appears the same as described yesterday, excepting this afternoon's journey through wood land, to cut off a bend of the river. Came about twenty-seven miles this day.

15th. We set out very early, and about one o'clock came to the Ouabache, within six or seven miles of Port Vincent. On my arrival there, I found a village of about eighty or ninety French families settled on the east side of this river, being one of the finest situations that can be found. The country is level and clear, and the soil very rich, producing wheat and tobacco. I think the latter preferable to that of Maryland or Virginia. The French inhabitants hereabouts, are an idle, lazy people, a parcel of renegadoes from Canada, and are much worse than the Indians. They took a secret pleasure at our misfortunes, and the moment we arrived, they came to the Indians, exchanging trifles for their valuable plunder. As the savages took from me a considerable quantity of gold and silver in specie, the French traders extorted ten half johannes from them for one pound of vermilion. Here is likewise an Indian village of the Pyankeshaws, who were much displeased with the party that took me, telling them that "our and your chiefs are gone to make peace, and you have begun a war, for which our women and children will have reason to cry." From this post the Indians permitted me to write to the Commander, at Fort Chartres, but would not suffer me to write to any body else, (this I apprehend was a precaution of the French, lest their villany should be perceived too soon,) although the Indians had given me permission to write to Sir William Johnson and Fort Pitt on our march, before we arrived at this place. But immediately after our arrival they had a private council with the French, in which the Indians urged, (as they afterwards informed me,) that as the French had engaged them in so bad an affair, which was likely to bring a war on their nation, they now expected a proof of their promise and assistance. Then delivered the French a scalp and part of the plunder, and wanted to deliver some presents to the Pyankeshaws; but they refused to accept of any, and declared they would not be concerned in the affair. This last information I got from the Pyankeshaws, as I had been well acquainted with them several years before this time.

Port Vincent is a place of great consequence for trade, being a fine hunting country all along the Ouabache, and too far for the Indians, which reside hereabouts, to go either to the Illinois, or elsewhere, to fetch their necessaries.

16th. We were obliged to stay here to get some little apparel made up for us, and to buy some horses for our journey to Ouicatonon, promising payment at Detroit, for we could not procure horses from the French for hire; though we were greatly fatigued, and our spirits much exhausted in our late march, they would lend us no assistance.

17th. At midday we set out; travelling the first five miles through a fine thick wood. We travelled eighteen miles this day, and encamped in a large, beautiful, well watered meadow.

18th and 19th. We travelled through a prodigious large meadow, called the Pyankeshaw's Hunting Ground: here is no wood to be seen, and the country appears like an ocean; the ground is exceedingly rich, and partly overgrown with wild hemp; the land, well watered, and full of buffaloe, deer, bears, and all kinds of wild game.

20th and 21st. We passed through some very large meadows, part of which belong to the Pyankeshaws on Vermilion River; the country and soil much the same as that we travelled over for these three days past; wild hemp grows here in abundance; the game very plenty: at any time, in half an hour we could kill as much as we wanted.

22d. We passed through part of the same meadow as mentioned yesterday; then came to a high woodland, and arrived at Vermilion River, so called from a fine red earth found here by the Indians, with which they paint themselves. About half a mile from the place where we crossed this river, there is a village of Pyankeshaws, distinguished by the addition of the name of the river. We then travelled about three hours, through a clear high woody country, but a deep and rich soil; then came to a meadow, where we encamped.

23d. Early in the morning we set out through a fine meadow, then some clear woods; in the afternoon came into a very large bottom on the Ouabache, within six miles of Ouicatanon; here I met several chiefs of the Kicapoos and Musquattimes, who spoke to their young men who had taken us, and reprimanded them severely for what they had done to me, after which they returned with us to their village, and delivered us all to their chiefs.

The distance from Port Vincent to Ouicatanon is two hundred and ten miles. This place is situated on the Ouabache. About fourteen French families are living in the fort, which stands on the north side of the river. The Kicapoos and Musquattimes, whose warriors had taken us, live nigh the fort, on the same side of the river, where they have two villages; and the Ouicatonons have a village on the south side of the river. At our arrival at this post, several of the Wawcottonans, (or Ouicatonans) with whom I had been formerly acquainted, came to visit me, and seemed greatly concerned at what had happened. They went immediately to the Kiccapoos and Musquatimes, and charged them to take the greatest care of us, till their chiefs should arrive from the Illinois, where they were gone to meet me some time ago, and who were entirely ignorant of this affair, and said the French had spirited up this party to go and strike us.

The French have a very great influence over these Indians, and never fail in telling them many lies to the prejudice of his Majesty's interest, by making the English nation odious and hateful to them. I had the greatest difficulties in removing these prejudices. As these Indians are a weak, foolish, and credulous people, they are easily imposed on by a designing people, who have led them hitherto as they pleased. The French told them that as the southern Indians had for two years past made war on them, it must have been at the instigation of the English, who are a bad people. However I have been fortunate enough to remove their prejudice, and, in a great measure, their suspicions against the English. The country hereabouts is exceedingly pleasant, being open and clear for many miles; the soil very rich and well watered; all plants have a quick vegetation, and the climate very temperate through the winter. This post has always been a very considerable trading place. The great plenty of furs taken in this country, induced the French to establish this post, which was the first on the Ouabache, and by a very advantageous trade they have been richly recompensed for their labour.

On the south side of the Ouabache runs a high bank, in which are several fine coal mines, and behind this bank, is a very large meadow, clear for several miles. It is surprising what false information we have had respecting this country: some mention these spacious and beautiful meadows as large and barren savannahs. I apprehend it has been the artifice of the French to keep us ignorant of the country. These meadows bear fine wild grass, and wild hemp ten or twelve feet high, which, if properly manufactured, would prove as good, and answer all the purposes of the hemp we cultivate.

July 25th. We set out from this place (after settling all matters happily with the natives) for the Miames, and travelled the whole way through a fine, rich bottom, overgrown with wild hemp, alongside the Ouabache, till we came to Eel River, where we arrived the 27th. About six miles up this river is a small village of the Twightwee, situated on a very delightful spot of ground on the bank of the river. The Eel river heads near St. Joseph's, and runs nearly parallel to the Miames, and at some few miles distance from it, through a fine, pleasant country, and after a course of about one hundred and eighty miles empties itself into the Ouabache.

28th, 29th, 30th and 31st. We travelled still along side the Eel River, passing through fine clear woods, and some good meadows, though not so large as those we passed some days before. The country is more overgrown with woods, the soil is sufficiently rich, and well watered with springs.

August 1st. We arrived at the carrying place between the River Miames and the Ouabache, which is about nine miles long in dry seasons, but not above half that length in freshes. The head of the Ouabache is about forty miles from this place, and after a course of about seven hundred and sixty miles from the head spring, through one of the finest countries in the world, it empties itself into the Ohio. The navigation from hence to Ouicatanon, is very difficult in low water, on account of many rapids and rifts; but in freshes, which generally happen in the spring and fall, batteaux or canoes will pass, without difficulty, from here to Ouicatanon in three days, which is about two hundred and forty miles, and by land about two hundred and ten miles. From Ouicatanon to Port Vincent, and thence to the Ohio, batteaux and canoes may go at any season of the year. Throughout the whole course of the Ouabache the banks are pretty high, and in the river are a great many islands. Many shrubs and trees are found here unknown to us.

Within a mile of the Twightwee village, I was met by the chiefs of that nation, who received us very kindly. The most part of these Indians knew me, and conducted me to their village, where they immediately hoisted an English flag that I had formerly given them at Fort Pitt. The next day they held a council, after which they gave me up all the English prisoners they had, then made several speeches, in all which they expressed the great pleasure it gave them, to see the unhappy differences which embroiled the several nations in a war with their brethren, the English, were now so near a happy conclusion, and that peace was established in their country.

The Twightwee village is situated on both sides of a river, called St. Joseph's. This river, where it falls into the Miame river, about a quarter of a mile from this place, is one hundred yards wide, on the east side of which stands a stockade fort, somewhat ruinous.

The Indian village consists of about forty or fifty cabins, besides nine or ten French houses, a runaway colony from Detroit, during the late Indian war; they were concerned in it, and being afraid of punishment, came to this post, where ever since they have spirited up the Indians against the English. All the French residing here are a lazy, indolent people, fond of breeding mischief, and spiriting up the Indians against the English, and should by no means be suffered to remain here. The country is pleasant, the soil rich and well watered. After several conferences with these Indians and their delivering me up all the English prisoners they had,——

On the 6th of August we set out for Detroit, down the Miames river in a canoe. This river heads about ten miles from hence. The river is not navigable till you come to the place where the river St. Joseph joins it, and makes a considerable large stream, nevertheless we found a great deal of difficulty in getting our canoe over shoals, as the waters at this season were very low. The banks of the river are high, and the country overgrown with lofty timber of various kinds; the land is level, and the woods clear. About ninety miles from the Miames or Twightwee, we came to where a large river, that heads in a large lick, falls into the Miame river; this they call the Forks. The Ottawas claim this country, and hunt here, where game is very plenty. From hence we proceeded to the Ottawa village. This nation formerly lived at Detroit, but is now settled here, on account of the richness of the country, where game is always to be found in plenty. Here we were obliged to get out of our canoes, and drag them eighteen miles, on account of the rifts which interrupt the navigation. At the end of these rifts, we came to a village of the Wyondotts, who received us very kindly; and from thence we proceeded to the mouth of this river, where it falls into Lake Erie. From the Miames to the lake is computed one hundred and eighty miles, and from the entrance of the river into the lake to Detroit, is sixty miles; that is, forty-two miles upon the lake, and eighteen miles up the Detroit river to the garrison of that name. The land on the lake side is low and flat. We passed several large rivers and bays, and on the 16th of August, in the afternoon, we arrived at Detroit river. The country here is much higher than on the lake side; the river is about nine hundred yards wide, and the current runs very strong. There are several fine and large islands in this river, one of which is nine miles long; its banks high, and the soil very good.

17th. In the morning we arrived at the fort, which is a large stockade, inclosing about eighty houses, it stands close on the north side of the river, on a high bank, commands a very pleasant prospect for nine miles above; and nine miles below the fort; the country is thick settled with French, their plantations are generally laid out about three or four acres in breadth on the river, and eighty acres in depth; the soil is good, producing plenty of grain. All the people here are generally poor wretches, and consist of three or four hundred French families, a lazy, idle people, depending chiefly on the savages for their subsistence; though the land, with little labour, produces plenty of grain, they scarcely raise as much as will supply their wants, in imitation of the Indians, whose manners and customs they have entirely adopted, and cannot subsist without them. The men, women, and children speak the Indian tongue perfectly well. In the last Indian war the most part of the French were concerned in it, (although the whole settlement had taken the oath of allegiance to his Britannic Majesty) they have, therefore, great reason to be thankful to the English clemency in not bringing them to deserved punishment. Before the late Indian war there resided three nations of Indians at this place: the Putawatimes, whose village was on the west side of the river, about one mile below the fort; the Ottawas, on the east side, about three miles above the fort; and the Wyondotts, whose village lays on the east side, about two miles below the fort. The former two nations have removed to a considerable distance, and the latter still remain where they were, and are remarkable for their good sense and hospitality. They have a particular attachment to the Roman Catholic religion, the French, by their priests, having taken uncommon pains to instruct them.

During my stay here, I held frequent conferences with the different nations of Indians assembled at this place, with whom I settled matters to their general satisfaction.

September 26th. Set out from Detroit for Niagara; passed Lake Erie along the north shore in a birch canoe, and arrived the 8th of October at Niagara. The navigation of the lake is dangerous for batteaux or canoes, by reason the lake is very shallow for a considerable distance from the shore. The bank, for several miles, high and steep, and affords a harbour for a single batteau. The lands in general, between Detroit and Niagara, are high, and the soil good, with several fine rivers falling into the lake. The distance from Detroit to Niagara is computed three hundred miles.

A List of the different Nations and Tribes of Indians in the Northern District of North America, with the number of their fighting Men.

Names of the Tribes.	*Nos.*	*Their Dwelling Ground.*	*Their Hunting Ground.*
Mohocks, *a*	160	Mohock River.	Between that and Lake George.
Oneidas, *b*	300	East side of Oneida Lake, and on the head waters of the east branch of Susquehannah.	In the country where they live.
Tuscaroras, *b*	200	Between the Oneidas and Onandagoes.	Between Oneida Lake and Lake Ontario.
Onandagoes, *b*	260	Near the Onandago Lake.	Between Onandago lake and mouth of Seneca River, near Oswego.
Cayugas, *b*	200	On two small Lakes, called the Cayuagas, on the north branch of Susquehannah.	Where they reside.
Senecas, *b*	1000	Seneca Country, on the waters of Susquehannah, the waters of Lake Ontario, and on the heads of Ohio River.	Their chief hunting country thereabouts.
Aughquagas, *c*	150	East branch of Susquehannah River, and on Aughquaga.	Where they live.
Nanticokes, *c*	100	Utsanango, Chaghmett, Oswego, and on the east branch of Susquehannah.	Do.
Mohickons, *c*	100		
Conoys, *c*	30		
Monsays, *c*	150	At Diahogo, and other villages up the north branch of Susquehannah.	Do.
Sapoones, *c*	30		
Delawares, *c*	150		

a These are the oldest Tribe of the Confederacy of the Six Nations.
b Connected with New York, part of the Confederacy with New York.
c Connected with, and depending on the Five Nations.

Names of the Tribes.	*Nos.*	*Their Dwelling Ground.*	*Their Hunting Ground.*
Delawares, *d*	600	Between the Ohio and Lake Erie, on the branches of Beaver Creek, Muskingum, and Guyehugo.	Where they live.
Shawnesse, *d*	300	On Scioto, & branch of Muskingum.	Do.
Mohickone, *d*	300	In Villages near Sandusky.	On the head banks of Scioto.
Coghnawages, *d*			
Twightwees, *e*	250	Miame River, near Fort Miame.	On the ground where they reside.
Wayoughtanies, *f*	300	On the branches of Ouabache, near Fort Ouitanon.	Between Ouitanon and the Miames.
Pyankeshas, *f*	300		
Shockays, *f*	200		
Huskhuskeys, *g*	300	Near the French Settlements, in the Illinois Country.	
Illinois, *g*	300		
Wayondotts, *h*	250	Near Fort Detroit.	About Lake Erie.
Ottawas, *h*	400		
Putawatimes, *h*	150		
Chipawas, *i* / Ottawas, *i*	200	On Saganna Creek, which empties into Lake Huron.	Thereabouts.
Chipawas, *j*	400	Near Michilimachinac.	On the north side of Lake Huron.
Ottawas, *j*	250		
Chipawas,* *k*	400	Near the entrance of Lake Superior, and not far from Fort St. Marys.	Thereabouts.
Chepawas, *k* / Mynonamies, *k* / Shockeys, *k*	550	Near Fort LaBay on the Lake Michigan.	Their hunting ground is thereabouts.
Putawatimes, *k*	150	Near Fort St. Joseph's.	Thereabouts.
Ottawas, *k*	150		
Kicapoos, *l* / Outtagamies, *l* / Musquatans *l* / Miscotins, *l* / Outtamacks, *l* / Musquakeys, *l*	4000	On Lake Michigan and between it and the Mississippi.	Where they respectively reside.
Oswegatches, *h*	100	Settled at Swagatchy in Canada, on the River St. Lawrence.	Thereabouts.
Connesedagoes, *k* / Coghnewagoes, *k*	300	Near Montreal.	
Orondocks, *k*	100	Settled near Trois Riviers.	
Abonakies, *k*	150		
Alagonkins, *k*	100		
La Suil,†	10,000	South-west of Lake Superior	

d Dependent on the Six Nations, and connected with Pennsylvania.
e Connected with Pennsylvania.
f Connected with the Twightwees.
g These two Nations the English had never any trade, or connection with.
h Connected formerly with the French.
i Connected with the Indians about Detroit, and dependent on the commanding officer.
j Always connected with the French.
k Connected with the French.
l Never connected in any trade or otherwise with the English.

*There are several villages of Chapawas settled along the bank of Lake Superior, but as I have no knowledge of that country, cannot ascertain their numbers.

† These are a nation of Indians settled south-west of Lake Superior, called by the French La Sue; who, by the best account that I could ever get from the French and Indians, are computed ten thousand fighting men. They spread over a large tract of country, and have forty odd villages; in which country are several other tribes of Indians, who are tributaries to the Lasues, none of whom, except a very few, have ever known the use of fire-arms; as yet but two villages. I suppose the French don't choose to risk a trade among such a powerful body of people, at so vast a distance.

GEOLOGICAL NOTICES OF BARBARY.

Abstract of M. Rozet's Geological Notices of Barbary, originally published in the "Journal de Geologie," for September, December, 1830, and January 1831.

Our object being to lay before our readers that kind of transatlantic information which is most curious in itself, and which is the least likely to be within their reach, we have thought they would be pleased with an account of the geology of that part of Barbary which the conquest of Algiers by the French, has made known. M. Rozet is a distinguished geologist, and is one of the joint editors, with M. A. Boue, and Jobert, of the "Journal de Geologie." The French government, which omits no opportunity to cherish science, when it sent the expedition to Africa, gave M. Rozet an appointment as Geographical Engineer, that every advantage might be taken of the expedition, in favour of geological science. M. Rozet has sent some very interesting memoirs on this subject to France, from the three first of which we have made the following abstracts, and have accompanied them with M. Rozet's sections. Ed.

M. Rozet, after saying that the French army landed 14th June, 1830, states, that "Algiers is built on a talcose schist, like that on the French coast at Toulon, and is traversed in its mass by veins of white quartz; that it passes in the upper part into mica schist; contains beds of white feldspar, subordinate masses of grey sub-lamellar, stratified lime stone, more than 100 metres thick, (328 feet English)—the strata thin, and separated by partings of talcose or micaceous schist, beautiful pyrites of copper in the mass. Near the suburbs of Babaloued there are some beds of white marble, worked for public buildings. This schistose groupe exceeds 500 metres in thickness (1640 feet.) The strata are irregular, and dip to the south, at an angle of from 20° to 45°. The mountains are 400 metres (1312 feet) above the level of the sea. (Mt. Banjareah.) The tops of these hills are rounded, and their sides very steep. They are separated from each other by deep valleys, through which small rivulets flow. The inhabited part of the country presents a magnificent vegetation; forests of orange, fig, and olive trees, separated by majestic palm trees, and tall hedges of the agave or aloe. This schistose formation is well developed around Algiers; at the east it rises to the summit of Mount Banjareah, and stretches along the coast at least as far as Cape Corinna. The fort of Twenty-four hours, and all the buildings of the mole, stand upon the grey limestone. About the mole the beds dip to the east. The gneiss forms a somewhat narrow belt, stretching from east to west. It leaves the sea-shore in front of fort Babazoum, passes to the emperor's castle, and the mountains which command that fortress, and is lost to the south under the tertiary deposits. M. Rozet remarks, that this gneiss which has all the characters of a primitive rock, *reposes upon talcose schists*, which appear *to belong to the transition*; but that the veins of mica schist passing through the gneiss, prove this last to be the oldest rock, although it covers the talcose schists which pass into mica slate. We leave the French geologists to reconcile this unconformable condition of gneiss to the modern opinions concerning transition.

The gneiss dips to the south, under the tertiary, a calcaire grossier, (London clay), or a grès calcaire, (calcareous sandstone,) passing into a pudding stone, resembling the calcaire *moellon* of Montpelier. These calcareous beds, like the gneiss, on which they repose, dip to the south. They pass occasionally into compact limestone, (at Staoueli) containing limnea and helices, together with marine shells. In other places, M. Rozet found large flat oysters, and large pectens, resembling those which characterize the beds in Provence. The tertiary abounds along the coast, from the Swedish consulate to El Aratch, with well preserved pectens, large oysters, and some terebratulæ. The tertiary is covered with diluvial soil, but in no part had fossil bones of quadrupeds been found. The tertiary formation is thought to cover a surface of country of twenty square leagues. The table lands, the plains, and the bottoms of the valleys, are covered with diluvial soil, resembling that of France. The superficial part is formed of a red or yellowish marl; beneath it is a mass of marl and rolled pebbles, all derived from the neigbhouring mountains. On the narrow plain to the east and west of Algiers, the diluvial soil is more than ten metres (32 feet) thick, with some boulders. M. Rozet finds a strong analogy between the geological phenomena of the opposite coasts of the Mediterranean.

Geological Notice of the country traversed by the French army, in the expedition of Media.

To punish the Bey of Titery for his treason, General Clausel resolved to seek him out in the middle of the Atlas. The army left Algiers the 17th November, traversing the tertiary hills before mentioned, on its way to the plain of Metidjah,* and directing its route towards the south-west, on the road to Bleidah. The plain was covered throughout with diluvial soil, lying in undisturbed horizontal layers, about 13½ feet thick, but in the bed of the Chieffa, at the foot of the Atlas, it was about 33 feet thick. The Metidjah is almost uninhabited, and nearly uncultivated, except where it joins the Atlas; there the town of Bleidah is charmingly situated, and almost surrounded with magnificent gardens of orange trees. The chain of the little Atlas is here at its greatest elevation, rising to more than 1200 metres, (3937 feet;) the valleys are deep and narrow, and the mountains covered with woods. These mountains are formed of the same rocks as those of Banjareah, near Algiers, with the strata dipping to the south: they present the same aspect as far west as the great farm of Huche de l'Aga; here the aspect of the mountains changes, they lower rapidly to the west, the planes have a less inclination, the vegetation is not as fine, and a change in the soil is announced. The first rock that occurred on the Atlas was a greyish black limestone, of a conchoidal fracture, passing into a marly and schistose limestone, and alternately with schistose marls, in the manner of the lias. The general inclination of the beds is to the south, at an angle varying from 10 to 40°, for the hills and tables, and which in the great escarpements rose to 70°. The stratification is often disturbed, but no volcanic rocks. This formation is poor in fossils, some broken pectens and ostrea, but no gryphea, ammonites, or belemnites. The schistose marls contain small bivalves, (possidonia) which in Europe are characteristic of the lias. An hour before arriving at the Col de Temiah,† which is on the dividing water line, the mass is almost altogether marly, the limestone becoming subordinate. The Col de Temiah has been hollowed out of these marls; the general dip is to the south. The strata south of the Col are cut by veins, almost vertical, of carbonated iron, and laminar sulphated barytes, mixed with grey copper, malachite, and a little blue carbonate. These veins are exposed about eighty metres, (262 feet) and the copper might be worked to advantage. Calcareous and schistose marls, and the laminar barytes, occur in like manner in Provence, Burgundy, and Ardennes, and M. Rozet considers them true equiva-

* Pl. 7. Fig. 2. † Pl. 7. Fig. 2, continued.

lents. This formation constitutes mountains 1100 metres (3609 feet) above the level of the sea, with few escarpments, although a talus is generally to be observed. The timber is oak and cork. There are no fruit trees in the Atlas, and the olive is only found as far as Media. After passing the Col de Temiah, the road is extremely difficult, with scarce room for two to pass abreast; and after a march of an hour and a half, the army came to the foot of the chain, upon a small narrow table land, perfectly smooth. A new change in the beds appeared here, the hills were closed in by the sub-appenine formation. At the foot of the chain, the hills which abut upon the lias, are entirely composed of an argillaceous blueish marl, not schistose like that of the north; about 100 metres thick, (328 feet) and no appearance of stratification. It contains gypsum, which furnishes plaster for the buildings at Media, Pectens, Pectunculi; and an immense quantity of that murex, which is characteristic of the calcareous moellon of Provence, is found in a yellow ferruginous sand stone, alternating with ferruginous sand, at the upper part of the hills. As far as Media, three leagues south-east from the Atlas, and a league further to the south, M. Rozet found the tertiary formation occurring in like manner. The town of Media* occupies the summit of a hill, situated upon the north flank of a great valley, which runs nearly from east to west. Section No. 2, terminates at this valley, and No. 3, made about three miles east of it, traverses the same valley, and shows the details of the sub-atlantic tertiary. This formation constitutes hills and small mountains, some of which are 1000 metres, or 3280 feet above the level of the sea, and is entirely identical with that of those hills, which, stretching along the coast from Cape Matifon to Cherchel, border the plain of Metidjah to the north; so that this tertiary has been deposited on each slope of the little Atlas, but not in the interior of the chain. M. Rozet concludes this interesting paper, by showing that the beds of the lias being highly inclined, and the tertiary deposits abutting horizontally against them, the chain of the little Atlas was necessarily raised before the deposit of these last.

In a subsequent paper, M. Rozet further shows that to the north of Metidjah, the hills which extend from Cape Matifou to beyond Kubber Romèrh, are formed of sub-atlantic tertiary, of the same character as that south of the little Atlas. Blue marl,

* Pl. 7. Fig. 3.

covered by sandstone, (grès) alternating with sand, the sandstones containing the same shells with the calcaire moellon of Provence. He had found belemnites in the supposed lias. He concludes by stating that the groupe of talcose schists is the inferior floor of the provinces of Algiers and Titery; that the tertiaries have been deposited posterior to the elevation of the schists, and that certain trachytic porphyrys, near the ancient Rustonium, about six leagues from Algiers, did not make their appearance until after the deposit of the tertiaries."

Our geological readers will be struck with the importance of the remarkable agreement of the entire formations, of the opposite coasts of the Mediterranean, as well as with the equivalent tertiaries south of the little Atlas; all of which facts occasion many curious reflections concerning the ancient geological state of that part of the world.

In concluding this abstract, we would point to the especial interest which these notices of M. Rozet will in future create, when it is known that the principal geological circumstances which he has so clearly made out on the coast, and in the interior of the province of Algiers, are, with the exception of the Atlas chain, repeated on our Atlantic coast; where we have the primary rocks stretching from New York to Florida, with occasional deposits of blue marl, covered with sandstone and ferruginous sand, as at Mullica Hall, Tinton Falls near Long Branch in New Jersey, and many other places, the secondary character of these is well made out by belemnites, crocodiles, saurians, &c.—and they are again superimposed by acknowledged tertiaries, in New Jersey, Delaware, and especially in Maryland and further south, to the total exclusion of the great calcareous deposits connected with coal, and the numerous beds of the oolitic series and chalk formation. We hope, ere long, to be in a situation to enter systematically upon the geology of this country; but we perceive more and more forcibly the necessity of raising up a school, and of rallying practical geologists here, before we can look for such contributions and aid, as the important task before us demands.

BONES IN CAVES, &c.

Extract of a letter from the Rev. Dr. Buckland to the Editor, dated Aug. 23, 1831.

"I have, not long since, had in my custody a fine meteoric stone about four pounds weight, that fell in Oxfordshire at Launton, near Bicester, in the spring of 1830; it is the property of Dr. Lee of Aylesbury. An account of it has been published in Loudon's Magazine of Natural History for March last. Since that time a piece of it has been examined by Farraday, *and found to contain chromium, as usual.* [This was doubted.]

"My expedition to Llandilo was in consequence of a report I received from W. Long Wrey, Esq., who resides at Llandebie, near Llandilo, stating that he had found a cave containing human bones mixed with those of other animals. This is the cave mentioned in my Reliquiæ,* and on my arrival I found, as I had expected, that the bones are of two distinct æras. First, at the top, and enveloped in stalagmite, were the human remains—probably of Celtic inhabitants that used this cave as a place of sepulture. Second, between the stalagmite, in diluvial sand and mud, the bones of bears, elks, and smaller deer, in the usual state of cave bones, just like those at Torquay. I saw none that had been gnawed, and too few of them had been collected to enable me to say whether it was a den or pitfall; and the deposit was so buried under the rubbish of the lime burners, that it was impossible to examine further, until the lime burning ceases, which will be in the autumn, when Mr. Wrey will again proceed to search. The whole of the rock that covered over the spot in which these human skeletons lay, has been removed.

"I have just received intelligence of the arrival in London of five cases of bones for me, from the cave at Wellington valley, collected by Mr. Henderson, (a surgeon) for Col. Dumaresque, who has forwarded them to me. I have not yet seen them, but am anxious to compare them with those sent to the Geological Society by Major Mitchell: the abstract published in the pro-

* "The other case occurred in 1810, at Llandebie, in Caermarthenshire, where a square cave was suddenly broken into, in working a quarry of solid mountain limestone, on the north border of the great coal basin. In this cave lay about a dozen human skeletons in two rows, at right angles to each other. The passage leading to this cave had been entirely closed up with stones for the purpose of concealment, and its mouth was completely grown over with grass.—Reliquiæ Diluvianæ, 2d ed. p. 166.

ceedings of the Geological Society, gives the whole sum and substance of the paper which he sent to the society, in which no theory is offered to explain their origin. In the account published in Jameson's Journal,* it was stated to be a cave like Kirkdale, of accumulation by the agency of beasts of prey. I do not concur in this opinion; there were no gnawed bones in the whole collection, and the mass was not collected in a horizontal cave, but in a great fissure, *into which I conceive the animals have tumbled during successive generations.* The position of the bones in the vertical fissure shows it never could have been a den; they lie in heaps amid angular blocks fallen from the sides of the fissure, and mixed with stalagmite, and red earthy incrustations, forming a cement, such as rains and trickling water may have introduced. There is no sign of violent igneous action, no rolled pebbles, no fragments of any distant rock, and in one case several bones of a carpus, adhering together by stalagmite: these have clearly been submitted to no violent agitation by water; but as the exact circumstances in which this specimen was found are not mentioned, it is possible this carpus may be derived from one of the most recently introduced animals. I have no doubt the fissure has thus been supplied with bones by animals falling into it, as in the Mediterranean fissures. There is no evidence to show that there is in it any accumulation of diluvium. Mr. Pentland is positive that the large bone found high up near the top of the deposit, is the bone of an elephant; and Mr. Clift is equally positive as to the tusk fixed in the anterior part of the jaw of a dugong. These are strange bed-fellows for kangaroos, wombats, and the *genus omne* of present inhabitants of New Holland. The place of the elephant's bone is known from the fact of a rope having been tied to it, to let down the persons who were descend-

* In the account given to Dr. Jameson by Dr. Lang of Sydney, and which was published in the ed. N. Phil. Jour. for March, 1831, the bones are stated to have been found "*in a third chamber, generally broken, some strewed on the floor of the cave, &c.*" From the various accounts published on this subject, we also fell into the opinion that this was a den which was not a stranger to a diluvial action of great extent. If these repositories of bones of the present races of animals found in New Holland, are, as Dr. Buckland supposes, extensive fissures, into which these bones have accidentally come, we have yet, thanks to the elephant and the dugong, two pretty good bones to gnaw. In Mr. Clift's report, that which Mr. Pentland—who studied with Cuvier—supposes to have belonged to an elephant, is said to bear a great resemblance to the *radius* of a hippopotamus.

ing to a lower part of the fissure where bones were most abundant. There are also in one part of the cavity, transverse plates of stalagmite enveloping bones, and separated by a thin parting of red earth, which shows the process of accumulation to have been gradual, in this part at least. There is also at the geological society a large dentata, sent from New Holland, from near Sidney, and said to have been found, not in a cave, but near the surface of the land. It is about the size of the dentata of a rhinoceros, but is not exactly like that animal's vertebra: it remains yet to be identified.

SCIENTIFIC MEETINGS.

Meeting of the Cultivators of Natural Science and Medicine, at Hamburgh, in September, 1830.

In the April number, for 1831, of Dr. Brewster's valuable work, the Edinburgh Journal of Science, is a very interesting and lively account, by Mr. Johnston, of the meeting of naturalists at Hamburgh, in September, 1830. These German conventions of learned men, who cultivate the natural sciences, owe their origin to Professor Oken of Munich, a distinguished naturalist and author, and Editor of the Isis, a monthly periodical, commenced at Jena, in 1817, and devoted to literature and science. It was in the Isis that Oken first proposed these annual meetings of naturalists; but it was a time when the German courts kept a surveillance over periodical literature, and the proposition coming from him, was not sufficiently favoured. By the introduction of some political articles into his Journal, he had formerly given offence, his Professor's chair of natural history at Jena was taken from him, and the Isis forbidden to be published in Weimar. In 1827, however, the King of Bavaria presented him with a chair in the university of Munich, where he is now Professor of Physiology. The first meeting took place at Leipsic, in 1822. It consisted of about a dozen strangers, and twenty inhabitants. In 1823 they met in greater force at Halle. In 1824 at Wurtzburg. The accession this year both in numbers and talent was marked; and from this time credit seems to have been given to them for the real objects they had in view, which were not only to promote a friendly personal intercourse among men of science, but to draw public attention to science, and to excite governments to examine into the condition of their scientific institutions, and to seek for men of science competent to fill the chairs of public instruction. At Frankfort, in 1825, they were most honourably received. The inhabitants of this town, which has no university, vied with each other in the hospitable attentions they paid to their distinguished visitors. At Dresden, in 1826, they had also a very friendly reception. In 1827, Munich received them, but we shall give Mr. Johnston's words.

"The sixth meeting, in 1827, was held at Munich, the seat of a flourishing university, opened only the preceding year under the favouring auspices of Louis Maximilian of Bavaria. This city also deserves well of the society, and the attentions of the king was such as it had not hitherto experienced. Besides general attention to the comfort and accommodation of the whole body, particular attentions were paid to the individual members; and each person, during the period of his stay, had an invitation to dine at least once in the palace. They now began to reckon their number by hundreds; and the amount and variety of subjects brought forward at their public meetings having increased beyond expectation, it was found necessary to break themselves up into sections, of which the botanists, an amiable and enthusiastic race of men, first set the example. Thus time was gained; men of like tastes and pursuits brought more frequently and more closely together; and every one spared the infliction of dissertations and discussions upon the thousand and one subjects in which he felt no earthly interest: for, though all cultivators of natural science rejoice in the advancement, and admire those who successfully cultivate any one department, yet each one has his own favourite branch or branches, beyond which he has little anxiety to roam, and unconnected with which, discussions, however learned, are often only tiresome. It was a judicious plan, then, to make the separation into sections, and thus to permit the *shell* and *fly* men to discuss the mysteries of their several *ologies*, without scandalizing the more grave and weighty pursuits of medicine and oryctognosy. This practice, begun at Munich, assumed a more extended and definite form at Berlin, and was finally arranged and consolidated at Heidelberg."

But the most splendid meeting was at Berlin in 1828. The number of strangers from Germany and the northern countries amounted to two hundred and sixty-nine, for whom lodgings were provided in good and convenient situations, gratis. Humboldt presided, and the king and the royal family graced, with their presence, some of the entertainments given to them. The distinguished reception the meeting received in this scientific capital, raised the *Deutscher Naturforscher Versammlung* to the highest credit. In 1829, the beautiful and romantic city of Heidelberg received the convention, and in 1830, Hamburgh.

"It has now become a matter of debate among the cities of Germany, which shall have the honour of receiving the society at their anniversary. To have the smallest chance, the city desirous of the honour must either be represented by a deputation of members attending the meeting, or must otherwise express to the society through its president, its desires, its claims, and the efforts it will make for general accommodation."

It seems that some of the worthy Burgomasters of Hamburgh, and a great many more of their constituents, did not comprehend very clearly what all these queer mortals calling themselves *Naturforscher*, or investigators of nature, wanted in their old town. Nobody could make out that they desired to buy any thing, and not one of them had been seen with any thing that was worth buying; and as buying and selling constituted, in their eyes, the great ends of existence, they took it for granted that the presence of these gifted individuals, would be of no great advantage to them, especially, seeing it was generally understood they were to be fed at the public expense.

"You might hear the matter discussed over a shipping list, or a newspaper, in the Boursen Hall; over a sample of coffee, probably on the exchange, or a beef steak in a restaurateurs. 'So many men come together to see one another, come so far merely to look at one another—nonsense!' And then, said another, as he took up the thread of the affair, 'They say we are to feed them; but if the Senate spend our money in that way, the town will be about their ears. When you or I go a travelling on our affairs to a strange place, nobody will think of treating us, and why should we treat these *Naturforscher*, as they call themselves?' But the judicious and thinking men, though they did not pretend to understand all the objects of the meeting, thought, generally, that these strangers, being once within the walls, it would be for their own credit to use them well for a few days, when they would soon be off again."

And extremely well they were treated, as Mr. Johnston has abundantly shown.

The most distinguished members present upon this occasion, were Berzelius of Stockholm. Pfaff and Wiedeman from Kiel. This last is a celebrated accoucheur, and performed the Cesarean operation twice upon the same individual. He and Pfaff are the pride of the university of Kiel. The last is a profound naturalist, has an extremely lively mind, with a somewhat liberal inclination in politics.

"Travelling in Prussia some years ago, when secret societies were the order of the day, and the German governments in great alarm, he talked, as usual, more freely and boldly than was encouraged in that country. The Prussian government was offended, and Pfaff having got safe home, the Prussian ambassador at Copenhagen was charged to make a remonstrance on the subject; but the king paid no attention, and his ministers, therefore, could give the ambassador no satisfaction. Determined on pushing the affair, the ambassador had an audience of the king, and signified that the Prussian government expected Pfaff should be punished. '*Oh,*' said the king, '*Pfaff is my very good friend, he has only been a little distrait; he has fancied he was in his own country, where he might say any thing.*' A terrible satire, coming as it did from the most absolute monarch in Europe."

Amongst the others were Lichtenstein and Encke from Berlin, with the celebrated Oersted from Copenhagen. Professor Fischer of the Botanic Garden of St. Petersburg, and Fischer the Zoologist and President of the Academy of Sciences of Moscow, not the *vegetable*, but the *animal* Fischer, as he wittily told Mr. Johnston when presented. Struve, eminent in astronomy, from Dorpat; Oken from Munich; Dr. Schmeisser of Hamburgh, lecturer on chemistry, and an old friend and pupil of the celebrated Dr. Black, was prevented from attending the meeting by ill health, but Mr. Johnston has preserved some of his lively sayings, and amongst the rest the following pun of Blumenbach.

"And he told [Schmeisser] with much glee, how, when the method had become newly known, he formed a quantity of artifical *spermaceti* from some half decayed muscles by means of nitric acid, and making it into candles, sent some of them to Blumenbach, with the notice that they were prepared from the legs of a man, who in his life time had done no good, and how Blumenbach punningly replied to him, '*Mortui lucent qui in vita obscuri fuerunt.*"

There were only two or three individuals from England, and America was represented by Dr. Jamieson of Baltimore. The *Naturforchers* dined in public; from five hundred to six hundred individuals assembled, including the wives and sisters of members. Notwithstanding the presence of the ladies, it seems the noise and confusion, the running about, and the scrambling for places, were perfectly intolerable. An attempt however was made to drown the noise by the introduction of music, vocal and instrumental, which in some degree succeeded.

The opening of the session commenced on the 18th September, by the delivery of an inaugural discourse from the President Bartels. The secretary then read the laws of the society. From these it appears, every person, without election, is a member, who has written upon natural science or medicine: that a majority of voices decide every thing; that the place of meeting shall be variable, and be determined at each anniversary for the ensuing year. One of the laws is, that the society shall form no collections, and, except its records, possess no property. Whatever is laid before them, shall be again withdrawn by its owner. Another is, that the expenses of the meeting shall be defrayed by the contributions of the members present.

These preliminaries being gone through, Professor Struve delivered a long oration on the history, importance, and present state of astronomy. After magnifying astronomy beyond all conceivable studies, he decided that Germany, of all the countries of Europe, held the highest rank in this branch, Russia next, then England and Italy, and France last of all. The discourse is thought to have savoured of self-adulation, and not to have been well received. When the business of the first public sitting was closed, the members retired to form themselves into sections, and to choose their presidents.

These sections, or committees, appear to have proceeded smoothly, with the following exception:

"On reading his report of the proceedings of the zoological section, Professor Luckart took occasion to animadvert, in a few ill natured words, on the appointment of Englishmen to preside in that section. 'It is the first time,' said he, 'that a foreigner, who did not understand the language, has been appointed to preside at a meeting of German naturalists.'"

This was felt to be bad taste, and worse feeling, by all present; for this section had agreed to name a daily president, and in this way Mr. Gray, and Dr. Traill, had each been honoured with the chair. A Dr. Siemers, who followed him, by his judicious conduct made amends for this breach of good manners.

The hours not devoted to science, were most agreeably filled up by parties of pleasure to the neighbouring gardens, to the island of Heiligoland, to the theatres, and to evening re-unions of a very agreeable kind, amongst the most distinguished naturalists. On the 25th, the last day of the convention, the whole affair was finished off by a splendid ball, at which all the beauty of Hamburgh assisted.

We have been exceedingly pleased with every part of Mr. Johnston's narrative of this interesting meeting, with one exception, where, in ranging himself on the liberal side of the question, he does not appear with his accustomed liberality. It is where he attributes to the governments of the German States, an improper control over these interesting meetings, whilst it is evident to every one, that they are especially encouraged and protected by the very governments he hints at. The insinuations too, that Prince Metternicht discourages them, contrary to the wish of the Emperor, appear to be brought forward merely to support a bad pun, 'à la milady Morgan,' upon the Prince's name.—"Il est comme un Roi ce Mitternacht," said a Halle man to me.

We do not presume to express any opinion upon the manner in which Prince Metternicht may discharge his duty to his sovereign, but we are not ignorant of Germany, and do not believe a word of the allegation brought—we believe without consideration,—against this distinguished personage, who is one of the best informed men in Europe, and whose taste and attainments in natural science, have, we venture to predict, insured all honour and protection to the Naturforscher, in their past session, which was to take place at Vienna in September last, under the very eye of the Prince. A valued friend of ours, whose name is at this time pre-eminently conspicuous in Europe in geological science, in a letter from Vienna, says, "*I met Prince Metternich at dinner, at Lord Cowley's, and had a tete a tete with him on geology: I found him quite au courant, and certainly a most accomplished and universal man.*" Such testimony as this, which accords with what we have otherwise heard of this great statesman, makes us turn a deaf ear to such ill founded suspicions of his being unfriendly to the cause of natural history. With this single exception, we repeat, that we have been highly pleased with Mr. Johnston's narrative, which has, in no small degree, made us desirous of receiving the earliest intelligence of the meeting at Vienna.

That a society of this kind, constituted by delegates from all the branches of science, should be imitated in other countries, was to be expected, and especially in England. Annual meetings of this nature, unless attended by eminent men, would sink into insignificance, and Germany is too extensive a country, its principal cities too far separated from each other, to admit of the most eminent men annually leaving their homes and pursuits, upon a visit to a distant country. It is probable, that ere long, Germany, England, Scandinavia, Italy and France will each have their separate conventions; and if they are held at convenient seasons, a few individuals, ardent in the pursuit of knowledge, and blessed with leisure and wealth, may visit them all, and thus get annually a panoramic view of the progress of universal philosophical theory. If an abstract of the proceedings of such meetings were published, after the manner of the proceedings of the Geological Society of London, this indeed would be a highly intellectual age.

We shall hope soon to lay before our readers an account of the "Proposed general Scientific Meeting at York." The following circular was forwarded to us some time ago.

***Proposed general Scientific Meeting at York, England, to be held September* 26, 1831.**

A STRONG desire having been expressed that a meeting of friends of science should take place annually, in some central town in England, with the view of promoting unrestrained communication of scientific opinions and discoveries; notice is hereby given, that a committee of the principal scientific societies of London, Edinburgh, &c., have fixed on the city of York as a most desirable place for the first meeting;—to commence on Monday, the 26th of September, a period of the year which has been ascertained to be most convenient for the parties interested, and the meeting to be continued during as many days as may be deemed expedient.

Any friends of science in Great Britain, or in any other parts of Europe, who may wish to attend this meeting, are requested to send a letter (post paid) to the Secretary of the Yorkshire Philosophical Society, York, in order that adequate preparation and accommodation may be secured. It is proposed that the visitors shall assemble in the Museum and apartments of the Yorkshire Philosophical Society, to receive memoirs and communications, and that they shall dine together daily.

Persons arriving in York on the 26th of September, are requested to apply to the Porter of the Museum for information as to the hours and places of meeting.

Foreigners who may honour this meeting with their presence, will find every accommodation prepared for them.

London, May 25, 1831.

This meeting, which we believe was originally proposed by Dr. Brewster, will probably be attended by many of the leading men of Great Britain. Our private letters inform us, that Babbage, Murchison, Greenough, Conybeare, Daubeny, Brewster, Jameson, and a host of eminent persons, had intimated their intention of being present. We have no doubt it will produce the most beneficial effects to science, smoothing the asperities of rivalry, and creating a personal bond between individuals, who have the loftiest objects in view. Under the direction of great minds, the influence of such institutions will be universally felt, and thus, ere long, it will be acknowledged, that to study nature and nature's laws, constitutes not only the most elevated, but the most useful of occupations. Ed.

METEOROLOGICAL OBSERVATIONS,

Kept at Wilmington, Delaware, by Henry Gibbons, M. D.

Summary for August 1831.

	Therm.	*Barom.*		
Average at sun-rise,	67°.23	*in.* 29.92	Proportion of clear weather, *days*	18
Average at mid-day,	78°.68	29.91	Proportion of cloudy,	13
Average at 10 P.M.	69°.74	29.91	Whole days clear,	13
Monthly average,	72°.95	29.915	Days on which rain fell,	8
Maximum,	85°.50	30.15	Depth of rain, *inches*	11.9
Minimum,	52°	29.68	Northerly wind prevailed, *days*	8
Range,	33°.50	.47	Easterly,	10
Warmest day (17th,)	80°.		Southerly, (S. to W.)	13
Coldest day (29th,)	60°.50			

Auroras, none. That observed in Massachusetts, (noticed in the last number,) on the 31st. ult. was followed by unsettled weather, and a severe easterly storm in a week. A very wet month; rains heavy; nearly six inches fell on the 8th and 9th. The early part of the month cool; the remainder warm, except the few last days. Winds generally light and variable. But few electric clouds. A severe easterly storm on the 7th and 8th. A peculiar haziness in the atmosphere during this month, and the last, which will be noticed hereafter.

Summary for September 1831.

	Therm.	*Barom.*		
Average at sun-rise,	58°.03	*in.* 29.85	Proportion of clear weather, *days*	16
Average at mid-day,	70°.90	29.83	Proportion of cloudy,	14
Average at 10 P. M.	60°.36	29.82	Whole days clear,	12
Monthly Average,	64°.46	29.84	Days on which rain fell,	10
Maximum,	83°.	30.04	Quantity of rain, *inches*	7.25
Minimum,	44°.	29.44	Northerly winds pevailed, *days*	11
Range,	39°.	.60	Easterly,	7
Warmest day, (11th,)	77°.		Southerly, (S. to W.)	12
Coldest days (17th and 30th)	55°.			

Auroras, none. A wet month; rains frequent but not very heavy. Generally cool; only a few warm days. Winds not so light nor so changeable as in the summer months. Electric clouds more frequent than in August. Four easterly storms, two of them light, and one not accompanied with rain. A partial white frost on the 30th.

SUMMARY FOR OCTOBER 1831.

	Therm.	Barom.			
Average at sun-rise,	48°.81	*in.* 29.87	Proportion of clear weather	*days*	23
Average at mid-day,	62°.43	29.84	Proportion of cloudy,		8
Average at 10 P. M,	51°.74	29.84	Whole days clear,		19
Monthly average,	55°.65	29.855	Days on which rain fell,		8
Maximum,	75°.	30.18	Quantity of rain,	*inches*	8
Minimum,	36°.	29.39	Northerly winds prevailed,	*days*	12
Range,	39°.	.79	Easterly,		6
Warmest day (3rd,)	67°.50		Southerly, (S. to W.)		13
Coldest day (28th,)	44°.				

An aurora, on the 29th, followed in two days by a transient easterlystorm, and subsequently by northerly winds. Several heavy rains this month; six inches fell on the 8th, 9th, and 10th. Temperature moderate and seasonable; the middle portion of the month delightful. Winds tolerably constant; during the first week, and also in the last week, stormy. A few electric clouds in the first week. One slight easterly storm, following the aurora; also a violent storm from north, with heavy rain, of 36 hours duration, on the 9th, and 10th. Several partial frosts, and one pretty general one, with ice in places, on the 29th; but the tomato (Solanum Lycopersicon) and other garden vegetables which are considered sensitive to frost, appear very little injured yet. The haziness of the atmosphere, observed during the summer, continued through this month. The sky was scarcely ever clear of it.

Account of an ancient Body, found in a Bog in Ireland.—The body of a man, in a bog ten and a half feet deep, was found about nine feet below the surface. The abdomen was collapsed, but it, in all other respects, bore the appearance of recent death. The face was that of a youth of fine features, with hair long and black, loosely hanging over the shoulders. The dress, which was tight, and reached to the elbows and knees, was composed of the skin of an animal, probably the moose deer, laced with thongs, and having the hair inwards. There were no weapons, but a long staff or pole was laid on each side the body. Varro derives the Sagum of the Romans from the Sac, or skin dress of the Gauls and Britons, which probably was tight, and not flowing, from the nature of the material. The Suevi according to Tacitus bore flowing hair, and the staffs were familiar to the Silures, according to the same author. From the depth at which it was found, an immense period of time must have passed to admit of nine feet of vegetable matter having grown over the body, and all the circumstances concur to make it probable that the body was of a very remote period; for before the arrival of the English, the Irish wore, for the most part, ill made garments, made from their black sheep.—*Abstract of a paper in Edin. N. Phil. Jour. June* 1831.

Collection of Natural History from India.—M. Delamare Picot has brought from India, into France, an extraordinary collection, for a private individual, of objects in natural history, and of Indian antiquities. Fifty three species of Mammifera, among which the Rhinoceros Javanus, found hitherto in Java only, and which the Jardin des Plantes did not possess.

Pros. R. A. S. of Paris.

Plate VIII.

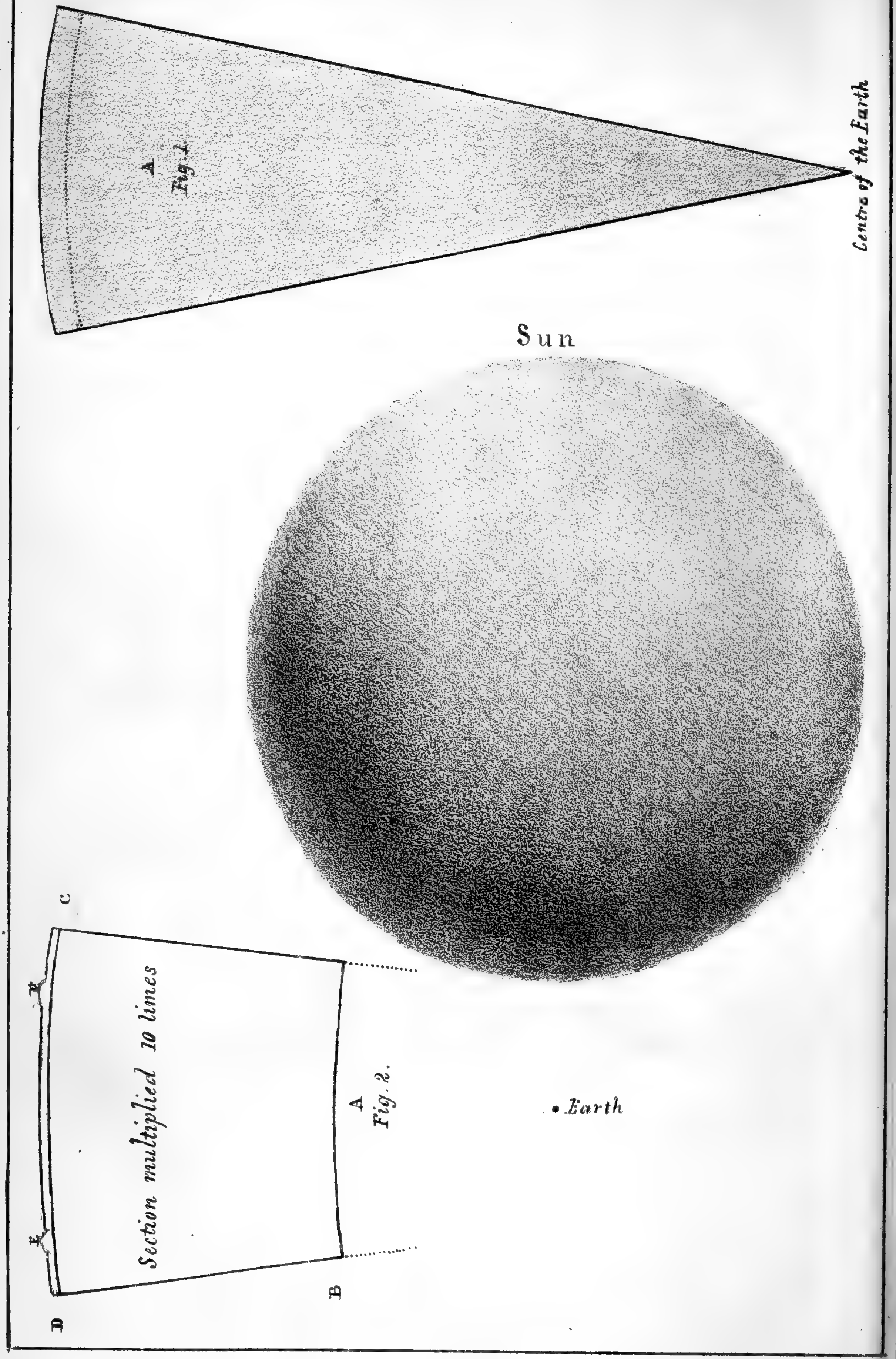


Diagram for the Essay on the Crust of the Earth.

C & L. Lith

HOTHAM ISLAND.

37°7'30"N Lat 12°41 E Long

from Childs & Inman's Press

THE

MONTHLY AMERICAN JOURNAL

OF

GEOLOGY

AND NATURAL SCIENCE.

Vol. I. PHILADELPHIA, JANUARY, 1832. No. 7.

GEOLOGY. No. 1.—ON THE CRUST OF THE EARTH.

Having in the preceding numbers given our readers a rapid sketch of the rise and progress of science, and of the causes which have affected that progress at various periods of society, we trust that the lesson to be derived from it may be deemed useful to this young and prosperous country; the citizens of which have, for one of their most important duties, to act under the belief, "*that nations, like individuals, are weak in proportion as they are ignorant; and that the memories of both are most honoured, when they have advanced the arts and sciences.*"

We now commence the first number of the promised Essays on Geology, and shall endeavour to redeem the pledge given in our prospectus, "to treat the subject in an elementary manner, divested of all unexplained technicalities; so that the great principles, from which philosophical views of the arrangements and operations of nature are drawn, may be lucidly brought forward."

We enter upon this duty with a desire to make our labours instructive and amusing to all, and aware that we shall have to attend to the wants of two classes of readers, the initiated, and those who have even the elements of our science to acquire. We shall have to throw ourselves upon the indulgence of the first, the members of which must bear with us for awhile, if we seek the simplest, and the surest means of accomplishing the object we have in view—the general diffusion of the study of nature. They will remember the time when they were, as well as ourselves, ignorant of elementary principles, and will patiently accompany us in the—to ourselves—not most grateful task, of going over, as it were, the horn-book of geology. This task, however, we cheerfully enter upon, and shall persevere in it, urged by the general advantage we hope to accomplish.—Having no fancies of our own to cherish, no theory to support which is not raised upon principles of universal application, no duty to perform but that of placing facts in an intelligent manner before our readers, we shall hope that by the accumulation of one simple fact upon another, and by the connexion of results satisfactorily deduced from those admitted facts, we may raise such accumulated evidences from nature, that their concentrated light will at length beam with splendour upon the higher phenomena of our science; and that our earth, which to some, perhaps, appears an incongruous assemblage of inexplicable difficulties, and the study of it a hopeless and repelling pursuit, may at length be recognized as a temple of nature, not less remarkable for the magnitude of its dimensions, than for the order, the design, and harmony of its parts; and these manifesting a constant physical adaptation to the loftiest moral ends. We trust that the subject, treated as we here propose, unincumbered with any speculative views, will be acceptable to all, and that our more learned readers, whilst elementary principles are engaging our attention, will find some compensation in the higher branches of geology of other parts of our Journal.

Geology,—which is derived from two Greek words, meaning the science of the earth,—in its most comprehensive sense, means the study of nature, and of all natural objects; whether those recent ones belonging to the present order of nature, or those fossil ones, belonging to more remote periods; and which are supposed to have preceded the creation of man, because no vestige of the existence of our race has been found co-eval with them. And since all the forms in nature present themselves to us, either in organic or inorganic bodies,—meaning bodies which have the faculty of continuing their kinds, and those which have not;—it is evident that geology stands in relation with all the physical sciences, and that the geologist who is diligent and faithful in the practical line of his pursuit, must necessarily become acquainted with mineralogy, zoology, and botany; since the first comprehends all inorganic bodies, and the two last all organic bodies. By many the term geology is understood in a more limited sense, comprehending only the mineral structure of rocks, their relative position, and the fossils embedded in them. Although the naturalists who have restricted their investigations to these branches, have added to the general stock of information, yet in such hands the study could not rise to the dignity of a science. The origin of mountains and valleys, the changes of the bed of the ocean, the action of rivers and nature of volcanoes, and the highly liberal study of comparative anatomy, were all excluded by this narrow field of observation, and with them all the high philosophical views of the harmony of nature, by the aid of which Geology may claim to be considered as a study which leads to the knowledge of all natural science. Such is the definition we would give to our favourite pursuit.

In this Essay we propose to speak of that superficial part of the globe which is called the crust, and which has been variously exposed to our observation either by the action of natural agents, or by human labour. It is from the geological phenomena thus disclosed, that we become acquainted with the relation in which Geology stands to all the physical sciences. Let us first begin with the surface upon which we stand, and let us suppose an individual whose mind has never been awakened to this subject, contemplating, for the first time, the nature of that surface, the sublime height of the mountains, the profound valleys, the extensive plains without hills or vales, the oceans, lakes and rivers, and the thousand irregular beauties which give so much grace to the face of nature. Yet would this superficial aspect perhaps awaken no further idea with him, than that the earth was a homogeneous mass of rocks and clays and sands, assembled without order and design. But at the sea shore, where the rocks have been worn down to mural escarpments, he will perceive the beach to be covered with shingles or pebbles, triturated against each other, and thus divested of the angular form they had, when first broken off from the parent mass, where they once were, as geologists say, *in situ*, or in place. These will at once remind him of the rounded pebbles of a similar character found on the dry land, almost universally, and far above the level of the sea; in many instances thousands of feet above the marine level. The moment he begins to think of the cause which could have produced this agreement betwixt pebbles found in such dissimilar situations, he enters upon the study of Geology. This is one of its first and most important lessons, and the solution to the inquiry will be found to be the key to similar phenomena, in situations still more extraordinary. To trace these rounded pebbles to their native rocks—and on the dry lands they are sometimes found, hundreds of miles from their parent beds—they must be compared with other pebbles, which are generally to be found strewed through countries, to the original masses. Here a slight knowledge of mineralogy, one of the branches of geology, is necessary. The next question the young geologist asks himself is, whether the whole substance of the planet is one solid mass of rocks resembling those he finds near the surface. If he has hitherto observed no mineral difference in the rocks he has examined, and if the territory under examination furnishes several members of the geological series of beds superimposed upon each other, he will find some indications of the presence of those members either in the mural escarpments on the sea coast, in the ravines inland which have been worn by the action of rivers, in valleys or depressions, or in the fissures which have been caused by any natural agents. In such situations he will often find the mineral structure of the rocks corresponding on the opposite sides, where the continuity of the surface has been interrupted, the same beds presenting themselves on each side. When he is fully satisfied that there are various mineral beds lying beneath the arable soil on the surface containing rolled pebbles, he will be still more anxious to learn the nature of all the beds lying beneath those he has examined. And thus it is by travelling and practical investigation, and by books and the conversation of learned men, that the young geologist at length comes to the knowledge, that the earth is not a mass of rocks and clays and sands, accumulated without order and design; but that a portion of the superficial part of the planet, now called the crust, is composed of a series of rocks, clays and sands, differing from each other in very material circumstances, and of which the respective members are, at very great geographical distances, found in a constant relation to each other, in the general geological series of beds. This geological series has been described with great fidelity, and will be the subject of our next Essay.

By the crust of the earth, we understand that portion of it of which we have a practical knowledge. There are certain rocks at the bottom of the geological series, which have obtained the name of granite, from the granular form of their constituent minerals. The class of rocks to which granite belongs, has, for distinction's sake, been called primitive: this designation was given in the infancy of geology. It was conceived because no rocks had been discovered beneath granite, that it was the most ancient mineral portion of the earth, and hence it got the hypothetical name of primitive. To steer as clear as possible of hypothesis, we shall not use that term, but speak of those rocks as Primary, in relation to their position in the geological series in the ascending order; that is, counting from the granite to the arable soil at the surface, or the diluvium, as this also has been hypothetically called, though perhaps with better cause. Of the depths to which this granite extends we know nothing; it is true, we know from inspection, that in many situations the volcanic lavas come through the granite, and of course may infer that they exist in a state of fusion beneath the granite, or—which is a reasonable conclusion derived from the affinity of their constituent parts—that they are granite in a state of igneous fusion, and that consequently there must be vast cavities in the planet, inferior to the crust.

The existence of volcanic action through every part of the known world, either by the eruptions of active volcanos, or by earthquakes, is an assurance that there must be vast cavities in the globe, where igneous action is fiercely at work, and of which these volcanoes are the safety valves. Of their extent, some opinion can be formed from the great distances at which particular earthquakes have been felt. That of Lisbon, in 1755, not only affected the lakes and springs in every part of Europe, but was sensibly felt in North America. That of New Madrid, in 1811, shook the valley of the Mississippi for several hundred miles. Such disturbances are to be considered as the effect of the resistance which the solid parts of the crust of the earth oppose to the expansive power striving in those profound cavities. We at length apply this force to many phenomena of our science, and thus comprehend what would otherwise be incomprehensible: it is thus we come to understand how the tops of the highest mountains, and the bottoms of the lowest valleys, are formed of the same primary rocks; for when we observe some of the stratified beds which lie much higher up in the series than the granite, reposing at high inclinations upon the flanks of the granite mountains, with accompanying marks of violent dislocation, the truth flashes upon us, and we perceive that these mountains have once existed at lower levels, and that they have been forced up through the superincumbent beds, by the expansive power for ever struggling in the interior of the globe. It is thus we become acquainted with the existence of a power capable of the mightiest mechanical exertions. If earthquakes in our own time rend the earth, dislocate its solid parts, and ingulph portions of it in the chasms they produce, it may have been so co-eval with the existence of the planet. If the volcano of Skapta Jokul in Iceland, could, in 1783, pour out streams of lava, sufficiently hot and voluminous, not only to melt down the ancient lavas, but to more than fill the gorge of a river two hundred feet wide, and six hundred feet deep, damming up the streams and inundating the whole country, so may it have been in ancient geological times. If in 1822, the coast of Chili was raised to the height of five feet, for one hundred miles, by a single volcanic paroxysm, we can conceive of continents and mountain chains being raised to their present elevation, by repeated shocks in ancient times. In the account of the recent rising of the volcano of Hotham Island in the Mediterranean sea, it will be observed that the interval between the eruptions, was uniform between one hour and a quarter and one hour and a half, and that the eruptions *were followed by an evident increase in the size of the island.* The details of this rare spectacle are highly valuable; they will be seized upon with great avidity by geologists, many of whom, we have no doubt, will consider the phenomenon as an epitome of those ancient parturitions of the ocean, geology is so pregnant with. Finally, if at the present day, springs peculiar to volcanic countries, deposit silex, bitumen, lime, and other substances, so it may always have been. And indeed we have the physical assertions of these probabilities, in the disturbed state of the lower stratified rocks, the extent of the trap formations, the elevation of Italy, the Alps, and many other regions, and the ancient beds of quarts, pitchstone, primary limestone and oolites, which last approach so near to the modern travertinos of Italy. Wherever volcanic waters are, there we find calcareous and other mineral substances, and under circumstances encouraging the opinion, that they have at all times derived their origin from the interior and unsearchable parts of the globe.

To some who have never reflected upon this subject, it may appear startling to hear, that continents and chains of mountains have been raised from the interior parts of the earth by the force of subterranean expansive power; but every effect is proportionate to its cause, and where the first is definite and the last immeasurable, we must submit to the reasonableness of the proposition, remembering always, that although human power dwindles into insignificance, when applied in imagination to disturb a mineral mass like the crust of the earth, which has a thickness of between seven and eight miles attributed to it; yet that the semi-diameter of the earth exceeds more than five hundred times the space occupied by that crust; and that it is demonstrable that a gaseous pressure may be generated in such a radius, to which the known mineral mass could make no resistance. In reasoning therefore upon these high matters, we must not measure unknown forces by our own feeble powers, but by the effects they are capable of producing, and must treat of the causes and of the effects of this high planetary character, in relation to the proportion in which they stand to each other.

Mr. De la Beche, in his Sections and Views illustrative of geological phenomena, has an admirable Plate on this subject, which will do much towards reconciling the most incredulous to the views we have offered. We have made this plate somewhat more elementary, in accordance with our plan. *A. Fig. 1, is the radius of the earth, from which at B. a line is set off at 100 miles from the level of the sea. A. Fig. 2. represents the same radius multiplied 10 times. B. is a line at 100 miles from the level of the sea. C. a line eight miles from the tops of the highest mountains. D. the level of the sea. E. the height of the Himalaya and Andes. F. the Alps.

The crust of the earth has been often likened to the proportion which the varnish on a cabinet globe bears to the mass it encloses, but this Diagram appeals more strongly to the imagination. It is evident that the pneumatic forces which may be generated in this radius, are capable of producing inequalities upon the earth's surface, that would, to use the language of Shakspeare, "make Ossa like a wart," even if they had their

* Vide Pl. 8.

seat within the line B, extending itself at a depth of one hundred miles from the level of the sea. Mr. De la Beche ridicules the "*stupendous* mountains" and "*tremendous* dislocations" of some writers; and in truth, when we consider this Diagram, we are not only apt to hold mountains, and earthquakes, and fissures very cheap, but to wonder how it is that we are permitted to keep possession so quietly. Our readers, however, will not take alarm at our A's and B's and C's; they know that there is a power both wise and benevolent that controls the fearful agents appointed to work his will. These, whilst they beautifully dispose the surface of the earth for our benefit and enjoyment, remember the voice, "thus far and no farther." With great confidence, therefore, we may all say with the psalmist, "Therefore will we not fear, though the earth be moved, and though the hills be carried into the midst of the sea; though the waters rage and swell, and though the mountains shake at the tempest of the same."

NOTE.—Lest it should be supposed that some of the language of this Essay has been borrowed, without acknowledgment, from geological writings heretofore published, where the name of the writer may not have been affixed; the Editor requests those who may observe any coincidence of this kind, to believe, that he never quotes from a previous publication without acknowledgment, except where he has been the unknown author.

ON THE CAUSES WHICH RETARD GEOLOGICAL KNOWLEDGE.

(From a correspondent, dated London, October 12, 1831.)

"I take great pleasure in speaking encouragingly to you, of the success of your Journal in England. I am sure you will be satisfied with the various commendations it has received. The review of your first number, in the Philosophical Magazine for this month, is conclusive as to its reception here; and I think your numbers for August and September sustain well the praises which it has amply given to that for July. American geology has been in such a state of confusion, and we have been so much in the dark about it, that we are very much gratified in the prospect before us, of having the geological facts of your country brought intelligently out; and I know that this feeling is partaken by many of the leading continental geologists. I also know that the tone of the "Introduction" in your first number, has given particular satisfaction here. Your friendly critic in the Philosophical Magazine has but done you justice on that subject. You have certainly taken the correct philosophical view of the manner in which geologists should treat that—with inexperienced minds—too attractive branch of our science, and have happily freed both your Journal and the subject from the apprehensions which would enable prejudice to raise up an unfriendly spirit against them. In truth, the material origin of this planet is by no means a proper topic for geological writers, and you may observe, that all writers, who—as they thought—have been laying a great deal of strength out upon it, are now entirely disregarded, and are indeed classed among the weakest of those writers who have entered the lists. See the inventions and opinions of Burnet, Whiston, Buffon, De Luc, and many others, whose names have at different periods greatly influenced science: we look back with surprise, mingled with pity, upon the effusions of great minds like theirs, which aspired to instruct mankind in some of the loftiest branches of physical science, whilst yet unconscious of its elements.

"It has been an axiom in education for a long period, that it is of the very nature of truth, that we should be led to it by practical induction; yet how much is that axiom disregarded, to the detriment of science, and to the bringing of names—otherwise meritorious—into disrepute. It is lamentable to see how men erect altars, from time to time, as if to immolate themselves upon. Men who knew little or nothing of practical geology, have written on the subject as if for the express purpose of deterring others from the pursuit of it; they have cherished the false idea that modern geology and true religion do not accord with each other. Some of them have affectedly assumed a tone of piety, merely to entrap their readers; and, indeed, as you say, if the modern leaders in geology had not, by their learning, industry and prudence, succeeded in eradicating these groundless opinions, the science would have been very much retarded with us. In like manner on your side of the Atlantic, in order to prevent the few from misleading the million, you will find it necessary to assail all wild and affected speculations, whether religious or irreligious, and to tell your readers what is not geology, before a steady attention can be drawn to the facts upon which a knowledge of the science can be raised. In Europe there are sufficient sound geologists to check all affectations in the science. This is not the case in countries where the science has not been actively pursued, nor can it be supposed there is the same check upon the propagation of errors in the United States: hence the teachers of geology there have a great responsibility upon their hands, and it is certain that the progress of geological knowledge will be commensurately slow in America, if, to the discarded theories and prejudices of Europe, others of native growth are superadded. I do not know that any information I could send you from this side of the water, would be as valuable as the result of the experience of this country in the study of geology, and which you can apply, if you choose, with the same success to the present state of that science with you, that you do all the other instructive lessons you derive from Europe, which is at present a great experimental school for America.

"The re-publication in your country of the third edition of Bakewell's 'Introduction to Geology,' was some evidence of a strong taste for that science, for the author of that work is an experienced practical observer; and the one hundred and twenty pages of matter appended to it by the American editor, himself a professor of geology, induced the friends of science here to expect a summary of American phenomena, to contrast with those European ones Mr. Bakewell has brought forward with so much ability. In this we have been greatly disappointed. This voluminous Appendix, which has both Preface, Introductory Views, and an Index, and which professes to be an outline of the *Philosophy of Geology*, is not only barren of practical instruction, but has by no means steered clear of those conceits and fancies, which have rendered the labours of so many writers utterly useless. This is greatly to be regretted, coming from a public teacher, who has it in his power to bias the minds of so many ingenuous youths. It is by no means with unkind intentions to the writer, that I enter upon a brief analysis of some parts of this appendix.

"Page 7. 'Are the discoveries of geology consistent with the history contained in the book of Genesis?

"'Respecting the deluge, *there can be but one opinion*, and that opinion has been already stated; geology fully confirms the scripture history of that event.'

"'There is doubtless more difficulty as to the earlier periods; but the writer, after studying the subject for many years, has formed the opinion, that the geological facts are not only consistent with sacred history, but that their tendency is to illustrate and confirm it.'

"The sum total of the meaning of these passages is, that the sedimentary deposit found so extensively upon the present surface, was deposited there by the Noachic deluge recorded in the scriptures; for there are no other discoveries in geology, that have any reference to any thing contained in the book of Genesis. And when he says, "there can be but one opinion," and a confirmative one, that geology fully confirms the scripture history of that event, he either speaks unadvisedly, or without information; for the leading names in geology with us in Europe, have been for some time divided on that point. Lyell, Murchison, Sedgewick, (a clergyman, and professor too, at Cambridge,) Scrope, Fitton, and many others, distinguished Fellows of the Royal Society of London, have declared they do not believe geology confirms the scripture history of the deluge. To these may be added the distinguished names of Blainville, Jeffroy, Demarest, &c. &c. from the continental geologists. Not one of these philosophers has ventured to impugn the scripture account of a great deluge, but they do declare, that their laborious investigations have led them to the opinion, that the sedimentary matter ascribed by some geologists to the Noachic flood, has been deposited by partial and local inundations, arising from causes still in action, and which have been immemorially degrading old surfaces, and producing new ones. They see no evidence of one universal inundation of the earth, in practical geology, and few men have seen more than themselves. The antagonist names of others who hold modified opinions on this subject, are also of great weight; for if any men deserve the confidence of the scientific world, it is Buckland, Greenough, Conybeare, De la Beche, Warburton, in England; Cuvier, Brogniart, Cordier, Elie de Beaumont, &c. in France. Thus we see, that although there may be only one opinion in Yale college on this point, yet out of it, the scientific world is divided into two great parties. There are other passages in this appendix, of a similar nature, and even more censurable.

"Page 25. 'Indeed, it is generally agreed, that judging from the appearances of things, we must conclude, that the earth was originally, and for a long time, submerged; and that its crust, at least, has been in a soft and impressible state, if not partially, or wholly in solution.'

" 'Geology declares, that the original, or at least early state of the surface of the planet, was that of a watery abyss; and *the book of Genesis*, in the concise account which is there exhibited of the origin of things, reveals the same fact, as well as the recession of the waters, by which the dry land was made to appear.'

" 'The most important fundamental rocks of our globe are composed, in general, of crystalline materials, *bearing every appearance of having been deposited from a state of prevailing repose*,' &c.

" ' We may therefore *take it for granted*, that the aqueous abyss preceded the habitable condition of the earth, and we are *at liberty to reason* upon its probable constitution and possible effects.'

" After all which suppositions taken for granted, follows a full analysis of this said aqueous abyss; containing all the chemical agents, the sulphuric, muriatic, nitric, phosphoric, fluoric and carbonic acids; the alkalies, potassa, soda, lithia; the metallic oxides: carbon, and other combustibles: oxygen, chlorine, iodine, in short, every thing a chemist could possess in his laboratory,—for it is there the author must have learnt to concoct aqueous abysses—all acting with intense energy, " *as they came from the hand of the Creator*." Solutions, decompositions, precipitations, &c. &c. With such a fermentation as this strange mess must have made, it is impossible to conceive how it could be got quiet enough to assume that state of "prevailing repose," necessary to the production of his crystalline rocks, his garnets, his tourmalines, his beryls, as they are found in all their beauty at Haddam, Connecticut. That any geologist ever discovered a spoonful of such a concoction, is not to be believed. The Dead sea is pure compared with it. *Not a syllable is mentioned of it in the Bible*, and thus we are obliged to submit to the conclusion, that it never existed out of the chemical imagination of the writer, who very innocently believes, as we may gather from the following passage, that no one can possibly disagree with him on this subject.

" Page 27. 'For while decisive facts declare it to the mere philosopher, revelation unfolds it to the believer, and both conspire to establish the truth in the minds of that large and respectable class of individuals, who combine both these characters in one.'

"In the present state of geological knowledge, it is impossible to read the passages I have cited, without animadverting upon the extraordinary delusion they betray. Much as we agree with the professor in his reverence for the scriptures, we have long come to the opinion, on this side of the water, that it is the hammer and not the bible we are to take up when we would enter upon the study of geology; besides, all Europe is now on the side of the igneous origin of the inferior rocks, and nothing can be more superfluous than such an extravagant chemico-aqueous abyss.

"I make these strictures with reluctance; the acknowledged friend to science they concern, must break through the web he is weaving around himself and others, if he would not obscure his reputation by indulging in empiricisms unworthy of the age."

ON THE CAUSES WHICH RETARD THE ADVANCEMENT OF ZOOLOGICAL KNOWLEDGE.

Critical Notice of " Synopsis Reptilium, or Short Description of the Species of Reptiles.—By John Edward Gray, F. R. S. F. G. S. *&c.—Part I.*— Cataphracta. *London,* 1831."

The higher branches of mathematics, politics, and metaphysics, for many years occupied the vigorous intellect of the British nation, whilst natural science was comparatively neglected.— For some time, however, its various branches have excited great interest, and their importance is now duly appreciated and acknowledged, in many departments vying with the most forward nations, and in Geology, absolutely taking the lead.

In the work before us we have a very neatly printed octavo of eighty pages, constituting one, of the many attempts of English naturalists to classify and arrange a very interesting department of zoology; but one which has been characterized by great confusion, and which yet requires much labour and research to make the system complete. To us it appears that the great fault of most of the writers on zoological nomenclature since the days of Linnæus, consists in a laboured effort at a display of learning in coining useless new names of objects, already long described, and well known to naturalists. The changing of names, and adding to the already confused state of the synonyma; the elevating varieties into species, and cutting up the species into numerous sections, families and genera, on the most trifling distinction, or on no distinction whatever. The study of natural history is thus rendered as dry and uninteresting as a Greek vocabulary, and the interest of the object absolutely lost in the learned pleonasm in which it is buried. Thus it will continue to be until there arises a powerful reformer, some modern Linnæus or youthful Aristotle, to make a clear sweep of this Augean stable, who, guided by nature alone, and governed by that admirable simplicity so forcibly displayed in all her operations, will present the world with a system at once comprehensive and intelligible. In the words of one of the purest writers, "If I was to form a *system*, it would be that of *simplicity;* it should pervade all works of imagination, *all inquiries of science,* all performances of the chisel and pencil, all behaviour, and all dress. Carry this idea even to the most awful height, what is simplicity but truth, the great basis of virtue and religion? *Simplicity is the child of nature;* the love of it seems implanted in us by Providence; yet all the labour of erring mortals is to depart from this great and open road, and to return to it when they have seen the fallacy of winding paths and doubtful mazes."—Johnson.

The recently formed genera, Kinixys, Pyxis, Kinosternon, Sternotherus, Hydrospis, &c. will be considered of no avail in such a system, seeing that they consist in unimportant variations in colour, and slight modifications of the form of the shell, which produce no difference of consequence either in the habits or general organization of the animals themselves; and constitute, in fact, mere varieties of species, in some instances not characteristic of any peculiar genus; and in one instance at least, the character absolutely becomes obliterated by age.

This work is principally characterized by such learned displays in nomenclature, and too frequently at the expense of accurate knowledge of the subject discussed.

Had one half the talent, labour, and observation, which the author has displayed in this little treatise, been applied to detect the true habits of the animals, as displayed in the woods, the fields, the rivers and the seas; or had he directed his observations to their internal organization as unfolded by zootomy, he would have added greatly to the cumulative mass of solid information, and would have spared himself much unproductive labour.

We have, nevertheless, perused the treatise with both profit and satisfaction; it not only shows considerable research, but convinces us of the increasing taste for similar pursuits in England.

With these preliminary observations we propose to note a few of the inaccuracies and oversights which are but too evident to the practical herpetologist. There is occasionally displayed a looseness of style, which might have been dispensed with in a work strictly scientific; speaking of the class reptilia, he says, "*the young are like the mother.*" Now we have raised numbers of these little creatures in our own garden, and can assure Mr. G. that the young not unfrequently betray a strong likeness to the *father!* The characters which distinguish some of his genera, are in reality no distinction whatever; thus his genus "*Chelys*," at page 7, is designated by marks equally applicable to the very different genus Trionyx.

He sometimes founds specific distinctions, on slight difference in colour, or some insignificant markings: see for example his Emys decupata, compared with E. serrata; whilst in other instances, *species*, perfectly well characterized by recent authors, are confounded in the synonyma: thus Testudo *elephantopus*, is quoted as synonymous with T. indica—the former differing in the *number* and *form* of the marginal plates, in the presence of a *nuchal* plate, and in the totally different *direction* of the posterior marginal plates—not to mention other peculiarities observable in the head and integuments. We consider these species to be as distinct in organization, as they are distant in their habits.

After having stated that the marginal plates of tortoises represent analogically the costal cartilages of mammalia; Mr. G. remarks, "the *testudo areolata* (Thunb.) is apt to vary in the number of dorsal and marginal plates," which is to admit a variation in the number of ribs and of their cartilages; a difference of this nature, we think, rather points to specific distinction; much more so, indeed, than the "sculpture of its shields, and peculiar scaling of the animal." Vide page 13.

The Testudo pusilla, (Linn.) Mr. Gray describes for the eighth time, under almost as many names, and has given a tolerable good figure; he here calls it CHERSINA *angulata,* having previously described it as T. Bellii: vide Gray, spic. zool. t. 3.—If the synonyma he quotes are to be depended on, then the real Linnæan name of the species must be retained, bearing in mind always, that the genus CHERSINA of Merrem, is only the old genus TESTUDO, with the sternal plate slightly projecting anteriorly, and would include T. polyphemus of Bartram.

Concerning the genus "KINIXYS" of Bell, it may be remarked, that, if the peculiarity noticed in the back-plate of the species of this genus be not only accidental, as Baron Cuvier states it to be, it can serve only to distinguish a *variety* common to two or more species of testudo: and the genus "PYXIS" of Bell, also appears to us as representing a variety of the genus CISTUDA, or common box tortoise.

The very natural genus CISTUDA, first established by that sensible and classical naturalist, Mr. Fleming, (Vide Philos. of Zool.) and adopted by Mr. Say two years subsequently, (Vide Jour. A. N. S. vol. iv.) Mr. Gray places in the family EMYDÆ, and represents these animals "as living in ponds and ditches, only taking their food while in the water," and thinks he has observed 36 species, 18 of which come from America; (vide p. 17.) The cistuda clausa, or common "*box turtle*" of North America, possesses none of the habits above enumerated, but is in every respect a "*land tortoise,*" which is the name by which this animal universally goes by in this country; and Mr. Say remarks, very judiciously, (vide Long's 1st Exped.) that he examined this species as it came under his observation throughout the country, from the shores of the Delaware to the base of the Rocky Mountains, and could detect only a single species, presenting many varieties in colour and markings. In like manner, the TESTUDO *trifasciata* of Bell, or *Cistuda* trifasciata, Gray—is a variety of *Cistuda clausa* of other authors.

Mr. G. is most fruitful in synonyma: the land-tortoise of Europe, so familiarly known, is dignified by ten titles, not doubting but that it possesses legitimate claims to all of them.

The genus *Emys* of Gray, only differs from the other species of this genus, as adopted by other authors—and from which this is taken—in having the back and breast-plates united by solid (not osseous) symphysis; the habits and general organization being similar, they naturally arrange themselves under one genus, but admit of being divided into two sections.

Mr. Say had confounded the Testudo scabra of Linn., which inhabits South America, with a kindred species existing in New Jersey, in the vicinity of Philadelphia. This species was subsequently described as distinct by Major Le Conte, under the name of Emys *inscripta.* Mr. Gray has unnecessarily increased the synonyma by adding the specific appellation of "*speciosa*" to this tortoise. (Vide p. 26.)

The Emys *concentrica,* or *centrata,* is the only tortoise vulgarly called Terrapin in our country; it has been so long and so highly esteemed as a luxurious article of diet with us, as to have occasioned the almost total extinction of the species in the vicinity of Philadelphia; but the Emys *serrata,* or red-bellied terrapin,—E. *rubriventris* of Le Conte, is beginning to appear in our market to replace it in some degree; the former have been sold for six dollars a dozen, and are brought from a distance of more than a hundred miles: we have seen a black-spotted variety of this species from South Carolina.

The Emys *vittata* of Gray, is very probably the young of the E. concinna of Le Conte.—Vide Cuv. Regne Anim.

E. *decussata,* E. *rugosa,* and E. *scripta,* of Gray, are mere varieties of E. *serrata,* (Daudin,) which is very common in our middle and southern states.

The E. *Lesueuri,* (Gray,) has been more descriptively named E. geographica by Lesueur himself; writers cannot too scrupulously avoid adding to the already plethoric list of synonyma.

E. *Bellii,* E. *Kinosternoides,* and E. *Annulifera,* of Gray, do not appear as yet *specifically* identified. Vide pp. 31, 32.

In two of our fresh water tortoises, viz. E. *odorata* and E. *pensylvanica,* the anterior and posterior lobes of the sternum, are frequently united to the middle lobe by a cartilaginous suture only, admitting of slight motion; a peculiarity which was thought sufficiently important by Spix, on which to construct a new genus, under the name of Kinosternon, an arrangement adopted by Bell and Gray, although it is admitted that these sutures are liable to become obliterated by age; under which circumstance, an old individual of E. odorata was pronounced a distinct species by Daudin and Merrem, and named "*Glutinata!*"

The fourth genus, Chelydra, of Schweiger, also constructed on the old genus Emys, possesses stronger claims to distinction, though we at the same time prefer the more classic name "CHELONURA," of Dr. Fleming, for this genus: it consists, according to Mr. Gray, of only a single species, vulgarly called alligator-tortoise, or "snapping-tortoise," of the middle states, and known to the African slaves of the southern states by the name of "couta," probably from some fancied resemblance to an animal of their own country. We have, however, seen the shells of three other distinct species of this genus; one from our northern lakes, one from South America, and another from oriental India, from the river Silet, a branch of the Burrempootra.

The family "TRIONYCHIDÆ," includes a very interesting group of fresh water tortoises: two or three species having been recently observed with more than three claws; the genus trionyx, will not, as heretofore, include all the species.—Mr. Gray's remarks on the species of this genus would be more useful, had he stated the dimensions, in his descriptions of animals varying in size, from a few inches, to a foot, and more.

The remarks of our author on the sea tortoises, (family CHELONIADŒ,) are not without interest; his first genus, SPHARGIS, of Merrem, has been better named "CORIUDO," by Fleming.—Vide Philosophy of Zoology.—These animals attain to a great size occasionally on our coasts, as noble specimens preserved in our museums abundantly testify. An individual now in the New York museum, purchased by the proprietor for $500, was thrown on the coast of Long Island, in a recent N. E. gale, and weighed 1400lbs. Mr. Gray gives as the habitat of this species, "in mare Mediterraneo."

In the second order,—or EMYDOSAURI, of Blainville, are arranged all the living crocodiles and alligators. We think the denomination of CROCODILINI, applied by Oppel to this group, preferable on many accounts. Alluding to the general characters of this group, Mr. Gray repeats the exploded error, relative to a very important point in their anatomy: viz. "the heart is three celled," &c.—Vid. p. 55.—This oversight is the less excusable in Mr. G. inasmuch as he quotes the book, in which correct information is contained relative to this subject.

The habits which our author attributes to the animals of this group, will not apply in any respect to our alligator, which feeds chiefly on live fish. (Vid. Bartram's Travels, et passim.) We recommend the author of this synopsis to peruse carefully the Journal of the Academy of Natural Science of Philadelphia, and promise him much useful information on the anatomy and classification of reptilia.

For the habits of *crocodilus acutus*, (Cuv.) Mr. G. quotes, erroneously, Bartram and Descourtilz, whose observations refer to c. *lucius* (Cuv.) only, which in this synopsis adds another to the interminable list of names, and figures as *alligator mississipiensis!!*

When will closet writers learn to copy that beautiful simplicity which we observe displayed by nature, in all her operations?—In the Journal of the Academy of Natural Science of Philadelphia, Mr. G. may obtain more interesting materials concerning the *fossil* crocodiles.

The third and last order of this treatise, or ENALIOSAURI of Conybeare, consists of fossil extinct genera and species, and are more particularly interesting to the geologist and comparative anatomist; but as they constitute a new order of reptilia, are very properly treated of in a general synopsis: in this, as in almost every other instance in the volume before us, Mr. G. has failed to do justice to American writers; the new genera and species which they have added to this order, are not even noticed. —Is this to be attributed to ignorance, ill nature, or criminal indifference towards his collaborators? R. S. T.

ON A NEW EXTINCT FOSSIL VEGETABLE OF THE FAMILY FUCOIDES.

By Richard Harlan, M. D. Philadelphia, Dec. 6th, 1831.

Natural order, ALGŒ.—Linnæus. *Family*, Fucoides.—Sternburg and Brongniart. Algacites, Schlotheim. *Section*, Cladorytes.—Harlan.

F. *Brongniartii.*—Fronde elongata, sub-quadrangularis, canaliculata, transverse rugosa; ramulis inequalis, sparsis, remotis, compressis, rugatis, recurvis, nudis.

Place in the series.—Compact sand-stone, subjacent to the coal formation: occurring in slabs from one to three inches in thickness, the upper surface being tinged ferruginous.

Locality.—Western part of the state of New York: the fossil is also stated to abound on the Welland canal, Canada.

This fossil fucus is readily recognized as a species allied to the F. *alleghaniensis*, which I recently described in the Journal of the Academy of Natural Science, vol. vi. from which it differs principally in the elongation and uniformity of the stem, its sub-quadrangular form, in general, and in being more compressed and elevated on the surface of the stone. The branches of the present species are less fastigiated, and more remote from each other: in no instance are the tops of the branches exposed to view in the specimens which have come under my cognizance. The largest stem is one third less in its greatest visible diameter in the present species, and they intercept, cross, or run into each other in various directions, so as occasionally to assume an appearance not unlike the asterias.

I have seen a very perfect specimen of this fossil, from the vicinity of Lockport, N. Y. in the possession of W. R. Johnson, Esq.; and Mr. Peale's museum of N. York possesses a very large slab of these fossils. I am indebted to the politeness of P. A. Brown, Esq., for the opportunity of describing this species, who obtained it in the state of New York, during a geological excursion last summer. Specimens in the cabinet of the Academy of Natural Science, cabinet of Mr. P. A. Brown, &c.

In consideration of the great obligation under which Dr. Brongniart has placed all admirers of oryctology, by the publication of his invaluable "*Vegetaux fossiles*," I have taken the liberty to designate this species by his name.

GENERAL REMARKS ON THE CONSTITUENTS OF PRIMARY ROCKS.

We have on this continent a very extensive geological limit, constituted of primary rocks and their subordinates. It constitutes an inflected line, commencing in the north, and passing southwardly from the indented shores of Maine, New Hampshire, Massachusetts, Rhode Island, and Connecticut, to the city of New York, of which it forms the base. Thus far, this limit is bounded by the ocean, and has for its general mineralogical character, the rocks commonly called granite and gneiss. There are many varieties of these two rocks, occasioned by the varying proportions in which their respective constituents are found together. Granite has for its constituents, felspar, quartz, and mica, and in general, granites are distinguished by having a much greater proportion of felspar than of either of the other two minerals. Sometimes the felspar is formed into well defined crystals, either white or red, it is then called a porphyritic granite. The quartz of such rocks is usually of a glassy lustre, and in very irregular shaped grains. The mica is disseminated in it, in small blackish or silvery scales. Granite rocks of this character, although they pass gradually into gneiss, differ remarkably from it in one particular, all granite being massive.

When the predominating mineral of the granite, felspar, decreases very much, and the mica greatly increases, and its innumerable plates become formed into well defined parallel layers, then granite losing its massive structure, splits in the direction of the mica, and becomes a true gneiss, recognizable by the eye by the parallel lines it externally bears. Students in geology will also observe, that the granite we have been describing, is always found subjacent to the gneiss, and indeed, from no other rock being found inferior to it, granite is considered as the basis of all the primary rocks; and gneiss, from the constancy with which it is found reposing upon the granite, is considered the next in order of succession. When the principal constituent parts of gneiss, quartz and mica, are finely combined together, and have a yellowish or greenish lustre, then they form a rock which splits into tables easily, and is called mica slate. Sometimes the plates of mica in this rock are larger, and then they form a mica slate of a coarser character. Mica slate is the third rock in the order of succession. There are other rocks in this marine part of the geological limit, occasionally found subordinate to the three members of the primary rocks we have enumerated; these are principally the hornblende, serpentine, and that calcareous formation usually called primitive marble. As the gneiss, which is the base of the city of New York, re-appears across the Sound on Long Island, so the serpentine, which is found massive at Hoboken, on the Jersey shore, re-appears on the east side of the river not far from the city of New York.

At Philadelphia, we find this line of primary rocks inflecting inwards from the coast. Near the public Water-works, a well defined gneiss—not different from that at the city of New York—is quarried extensively for foundations of houses. Associated with this, is the Hornblende, which appears close to the Water-works, and stretching to the south and west, fronts the Delaware river, as far as Wilmington, in the State of Delaware; whence it can be traced inland, in the neighbourhood of Baltimore, and much farther into the southern states. The varieties of these hornblende rocks are very great; and as it is of these the Delaware Breakwater is now constructing, we have thought it due to the communication which Major Bender has favoured us with, to accompany his table of specific gravities, with some remarks on the mineral nature of these rocks. Having personally visited most of the localities mentioned in this table, we have had occasion to observe how generally the erroneous designation of trap, is given to some of the varieties of hornblende rocks, and as some of our correspondents have also requested information from us on this subject, we have thought to render a service to our readers by entering into such details of the primary rocks, as may enable them to judge with success for themselves, of the proper names to give those varieties which fall under their observation. We have spoken of felspar as forming the principal mineral in granite, with quartz and mica; when it is compounded with the mineral called hornblende, it constitutes that class of rocks of which we have spoken as extending from Philadelphia to Wilmington. Hornblende, called by the French, amphibole, is heavier than quartz or felspar, and when scratched, gives a light green streak. It contains a great proportion of magnesia, which felspar has not; and when the quantity of magnesia is increased, it passes into serpentine. The Germans call these combinations of felspar and hornblende, grünstein, or greenstone, especially when they have a granitic structure. When hornblende forms the principal part of such rocks, they take a greenish black colour. When it is combined in lamellar grains with felspar, it is called sienite. In some instances, as at Quarryville, on the Delaware, near Wilmington, the felspar is in beautiful resplendent lamellar crystals, of an oval form, and of a lightish red colour. This in the common language of mineralogy may be called a porphyrytic greenstone.

We have remarked, that the erroneous designation of trap has been given to these hornblende rocks; and this, no doubt, has grown out of there being an intimate combination, in some instances, of hornblende and felspar. This is also the case with the rocks which have received the generic name of trap, from their dividing into prismatic forms, and forming steps or stairs. (Trappa, in the Swedish tongue, means a stair.) Cabinet specimens of these respective rocks, sometimes resemble each other so closely, that they would puzzle a good practical geologist to decide whether they did not belong to the same class of rocks. There is also another mineral, augite, which combines with felspar in the same manner that hornblende does, and which is difficult to distinguish from it. The dark black basalts, which geologists are now agreed, have the same origin as the true trap, are composed of felspar and augite, finely combined, with sometimes grains of the mineral called olivine, and black oxide of iron. However these greenstones may resemble in their constituent particles, the traps—now universally admitted to have had an origin of the same nature with lava, of modern times—an experienced geologist can at once decide when he observes them *aperto campo.* Nothing can be more dissimilar with the massive hornblende rocks, fronting the Delaware river,—and undoubtedly associated with the primary rocks,—than the true trap on the Hudson river, at the Palisades, that at Hartford and New Haven, in Connecticut, and that at the Passaic falls, New Jersey, all of which overlie secondary rocks. To call the hornblende rocks then, of which we have been speaking, trap, is to confound very important geological distinctions. The various combinations of felspar and hornblende, and felspar and augite, have produced the rocks called greenstone, sienite, trap, and basalt; together with all the varieties which a change in the proportion of constituents occasions, such as are clinkstone, pitchstone, amygdaloid, and other porphyries.

To these rocks formed of hornblende and felspar, the French have given the name of *diabase;* and to those basaltic compounds, into which augite enters, they have given the name of *dolerite.* We know of no name more appropriate to the rocks we have been considering than hornblende rocks, because hornblende is chiefly found combined with felspar, when associated with the primary rocks; whilst augite is more peculiar to rocks of acknowledged volcanic origin, although hornblende is also found in them. The term diabase, is applicable to any rock having a double base, and we, therefore, prefer a name that expresses at once the mineral to which the rock owes its distinctive character. We trust that this subject will receive proper attention from

Messrs. Conybeare and Sedgewick, in the continuation of that admirable work, The Geology of England and Wales, of which the first volume has already given so much distinction to the name of Mr. Conybeare. Since the history of the primary rocks can receive no assistance from organic remains, we have nothing left to determine with accuracy the character of those rocks but their constituent minerals. And as the English language on this continent and in Europe, is destined to be spoken by the most important family of civilized society, we trust those gentlemen will give appropriate scientific names cognate to the English tongue. We despair of a universal nomenclature, and the sooner we have a well considered one, accommodated to our own overspreading language, the better.

We now proceed to give the table of specific gravities of the rocks used in constructing the Delaware Breakwater, for which, together with the preliminary information, we are indebted to that intelligent officer, Major Bender, of the United States Army.— Editor.

SPECIFIC GRAVITIES OF THE ROCKS USED IN THE CONSTRUCTION OF THE DELAWARE BREAKWATER.

Communicated by Major George Bender, United States Army.

"The two straight insulated stone dikes which form the work, are constructing on a clayey anchorage ground, in a depth of water from twenty-seven to thirty-four feet below the lowest spring tides. The principal one is to be twelve hundred yards in length, measuring from a point five hundred yards distant from the line of twenty-four foot water, near the extreme point of Cape Henlopen, and running in a W. N. W. direction from said point. At the distance of three hundred and fifty yards from the westernmost end of this, the other has also been commenced, and is to run W. by S. five hundred yards. These dikes, or islets of stone, are both to have a height of five and one third feet above the highest springtides, with a breadth at bottom of one hundred and sixty-seven feet, and at top twenty-two feet. The inner slope is made to assume an angle of forty-five degrees, while the outer has one hundred and six feet base to thirty-nine altitude, and being covered with blocks of stone weighing from three to five tons, and upwards, from six feet below low water, to the summit, is such as experience has shown that the sea will break upon, without disturbing the materials. These dikes will in no part be more than about one mile distant from the shore, and when completed, will afford a shelter from the waves over seven tenths of a square mile, having a depth of water of eighteen feet at lowest springtides. That portion of the compass from E. to W. round by the south, is protected by the formation of the shore.

The whole work will constitute an aggregate mass of about nine hundred thousand cubic yards of stone, the largest portion of which is to be in pieces exceeding a ton weight each, and although a smaller work than those of either Cherburg or Plymouth, yet from the comparatively great distance from whence the material is obtained, it is one of necessarily slow execution.

The country for many miles around being a sandy alluvion, the contractors for supplying the stone commenced with bringing it from the Palisade rocks on the Hudson river; but the tediousness of the navigation, which consumed upon an average, ten days for each trip, retarded the first season's operations very much. Since then, the largest portion has been obtained from quarries on the Delaware, between Wilmington and Crum creek, a mile or two above Chester. Upwards of two hundred and seventy-nine thousand tons have been already deposited, of which eighty-one thousand were from the Hudson, and one hundred and ninety-eight thousand from the Delaware, and the same having been principally used in forming the upper end of the first mentioned dike, it has afforded a shelter which was used by the pilots, and by vessels engaged in the work, for protection against the N. and N. E. gales, during the last two or three months of the late working season.

Specific Gravities of the Rocks.

1	From	Christiana Creek below Wilmington,		3,020 3-4	Hornblende or Greenstone.
2	"	Brandywine, below the lowest mills,		2,990 1-2	do.
3	"	Quarryville, north of road to Wilmington,		2,668	do.
4	"	do. near the river, south	do.	2,980	do.
5	"	Naaman's Creek, south	do.	2,688	do.
6	"	do. north,	do.	2,680 1-2	do.
7	"	Vicinity of Marcus Hook, north,	do.	2,751 1-2	do.
8	"	do. do. do.	do.	2,618	do.
9	"	Young's Quarry, Chester creek,	do. do	2,700	Gneiss.
10	"	Clark's do.	do. do.	2,764 1-2	do.
11	"	Hennis' do.	do. do.	2,649	do.

12	From	Hennis' Q. on Chester creek,	n. Wilm.	ro.		2,752 3-4	Gneiss.
13	"	Worral's	do.	do.	do.	2,672	do.
14	"	Smith's	do	do.	do.	2,717	do.
15	"	Murray's on Ridley Creek,		do.	do.	2,713 1-4	do.
16	"	Burk's	do.	do.	do.	2,700	do.
17	"	Shoemaker's	do.	do.	do.	2,713 1-4	do.
18	"	Clyde's	do.	do.	do.	2664	do.
19	"	M'Ilvaine's	do.	do.	do.	3,130	Hornblende or Greenstone.
20	"	do.	do.	do.	do.	2,726	Gneiss.
21	"	do.	do.	south	do.	2,654 1-2	do
22	"	Churchman's	do.	do.	do.	2,638 1-2	do.
23	"	J. L. Crosby's	do.	north	do.	2,664	do.
24	"	do.	do.	do.	do.	2,618	do.
25	"	R. P. Crosby's	do.	do.	do.	2,649	do.
26	"	Leiper's Crum Creek,		south	do.	2,649	do.
27	"	Hill's	do	do.	do.	2,786 1-4	Hornblende or Greenstone.
28	"	do. (Island Field)		do.	do.	2,805 1-4	do.
29	"	Palisades at Fort Lee, Hudson river,				2,990 1-2	Trap.
30	"	do. Claster	do.			2,968 3-4	do.
31	"	Nyack	do.			2,955 1-4	do.

THE NEW VOLCANO OF HOTHAM ISLAND.

In a letter to Professor Daubeny of Oxford, from Captain Ballingal of the Royal Marines, dated " H. M. S. St. Vincent, Malta, 27th July, 1831," which the Professor had the goodness to send to us, is the following account of the volcano:—

The situation of the volcano is in lat. 37° 10′ N. long. 12° 44′ E. the crater of which, above water, is about 70 or 80 yards in external diameter, and about 20 feet in height from the surface of the sea, lying between the island of Pantalleria and Cape Granitula, on the south-west coast of Sicily. The eruption is in a state of great activity. Large columns of fire, dust, and dense smoke, are constantly emitted, accompanied every hour and a half with an eruption of great velocity, throwing masses of stones of several tons weight, with cinders, and jets of mud and water, to a height equal to the mast-head of a first-rate man of war. Prospero Schiffino, the master of the Santa Arona, a coasting vessel from Sardinia, arrived here, and reported to our admiral, that three days before, while off Cape Bianco in Sicily, he discovered the extraordinary phenomena of *three* distinct columns of smoke issuing from the sea, accompanied by a sub-marine noise, which he compared to that made by the "wheels of a vast steam vessel." In the evening of the same day, a second report was brought by a vessel from London. No appearance of lava was to be seen. The admiral instantly directed two officers to proceed and verify the report. On the night of Wednesday the 20th inst., while proceeding on their voyage, they first discovered it at 25 or 30 miles distance, shooting upwards rays and flashes to a great height. The next day, observing that the intervals between the eruptions occupied almost a *correct uniformity of time*, viz. from an hour and a half, to an hour and a quarter, afforded them the chance to approach at one time within 60 yards of the crater, where they *sounded*, and *found* the *side* of the *cone* in 33 fathoms, the armory of the lead bringing up a small piece of black stone, being the only substance we got during three days' constant perseverance, whose specific gravity was greater than water, which I am sorry it is not in my power to transmit; but I have secured some cinders and ashes, which I shall have the pleasure to send home in the Melville, which will leave this shortly for England. Since writing the above, I have just learned that Lord William Thynne, on the morning of the 19th, on his return from Gibraltar to this place, was enabled to approach within 20, and to sound in 18 fathoms. At this time the island was just above the surface, and on the 21st my friend found it 20 feet in height; and I have now learned that the day before yesterday, viz. the 25th inst., it had acquired the height of 40 or 45 feet. Any further information you may wish to acquire, I shall be able to collect, as I shall in a day or so visit the scene."

The following report by the officers of the Philomel, has been published at Malta, by Admiral Hotham.—" The Philomel brig of war, which left Malta harbour on Tuesday afternoon the 19th of July, with the masters of the St. Vincent and Ganges, to ascertain the correct particulars of the new volcano island forming off Sciacca, in Sicily, discovered the object at 1 A. M. on Thursday the 21st; at 3, spoke an Austrian ship from Algiers, bound to Alexandria, the master of which reported, that he had seen dense smoke and much fire issuing for the last three days. At 6, observed a thick smoke issuing apparently from the sea, the spot bearing N. W. $\frac{3}{4}$ W., and on steering in that direction, fell in with the Hind cutter at 9, which vessel had left Malta on Sunday the 17th, but had not yet reached the new volcano, owing to calms. The island then bore N. W. by W. six or eight miles distant. At 9h. 45m. the Philomel hove to, three miles to windward. Capt. Smith, with the two masters, and Col. Bathurst, a passenger, left the vessel in boats for the purpose of taking soundings as near as they could approach with safety, but had scarcely got one mile away, when the volcano burst out with a tremendous explosion, resembling the noise of a very loud thunder-storm, and flames of fire, like flashes of lightning. The boats were covered with black cinders, which also fell on board the vessel, and all around, to a distance of at least three miles from the volcano. The eruption lasted in all its fury seven minutes, and when the smoke had somewhat cleared away, *the island had increased in size twofold.*

The volcano bursts out regularly at about every two hours, and emits all around it a suffocating, sulphureous stench. On first making it a long distance, it resembles a cluster or grove of cypress trees. The English brig Bootle, of Liverpool, an American, and one or two foreign vessels, were off the place.

Its precise latitude is 37° 7′ 30″ N. and longitude 12° 44′ E. the soundings in the vicinity, say 80 yards off the island, bearing N. E. are 70 to 75 fathoms; W. $\frac{1}{4}$ of a mile, 72 to 76 fathoms. At five and six miles distance, they vary from 70 to 80 fathoms. The volcano appears composed mostly of cinders of a rusty black colour, having only a sprinkling of lava, of an oblong shape; and the island, as last seen on Friday the 23d, was not less than three quarters of a mile in circumference. The N. W. point is the highest, say about 80 feet above the level of the sea, and gets lower towards the southern extremity. The S. E. side of the crater has fallen in to the side of the sea. The sea is drawn in with a very loud noise, and occasions an immense volume of white vapour to rise up in the air, curling and spreading high and wide: then succeeds rapidly the eruption of cinders and lava, thrown to the height of from 400 to 500 feet, and on some occasions to 1000 feet, forking and branching out in all directions in its ascent, and afterwards falling and pouring down in stupendous masses, with such violence as to cause a noise like heavy thunder, and making the sea, for a considerable distance around, one entire sheet of foam—altogether a sight not to be imagined.*

Malta, Aug. 4.—Our reports respecting the volcano, since the foregoing, are very unsatisfactory. There can be little doubt, however, that the island continues to increase in size. A boat, with five or six officers, returned yesterday afternoon, and they assert that the island is at least three miles in circumference, and from 200 to 300 feet high. They landed upon it, and, for ostentation's sake, I suppose, hoisted the union flag. The other stories, as to the increasing dimensions of the place, are too vague to speak on.

We learn from the coast of Sicily, that the town of Sciacca has been entirely abandoned by its inhabitants, the reported shocks, and trembling of the earth, leading to a belief that it will sink into the sea."—*Jameson's Edin. New Phil. Journal, October*, 1831.

Captain Swinburne's report concerning this volcano, to Admiral Hotham, will be found in our number for November, page 229. It appears that the captain of an Italian vessel, had, as early as the 9th of July, seen a great quantity of dead fish, and some black matter floating on the water; and that he heard a noise like thunder, which he attributed to volcanic action. The succeeding day, at gunshot distance, he perceived a column of water, with a circumference of near four hundred fathoms, rise to the height of about sixty feet. Smoke continued to rise from the place, and on his return from Girgenti, on the 16th, he found a tract of volcanic land, twelve feet above the level of the sea. During his absence, the masters of two other small Italian vessels, on the 13th of July, saw three columns of smoke issuing through the water; they remained, on account of the calm, in the vicinity near three days; a noise proceeding all this time from that part of the sea, whence the smoke arose, like that produced by the wheels of a steam vessel.

In the plate, (ix) the highest point of the island is about eighty feet above the level of the sea, and the circumference about three quarters of a mile. It is circular, and the opening on one side, represented in the shaded part of the drawing, admits the sea. Editor.

* Plate 9.

DESCRIPTION OF A CRYSTAL OF NATIVE COPPER,

In the Cabinet of Colonel Abert, at Washington.

The primitive form of crystals of native copper, is stated to be a cube. The form of the crystal in question is that of a cube, with all its solid angles replaced by triangular planes.

The decrement of the solid angles by the triangular planes, is extended, until the angles of the triangular planes meet at the centres of the edges of the faces of the primary cube, forming a regular figure of six square faces, and eight triangular faces, the square faces being also the faces of the primary cube.

Measurement does not prove either face to be a perfect square, or a perfect equilateral triangle; the differences from such figures are, however, very slight, and occasioned in some of the faces, by, evidently, artificial indentations of some of the angular points.

Several of the faces have slight incrustations of carbonate of copper upon them, and all of them have striæ, which have been considered by some who have seen the crystals, as marks of a file, used to free the crystal from the crust in which it was enveloped, when first found. But I have not considered them as resulting from such a cause. They are irregular in depth, width, and length, not always parallel, are strongest near the edges of each face,—the middle of several of the faces being entirely free from them. The colour of the striæ, also indicates an exposure equal to that of any part of the crystal.

The edges of the square faces are, of course, varied from the position of the edges of the primary cube, and are now parallel to what would have been a diagonal of a primary face; and the square faces are smaller, by the extent of the decrement.

Mr. J. P. W. and Dr. M. of Philadelphia, were both disposed to consider it a genuine crystal of native copper.

I am not quite sure of its history, and am now endeavouring to trace it out, but believe it came from South America. It was among coppers from that quarter, from England, from Siberia, and from Germany; and if any label had ever been affixed to it, noting its history, it has been rubbed off.

The doubts which have been raised in relation to this crystal's being a natural formation, are founded upon its unusual size.

Taking the faces of the cube by pairs, the following are its dimensions, or the direct distances between each pair of faces:

First pair, one inch, seventeen and a half twentieths.

Second pair, one inch, seventeen twentieths.

Third pair, one inch, sixteen and a half twentieths.

It may be seen by these dimensions, that with the present faces of the cube, had there have been no decrement of the solid angles, but the whole space filled, and the cubic faces extended to form a square figure, it would not have been a perfect cube. A.

TABLES

For converting French Toises and Metres into English Feet, and the contrary.

Readers of philosophical works, and foreign journals, frequently meet with dimensions expressed in French measures. To enable such to convert them readily into English measures, the following tables have been computed. The length of a toise and a metre in English measure, which are the foundation of the tables, have been taken from Baily's *Astronomical Tables and Formulæ*, and he deduced them from their lengths, as given in the *Base du Systeme Metrique*, vol. iii. and Captain Kater's paper on the length of the French metre, in the Phil. Trans. for 1818.

TABLE I.

1 French Toise = 1.949036 French Metres = 6.394950 English Feet.
1 French Metre = .513074 Toise = 3.280899 English Feet.
1 English Foot = .156373 Toise = .304794 French Metre.

TABLE II. FOR CONVERTING FRENCH TOISES INTO ENGLISH FEET.

Toises.	English Feet.	Toises.	English Feet.	T.	English Feet.	T.	Eng. Feet.	T.	Eng. Feet.	T.	Eng. Feet.
1000	6394.95	100	639.50	10	63.95	1	6.39	.1	.64	.01	.06
2000	12789.90	200	1278.99	20	127.90	2	12.79	.2	1.28	.02	.13
3000	19184.85	300	1918.49	30	191.85	3	19.18	.3	1.92	.03	.19
4000	25579.80	400	2557.98	40	255.80	4	25.58	.4	2.56	.04	.26
5000	31974.75	500	3197.48	50	319.75	5	31.97	.5	3.20	.05	.32
6000	38369.70	600	3836.97	60	383.70	6	38.37	.6	3.84	.06	.38
7000	44764.65	700	4476.47	70	447.65	7	44.76	.7	4.48	.07	.45
8000	51159.60	800	5115.96	89	511.60	8	51.16	.8	5.12	.08	·51
9000	57554.55	900	5755.45	00	575.55	9	57.55	.9	5.76	.09	.58

TABLE III. FOR CONVERTING FRENCH METRES INTO ENGLISH FEET.

Metres.	English Feet.	Metres.	English Feet.	M.	English Feet.	M.	Eng. Feet.	M.	Eng. Feet.	M.	Eng. Feet.
1000	3280.90	100	328.09	10	32.81	1	3.28	.1	.33	.01	.03
2000	6561.80	200	656.18	20	65.62	2	6.56	.2	.66	.02	.07
3000	9842.70	300	984.27	30	98.43	3	9.84	.3	.98	.03	.10
4000	13123.60	400	1312.36	40	131.24	4	13.12	.4	1.31	.04	.13
5000	16404.50	500	1640.45	50	164.04	5	16.40	.5	1.64	.05	.16
6000	19685.40	600	1968.54	60	196.86	6	19.69	.6	1.97	.06	.20
7000	22966.29	700	2296.63	70	229.66	7	22.97	.7	2.30	.07	.23
8000	26247.19	800	2624.72	80	262.47	8	26.25	.8	2.62	.08	.26
9000	29528.09	900	2952.81	90	295.28	9	29.53	.9	2.95	.09	.30
10000	32808.99										

EXAMPLE OF TABLE II.—Convert 2205.23 Toises (height of Mount Blanc above the Lake of Geneva) into English Feet.

Toises.		*Eng. Feet.*
2000	=	12789.90
200	=	1278.99
5	=	31.97
.2	=	1.28
.03	=	.19
2205.23	=	14102.33

EXAMPLE OF TABLE III.—Gay Lussac ascended with a balloon to the height of 7028.3 Metres, as determined by a barometer,—convert this into English Feet.

Metres.		*Eng. Feet.*
7000	=	22966.29
20	=	65.62
8	=	26.25
.3	=	0.98
7028.3	=	23059.14
	=	4 Miles 1939 Feet.

TABLE IV. REDUCTION OF DECIMETRES, CENTIMETRES, AND MILLIMETRES, TO ENGLISH INCHES.

From De La Bechés Geological Manual.

Dec.	Inches.	Cent.	Inches.	Milli.	Inches.
1	3.937	1	0.393	1	0.039
2	7.874	2	0.787	2	0.078
3	11.811	3	1.181	3	0.118
4	15.748	4	1.574	4	0.157
5	19.685	5	1.968	5	0.196
6	23.622	6	2.362	6	0.236
7	27.559	7	2.755	7	0.275
8	31.496	8	3.149	8	0.314
9	35.433	9	3.543	9	0.354
10	39.370	10	3.937	10	0.393

ON THE ATOMIC WEIGHT OF MERCURY.

To the Editor of the Monthly American Journal of Geology, &c.

SIR,—I beg leave to call your attention to a matter, which, though brought before the scientific public some time since, seems not to have received that attention from chemists, which its importance ought to command.

Three years ago, Mr. S. Allinson, jr. of your city, published an article in Silliman's Journal, in which he maintained that the atomic weight of mercury, as stated in the current treatises on chemistry, was incorrect, and offered several good reasons for his opinion. This article (in a much improved and enlarged form) was subsequently published in the Journal of the Philadelphia College of Pharmacy, for July, 1829; and to this Journal I would refer those who may wish to see the experiments and observations, which induced Mr. A. to call in question the correctness of the commonly received statements. Now I desire that some practical chemist or any one else, who may have the apparatus and skill requisite, would decide who is in the right. Mr. A., or the text books.

The doctrine of chemical equivalents is very justly regarded as one of the most interesting and important departments of chemistry; and it is certainly much to be desired that every thing relating to it be thoroughly investigated, and established with all possible certainty. Surely, it cannot be a very difficult matter to determine whether protoxide of mercury (for example) consists of 200 parts (by weight) of mercury, and 8 of oxygen, or 100 mercury, and 8 oxygen;—or whether protochloride of mercury is composed of 200 M. + 36 Chlo., or 100 M. + 36 Chl.;—and it appears to me that it requires nothing more than the determination of these or similar questions, to decide whether the chemical equivalent of mercury is 200 or 100. I think it much to be deplored that a matter of this sort should be suffered to remain in a state of uncertainty, and I do, therefore, earnestly hope that some of your correspondents will take up the subject and give the result in an early number of your valuable Journal. With great respect, I am yours, &c. A. B. H.

P. S.—If you think the following worthy of a place, I would thank you to insert it.

In the fourth edition of Ure's Chemical Dictionary, published in London the present year, is an article which shows a most lamentable ignorance of the progress of chemical science and discovery in this country. The article is one concerning *sanguinarine*; or, as Dr. Ure, in defiance of all analogy, spells it, *sanguinari.* He sets out with a doubt whether it is in fact a vegetable alkali, and then goes on to say, it was first "obtained by M. Dana," whom (from the title he gives him) he probably considers a Frenchman. The whole matter is dispatched in six lines, while Delphinine, an article not a whit more important, occupies seventy. The fact that sanguinarine is a vegetable alkali, was fully established five or six years ago. The properties of the substance, and those of many of its salts, have since been investigated to a considerable extent. Details of the processes for obtaining the alkali and its salts, have often been published in the medical journals of the country, and in some treatises on chemistry; and if I mistake not, in some places the article is used in medicine with considerable success.

I would recommend to Dr. Ure, that before he publishes a fifth edition of his Dictionary, he should take a look at the New York Medical and Physical Journal, Vol. 6, p. 218. American Medical Recorder, Vol. 13, (Phil. 1827,) and Silliman's Chemistry, Vol. 2.

New York, Dec. 5, 1831. A. B. H.

We have published with pleasure the communication of

A. B. H., and shall be gratified if any of our correspondents will give us further opportunity of obliging him.

We have read Mr. Prideaux's able papers in the Philosophical Magazine and Annals of Philosophy,* on atomic weights. He has there truly stated, that the general tables of Thompson and Berzelius, are at variance, and that the practice in atomic inquiries, is to obtain approximations by different modes of operation, and take a mean number, subject to proper corrections. We also know, from what we deem the best authority in this country, that the atomic weight of mercury, as reported in the standard books, is deemed sufficiently accurate for common purposes. Nevertheless, perfect accuracy is desirable, and we offer our pages cordially towards effecting so desirable a result.—Ed.

ON ROUND STERNS FOR SHIPS OF WAR.

Premium of 2000 *francs offered by the French Government for the best Memoir on ROUND STERNS for Line-of-Battle Ships and Frigates.*

We extract from an article in Dr. Brewster's Journal, the conditions proposed by the French Minister of Marine, for the best memoir to be forwarded to him, before the 1st of July 1832, in order to determine, "among all the forms that can be presented, that particular one, which shall unite in the highest degree all the requisite conditions, that the seaman, the naval architect, and the geometrician may require."—*Individuals from every country are eligible to receive the premium.*—Ed.

"To furnish the best plans for the circular sterns for line-of-battle ships and frigates, with all the exterior and interior fittings, the manner of disposing the timbering so as to combine the necessary conditions for defence, with strength, lightness, a dispersion of the weight in proper proportion to the displacement of each part, the efficiency of the rudder, the convenience of the water-closets, and the general suitableness of the accommodations.

"This manner of fitting the stern must possess facilities for enabling the commandant to be aware of whatever manœuvres may be in progress, without being obliged to appear on deck.

* Phil. Mag. and Annals of Philos., April, Sept. and Dec. 1830.

"The style of ornament which it would be proper to adopt, as well for the forward as for the after part of these new constructions, is also to be described. The competitors are to remember, that nothing of importance is to be at all sacrificed to these decorations.

"The side of the ship at the stern must have the same thickness as at the corresponding places in other parts of the ship. The ports must be so disposed, that it may be easy, on each deck, to bring guns to bear right aft, and on the angles of the quarters, to command those points which the other guns cannot be brought to bear upon.

"The rudder may be fitted either without board, or within with a circular head; but reasons must be given for whatever plan may be proposed. Reasons also are to be stated for the station which may be proposed for the water closets, whether they are fitted interiorly, or in an exterior gallery.

"The officers of the different branches of the naval service are called upon to send their proposals to the minister before the 1st of July 1832. *Other persons wishing to become competitors, are eligible to do so.*

"The memoir in which each competitor explains his proposals, must be accompanied with all the calculations and drawings which may be necessary to render his plan perfectly complete and intelligible in all its details.

"Each proposal must have a motto affixed to it, of which a copy is to be enclosed in a sealed letter, containing also the name and residence of the proposer.

"A medal of the value of 2000 francs will be given to the author of the best memoir presented to the minister of marine before the stated period."

ICEBERGS.

Remarks on several Icebergs which have been met with, in considerably low latitudes, in the Southern Hemisphere.

The following is an abstract of a paper read before the Royal Society, by Capt. Horsburg, hydrographer to the East India Company.

"The journal of the ships belonging to the East India company during the whole of the last century, contain no account of Icebergs having been seen in the course of their navigation in the southern hemisphere, although several of these ships proceeded into the parallels of latitude forty degrees, forty-one minutes, and forty-two degrees. But, during 1828, and 1829, it appears that icebergs were occasionally met with by several ships in their passage, very near the Cape of Good Hope, between the latitudes of thirty-six and thirty-nine degrees. The particulars relating to these observations, are detailed in the paper. The most remarkable occurred in the voyage of the brig Eliza, from Antwerp, bound to Batavia, which, on the 28th of April, 1828, fell in with five icebergs, in lat. thirty-seven degrees thirty-one minutes, S. long. eighteen degrees seventeen minutes E. of Greenwich. They had the appearance of church steeples, of a height from two hundred and fifty to three hundred feet; and the sea broke so violently against these enormous masses, that it was at first suspected they might be fixed on some unknown shoal, until, on sounding, no bottom could be discovered.

It is remarkable, that, in general, icebergs seem to be met in low latitudes, nearly at the same period of the year, namely, in April or May, in both the northern and southern hemispheres, although the seasons are reversed in these two divisions of the globe. In order to account for the origin and accretion of the southern icebergs, the author thinks it probable, that there exists a large tract of land near the antarctic circle, somewhere between the meridian of London and the twentieth degree of E. longitude, whence these icebergs have been carried in a N. and N. E. direction, by the united forces of currents, winds, and waves, prevailing from S. S. W. and S. W. Bouvet's and Thompson's islands are not of sufficient magnitude; and Sandwich land and Kesguelin's island are too remote to be the source of the icebergs lately observed in the vicinity of the Cape. From their unprecedented descent during the last two years, it is most probable that the disruption of these masses of ice, from the places of their formation, was the effect of some powerful cause, of rare occurrence, such as an earthquake or volcano, which has burst forth and convulsed the inaccessible regions of the south, leaving no other testimonials of the event, than some few fragments of ice, scattered at a distance in the Indian ocean.

Philos. Mag.

METEOROLOGICAL OBSERVATIONS.

Made at Wilmington, Delaware, by Henry Gibbons, M.D.

SUMMARY FOR NOVEMBER, 1831.

	Therm.	Barom.
Average at sun-rise,	33°.23	*in.*29.70
Average at mid-day,	47°.30	29.68
Average at 10 P.M.	37°.87	29.69
Monthly average,	40°.26	29.69
Maximum, 10th and 11th,	61°.	30.03
Minimum, 30th,	20°.	28.73
Range,	41°.	1.30
Warmest day, 11th,	59°.	
Coldest day, 30th,	26°.	

Proportion of clear weather,	*days* 21
Proportion of cloudy,	9
Whole days clear,	16
Days on which rain fell,	4
Days on which snow fell,	4
Depth of rain, including melted snow	*in.*3.02
Depth of snow,	4
Northerly winds prevailed	*days* 21
Easterly,	6
Southerly, (S. to W.)	3

Observations.—Auroras, none. Rain, less than in any month since June. Temperature, seasonably cool in the forepart of the month, without any severe frost: but the two last weeks wintry; the thermometer falling below the freezing point on 11 of the last 15 days, although previous to this period it had not sunk so low as 32° during the whole autumn. On these 15 days, the average at sun-rise was 29°. This cold weather was extensively felt. The navigation of the Potomac, from Washington to Alexandria, was obstructed by ice on the last day of the month. A snow storm occurred on the night of the 21st; slight at Wilmington, but severe in the New England states, and covering the ground 6 or 8 inches deep a few miles West of Baltimore. There were three small snows besides this. Barometer unusually low in its range. On the evening of the 21st, previous to the snow-storm above noticed, it sunk to 28.73 inches, a depression which it had not before experienced since the destructive easterly storm of "Easter Sunday," in March 1822. Winds, high and pretty constant. Clouds, very changeable in form; electrified once. Three slight easterly storms, in two of which the wind soon changed to south.

SCIENTIFIC MEMORANDA.

Account of a new Mode of Propelling Vessels.—A paper by Mr. Wm. Hall, was read before the Royal Society on this subject. The author ascribes the want of success, which has hitherto attended all attempts to propel vessels by a discharge of water from the stern, to the injudicious plan of the apparatus employed, and not to any defect in the principle itself, for he considers that the re-action upon the vessel from which a volume of water is thrown, depends in no degree on the resistance it meets with from the medium into which it is ejected, but simply upon the momentum given to the mass. The author proposes to accomplish the object of propelling water, by means of an instrument having the form of an eccentric curve, resembling the spiral of Archimides, made to revolve on an axis. The resistance offered to the fluid in which it is immersed, results from the different distances of the two ends of the spiral propeller, from the axis. This propeller acts in a box, having also a somewhat spiral shape, and the space between the two ends of the spiral, after describing one turn, is open to allow of the exit of the water driven out by the propeller. The bottom of the box has a circular aperture, of which the radius is equal to the shorter end of the propeller from the axis. The water within this circle meets with no resistance until it arrives at the line joining the two extremities of the propeller, when it is immediately acted upon by the eccentric curved surface of the propeller.—*Philosoph. Mag.*

On the errors in the course of vessels occasioned by local attraction, with some remarks on the recent loss of his majesty's ship, Thetis; by Peter Barlow, Esq. F. R. S.

This paper was read before the Royal Society. The author observes, that the errors arising from the deviation of the compass produced by the attraction of ships, were formerly much less considerable than at present, from the comparatively small quantity of iron existing in the vessel. The increase of this disturbing force in a modern ship of war, is easily accounted for by the immense proportion of iron now employed in its construction, by the use of iron ballast and iron tanks, of iron knees, iron cables, and above all, of iron capstans, besides various other articles made of the same materials, forming altogether a very large and powerful magnetic mass.

The direction and intensity of the deflecting forces thus produced, vary in different latitudes and on different sides of the equator; being greatest in the highest latitudes, where the dip is considerable, and when the ship's course is east or west: and in high southern latitudes, being the reverse of what it is in high northern latitudes. In his majesty's ship Gloucester, which may be taken as an example, the deviation of the compass in the east and west points was found to be, in the British channel, nine deg. thirty min.; so that after running ten miles, the vessel would be more than a mile and a half to the southward of her reckoning; and so on in proportion as the distances increased.

An error of this magnitude, occurring in a narrow channel and in a dark night, were it unknown or disregarded, might lead to the most fatal consequences; and the disaster might perhaps be erroneously ascribed to the prevalence of a powerful current, the existence of which was before unknown.

The Thetis sailed from Rio Janeiro, in December last, with a million of dollars on board, in the finest weather, directing her course to the S. E. The next day, thinking they were clear of land, they tacked, and were sailing at the rate of nine knots, when the first intimation they had of being near land, was the striking of the jib-boom against a high perpendicular cliff, which broke the bowsprit short off, and sent all three masts over the side; thus, in a moment, bringing utter destruction on this fine vessel and her valuable cargo. The author shows that the deviation of the compass arising from the attraction of the iron, was exactly of the kind which was likely to occasion this great mistake in the ship's reckoning; for the distance run by the Thetis, being about eighty miles, if the local attraction of the ship had been equal to that of the Gloucester, she would have passed five miles nearer to Cape Frio than her reckoning,—an error quite sufficient to account for the fatal catastrophe.—The author hence infers the importance of bestowing more attention than has hitherto been given to the influence of the local attraction of vessels, and to the application of the proper means of correction. *Philos. Mag.*

Continuation of Conybeare and Phillips's Outlines of the Geology of England and Wales.—We have the best authority for announcing, that a second volume of this celebrated work is at length determined upon. Our geological readers will remember, that the first volume only includes the tertiary and secondary formations. The entire want of a satisfactory survey of North Wales, the death of Mr. Phillips, the fall which the Rev. Mr. Conybeare got, and which was all but fatal, have combined with other circumstances, to interrupt the continuation of the remaining formations comprehended in the transition and primary Rocks. There will be no reason, however, to regret the delay which has taken place, since the coadjutor who is to assist Mr. Conybeare at the termination of his labours, is the Rev. Adam Sedgewick, of Trinity College, Cambridge. This gentleman has for many years been arduously engaged in examinations of the Cambrian system, including the old formations of Westmoreland and Lancashire: also the lower beds in Devonshire and Cornwall, together with their systems. Last year he completed the survey of the Cheviots on the Scotch border, and as soon as his examinations of the principality of Wales are terminated in the course of the next summer, the results comprehended in these elaborate investigations will be given to the public in the concluding volume of "Outlines of the Geology of England and Wales."

If a revised edition of the first volume were published at the same time, giving it the advantages of the second, by extending to it the appropriate geological information, produced since the first volume was written, this would be a standard work for future geological writers in every country. It would be a vain thing to expect that two individuals (both clergymen of the church of England,) more learned, more diligent, and more accurate than Messrs. Conybeare and Sedgewick, could ever unite their labours upon any subject connected with the physical sciences. EDITOR.

Professor Rafinesque.—This indefatigable and veteran naturalist has just published "A continuation of a Monograph of the Bivalve Shells of the River Ohio, and other Rivers of the Western States," containing 30 new genera, and 47 new species, with "A Supplement on the Fossil Bivalve Shells of the Western Region." They are offered for sale. The professor observes, "Some of these shells are so very rare, that I have only met them once in 4000 miles of travels and explorations; others I have never seen except in collections, such are the *unio ridibundus*, and the *alasmodon complanatum*, for instance. I shall describe here, only those which *I have now before my eyes*, and with the names given them ten years ago, at their discovery." He accuses by name, some of the modern conchologists on this side the water, of systematically excluding his discoveries, for the selfish pleasure of naming them over again; and of one of these gentlemen, he remarks, "I had respectfully noticed, in 1820, his previous labours; but he has never mentioned mine, and knows so little of the animals of these shells, as to have mistaken their mouth for their tail." Of the testaceous animadversions dealt out, in this interesting scientific tract of 8 pages, price 25 cents, to "one half of our naturalists, botanists, and geologists," Mr. Amos Eaton comes in for a conspicuous share in the following passage:—"Prof. Eaton, I regret to say, has (in his Zoological Text-book, Albany, 1826) noticed 33 species of *unio*, and *alasmodon* of Say and Barnes, but none of my previous ones! and put them all back to the old genus *Mya* of Linnæus! This, as well as his whole zoological book, proves that he is forty years backwards in the science of zoology, as he is thirty years backwards in botany, and about twenty years in geology." Fourscore and ten years old in backwardness. A very reverend age, truly!

We are glad to see the author of "Ancient History, or Annals of Kentucky," occupied in the publication of his own discoveries. We are well aware of the practice he complains of. Latin and Greek compounds, now that the trick is so common, are insufficient to protect the property of a naturalist. The learned professor would escape this injustice, if he were to give us the Indian names to his genera—he is unrivalled there. The Indian names to many shell-fish obtain yet on the Atlantic coast, and are in common use in some parts of Long Island.

Circumstances attending the birth of two young Armadillos belonging to the Zoological Society of London.—On the morning of the 1st February 1831, it was discovered that the female had made a nest of straw, close up to the pipe that conveys the warm water round the building, and had brought forth two young, which were quite blind, and measured about four inches from the head to the tail. The male was immediately removed to another cage, but it was supposed that he had injured one of the young ones on the head before they were discovered, of which hurt it died on the following morning. At that time the other young one seemed to be perfectly well, and was sucking; but it also was found dead on the morning of the 3d of February: it was bitten on several parts of the head by the mother. It is probable that the injuries were inflicted by her in consequence of her young having been moved about; and measures have been adopted to prevent the recurrence of such disturbance on any future occasion.

Phil. Mag.

A new practice of Painting: communicated to the Royal Institution of Great Britain.—Mr. Robertson paints in water-colours, and upon paper. He uses isinglass, dissolved in hot spirits of wine, between and over his colours, by which they acquire the brilliancy and force of oil; and when the picture is finished, he covers it with a colourless copal varnish. The pictures, when large, are covered with canvass and tin-foil. The durability and steadfastness of the colours appear to be extreme.—*Phil. Mag.*

Description of a new Species of Ichthyosaurus.—A paper on this subject by Daniel Sharpe, Esq. F. G. S. was read before the Geological Society of London.—This Ichthyosaurus was found in a quarry of lias limestone, about four miles from Stratford-upon-Avon. The whole length of the animal must probably have been about seven feet; the parts of it which remain exhibit the upper portions of the head from the nostrils backwards, in a very crushed state, a continuous series of 52 vertebræ, from the atlas to the commencement of the tail, with nearly all the spinous processes; one scapula, and nearly the whole of one fore paddle. The teeth (by which the four species formerly described have been chiefly distinguished) are entirely wanting in this individual; the author, however, considers it to be a new species, from the following peculiarities of character:—1. The length of each vertebræ is uniformly three-fifths of its breadth, a proportion not found to exist in any hitherto described species. 2. The paddle is of great size, and including the humerus, must have been equal to one-fifth of the length of the whole animal. In the ulna or radius, (it is difficult to say which,) there is a notch on the outward edge, and all the other bones of the paddle are very nearly circular or oval; thus differing essentially from the angular shaped phalanges of I. *communis*, *tenuirostris*, and *intermedius*. On account of the large size of its paddle, the author names this species "Ichthyosaurus grandipes."

Proceedings G. Soc. of London.

Formicological Waterloo.—On the 16th of last May, I was walking in the garden before breakfast, when my attention was attracted by an unusual assemblage of ants in the gravel walk; the species, I believe, was that of which Huber, in his *History of Ants*, has given a representation, and is called by him *formica* *fusca.* On a closer examination I found they were fighting: they were collected in groups of forty or fifty, running rapidly about, and then stopping and pulling each other with their mandibles. The field of battle did not extend over a surface of more than three feet square, and there were probably five or six groupes all eagerly contending with each other. After watching them with much attention for about half an hour, I was called in to breakfast; and, on returning, after a lapse of twenty minutes, the battle was still raging. How long the conflict lasted I am unable to say; for when I first saw them, they evidently had been some time engaged in their deadly game, and I was compelled to leave them before the battle was over. I however visited the spot again about one o'clock, and they were then busily employed in removing their slain comrades. I counted about thirty dead ants on the field; more, probably, had fallen, as doubtless many had been removed before my return. In one small spot, not more than an inch square, seven dead ants were extended. Their courage is very extraordinary; for in several instances, with such fury and obstinacy had these little warriors contended, that two might be perceived locked in each other's embraces, having died in this, their last mortal struggle. We have all read of the battles of ants, but as far as my inquiries have extended, I believe but few have witnessed their combats. I have observed ants for many years, but with this exception, never saw any thing like hostility among them.—*O. Loudon, March* 1831.

Magnetic re-action of Platina.—In a piece of Russian Platina the size of a walnut, Gobel detected the two magnetic poles. Its magnetism was so powerful that a middle sized needle was attracted by it, and a magnetic needle was, at a certain distance, set in motion by it. Many similar pieces of platina, from the size of a hazel-nut to that of a hen's egg, in the collection of the imperial mining academy of St. Petersburg, exhibit similar properties.—*Jameson.*

Interesting discovery of fossil animals.—There has been lately sent to the garden of plants, a collection of fossil bones, from the cacustrine deposits of Argenton, (Indre,) consisting of five or six species of Lophiodon, from the size of a large rabbit, to that of a horse; also species of the genus *anthrocotherium*, of the trionyx and crocodile. Some recent discoveries in the diluvian ossiferous deposite of Chevilly, (Loiret,) of the bones of the extremities of the animal called gigantic tapir, by Cuvier, show that this animal, by the test of its osteology, is closely allied to the living tapir, although equalling, if not exceeding, the rhinoceros. The Indre and Loiret are departments in the central districts of France.

Teleo-Saurus.—M. Geoffroy St. Hilaire has communicated to the Royal Academy of Sciences at Paris, some particulars respecting the fossil remains of an extinct animal, discovered at Caen, and which he has named Teleo-Saurus. M. St. Hiliare supposes it to be, from the form of the teeth, herbivorous, like the Iguanodon, discovered by Mr. Mantell; and that it probably fed on the algæ, and other marine plants. It is of the period of the ichthyosauri, and M. St. H., as usual, draws it into one of his ingenious theories.

The Eagle and the Weasel.—A group of haymakers in Selkirkshire, saw an eagle rising above the steep mountains that enclose the narrow valley. The spectators were soon aware of something peculiar in the flight of the bird they were observing. He used his wings violently, and the strokes were often repeated, as if he was unusually agitated, wheeling in circles constantly decreasing, whilst his ascent was proportionally rapid. He rose until he was nearly out of sight, when at length he appeared to descend, and with great rapidity, but in the manner of a shot bird. When he reached the ground, a black-tailed weasel came from the body, as the haymakers came up, looked around, stood on its hind legs for a moment or two, and then ran into a bush. The eagle was dead, covered with his blood; upon examination it appeared the weasel had eaten into his throat and destroyed him.—*Abstract from Mag. Nat. Hist. Vol.* 3. *p.* 2.

Winter Quarters of Frogs.—In draining a bog, or springy piece of ground in the winter, (during the frost,) I discovered a large quantity,—some hundreds, I suppose,—(frogs,) imbedded about three feet below the surface, in the head or source of a more than usually strong spring. Upon being uncovered, they appeared very inactive, but not torpid or motionless, and attempted to bury themselves again in the sand, which, from the flowing of the water, was so easily separated as to admit a pole of considerable length to be run down it, with a slight pressure. The cavity in which they were, and which apparently was formed by them, was so placed that the water of the spring flowed through it, and prevented their feeling the effects of the frost. In cleaning ditches or stagnant ponds during the winter, I have never seen any but at the bottom of ponds, in which, I am told, they are common. Are we not to infer from this, that they instinctively seek springs, as the water is less liable to freeze? and as they were in the instance mentioned, capable of moving, that they do not hybernate, or become torpid during the winter, but that they respire in water, or in their hiding places? I have never observed them in ditches or pools, until near their spawning time, viz.; after a few warm days in February or March, when their "croaking" is considered the precursor of spring, and provocative of sport to "boys;" after which the embryo frogs appear as black spots in a large mass of gelatinous matter.

J. F. B.—*Mag. Nat. Hist. Vol.* 3. p. 93.

Paganini.—On the 16th of May, Dr. Bennati read a physiological notice of this extraordinary man, in which he gives it as his opinion, that the prodigious talent of this artist, is mainly to be attributed to the peculiar conformation which enables him to bring his elbows close together, and place them one over the other; and to the elevation of his left shoulder, which is an inch higher than the right one,—to the slackening of the ligaments of the wrists, and the mobility of his phalanges, which he can move in a lateral direction at pleasure. Dr. Bennati also alluded to the excessive developement of Paganini's cerebellum, as connected with the extraordinary acuteness of his organs of hearing, which enables him to hear conversations carried on in a low tone, at a considerable distance. M. Geoffroy St. Hilaire remarked, that he had been particularly struck with the prominence of the artist's forehead, which hangs over his deeply seated eyes like a pent house.—*R. Acad. Scien. Paris.*

New plan of drawing, for Charts.—M. Coplin presented a topographical chart of the islands of La Perouse, in which, by a new plan of drawing, in imitation of relief, he has succeeded in so well availing himself of the process of shading, that not only the geological constitution, and the direction of the declivities, but also the variations in the surface of the different mountains are distinctly exhibited to the eye.—*R. Ac. Scien. Paris.*

Geology of Africa.—M. Cordier, at a meeting of the Royal Academy of Sciences at Paris, communicated some geological observations, made by Rozet in Africa. M. Rozet is now of opinion, that the earths which he had formerly considered as *terrains de transition*, are, in fact, to be classed amongst those belonging to the epoch of the lias and the calcareous gryphites. The most elevated summit of that part of the lower Atlas visited by M. Rozet, and measured with the assistance of the barometer, was 1399 metres (4590 feet) above the level of the Mediterranean.

Chloride of Lime a preservative against Small-Pox and Measles.—M. Remy, a physician at Chatillon, has made some successful experiments on chloride of lime, as a preservative against the small-pox. In a village where the small-pox raged, he caused the only twelve individuals in the place, who yet remained subject to the infection, to be washed thrice a week with a solution of chloride of lime, and gave them at the same time two drops of the solution in a glass of *eau sucree*. Two of them had a slight eruption, similar to a vaccine which had not taken well; the other ten, who were not separated from those suffering from the small-pox, had no symptoms of illness. In another village afflicted with the small-pox, of fifteen individuals still subject to it, ten were treated in the same manner, and escaped; whilst two of the remaining five caught the malady. M. Chevalier stated to the Royal Academy of Sciences at Paris, that he was the first to suggest chloride of lime as a preservative against the small-pox; and observed, that it might be used also as a protection against the measles, by keeping in the chamber of the child whom it was desired to prevent from infection, a saucer of dry chloride of lime, renewed from time to time, and dipping its shirts in a solution of one ounce of concentrated liquid chloride in twelve quarts of water.—*Abstract from Jour. Roy. Inst.*

The adult Frog retains the character of the Tadpole.—It appears that some full-grown animals, which have passed through trans-mutations, retain characters proper to the functions of their previous state. Thus the adult frog has a head, with a depressed and semi-elliptical form. The reason is, that the tadpole, which breathes through gills as fishes do, has its voluminous gills under the back cranium; and as the bones of the auricular region cover these extended gills, their developement is in proportion to the volume of the gills.—*Geoffroy St. Hilaire.*

Pterodactylus Crassirostris.—The genus *Pterodactylus* until now only comprehended four species; the *P. longirostris, brevirostris, medius,* and *Macronyx* of Buckland. Dr. Goldfuss has added a fifth, which he calls *P. Crassirostris,* and which has been discovered by Count Munster in the Lithographic Limestone of Daiting in Bavaria. The author has added to it the description of a new Ornithocephalus, *O. Munsteri,* and of a new Lacerta, *L. Neptunia,* in the same rock at Monheim. He describes and figures also some curious fossils, from the Dusodil of Stoschen near Lintz, of Friesdorf, of Orsberg near Erpel, and of Rott near Geistingen. Two species of fish from thence, have been for some time known, to the smallest of which M. Bronn gave the name of *Cyprinus Carbonarius.* There are besides insects of the genus, *lucanus, meloe, dytiscus, buprestis, cantharis, cerambyx, parandra, belostroma, cercopis, locusta, anthrax,* and *tabanus.* M. Bronn has also remarked a small crab. The new species described by M. Goldfuss, are *Rana diluviana, Salamandra Ogygia, Triton noachicus, Ophius dubius.*—Journal de Geologie.

A Golden-green Light Reflected from Moss.—A correspondent of Mr. Loudon's, W. C. T. states, " When making a tour in Cornwall, I was struck by a 'singularly brilliant golden-green light,' similar to that described in your Magazine (vol. ii. p. 406.) On looking into a small cavern by the roadside, near Penryn, I observed in its recesses a small moss (apparently minute plants of Dicranum taxifolium,) which, when seen in some particular positions, appeared of a most beautiful emerald green colour, with a phosphorescent brilliancy." In De Luc's Geological Travels, vol. iii. p. 131, is the following account of a similar phenomenon: " Passing by Botter Rock, Mr. Hill led me to a part of the foot of that Tor, where there are hollows like small caverns; and in these he showed me a vegetable phenomenon, which I had never seen but in the granitic mountains separating the country of Bayreuth from Bohemia. The innermost part of these cavities is lined with a very pretty moss, which reflects the light in the same manner as the eyes of a cat. So little light reaches these remote recesses, that, on looking in from without, they appear quite dark; but when viewed from a particular point, the part of the rock which is covered with this moss is suddenly seen to shine with a fine emerald green."

TO READERS AND CORRESPONDENTS.

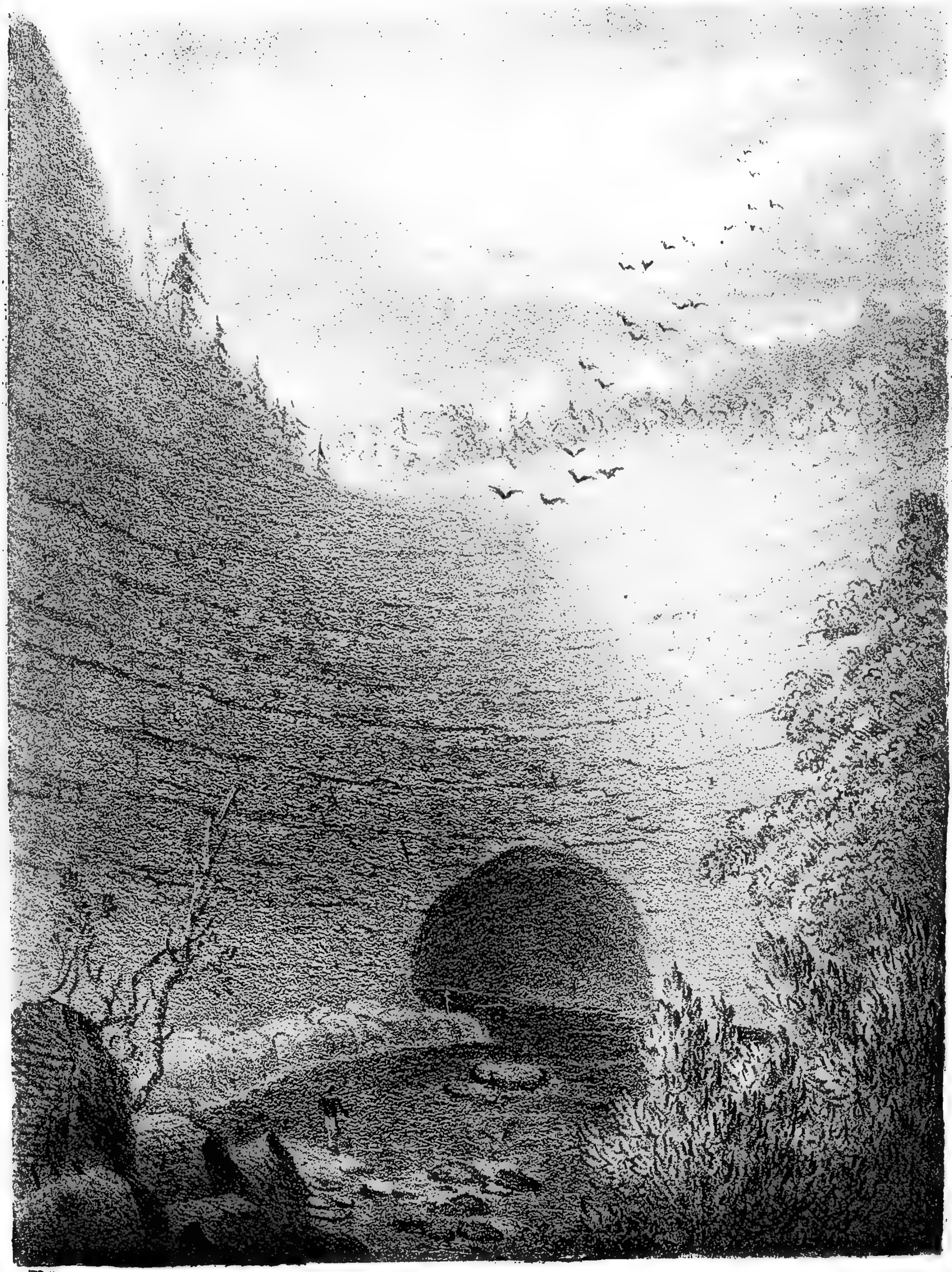
By a curious coincidence, not arising from any pre-concert on our part, we publish in this number some strictures upon an American writer on geology, from the pen of an Englishman, and some strictures upon an English writer on zoology, from the pen of an American. We have entitled the one, "on the causes which retard the advancement of geological knowledge;" and the other, "on the causes which retard the advancement of zoological knowledge." This is the second communication we have published from our valued correspondent in London; from the sources of whose accomplished mind, we hope often to enrich the pages of our Journal. The able and accurate paper from our American correspondent R. S. T. we have a particular pleasure in publishing; it will be found by those who peruse it understandingly, that our correspondent has, upon this occasion, well kept up the balance of our critical trade in natural history. We rejoice in being the medium through which these friendly exchanges of criticism are effected.

We have observed, in numerous instances, that selected passages from our Journal have been re-published in other periodicals, with an acknowledgment of the source from whence they were drawn. Although our copy-right is secured, we have not, in any of these instances, taken umbrage at this practice, nor do we know that we should, where it does not extend so far as to infringe upon our original right in important matters. In many instances, we have, on the contrary, felt gratified at seeing our labours noticed approvingly in other periodicals.

But instances are at this moment before us of a different and less grateful character, and we may as well notice them now, in a general manner, as at another time. If they have taken place inadvertently, which we are willing to believe, we hope they will not occur again. It is always our intention, and we believe has been our practice, to be just to others; and therefore, when we transfer to our pages any passage from the numerous periodicals we receive, we always refer in some mode or other to our authority. We occasionally however make abstracts, for convenience sake, of interesting papers, and refer at the conclusion to the title of the work containing the paper of which we have made an abstract. When our cotemporaries republish such abstracts, condensed by our own labour, and drawn from scientific works for which we pay, *and do not even allude to our Journal as the source from whence they have drawn them,* they are not only unjust to us, but do that which the law forbids. Honey to be sure is very pleasant, and perhaps none the worse when it is obtained without labour, but even the little bees will turn again when they are robbed of it; which predicament we shall conceive ourselves to lie under, if our attention should be drawn to the subject again.

We have complied with the wishes of our correspondent *A Minor*, and he will find a note addressed to him, according to his wishes.

We repeat, that a number of papers are lying on our table, without signature or designation of any kind; some of which, we desire to return to their authors. Other papers which have been sent to us, with particular initials from unknown writers, are unnoticed at present; because we have not had leisure to verify the rather severe criticisms some of them contain. When well drawn up papers, with avowed names, are presented to us, we have not that cause for hesitation, because the responsibility is not with us for the animadversions they may contain. But anonymous criticisms of a severe character, require, in our estimation, to be carefully investigated, and this supposes leisure and facilities, not always at hand. That some papers of this character have not yet been noticed, is not because we are afraid of stating the truth, but because we are desirous of avoiding to state what may not appear to be true to all.



NATURAL TUNNEL. SCOTT COUNTY VIRGINIA.

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THE

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GEOLOGY, No. 2.—ON THE ORDER OF SUCCESSION OF THE ROCKS COMPOSING THE CRUST OF THE EARTH.

The existence of an expansive subterranean power, generated by heat, is so well established by volcanic phenomena, as to render it unnecessary at present to support that opinion, by entering upon any discussions respecting what has been called *central heat,* founded upon the temperature of the earth, the ocean, or that of the thermal springs found in different parts of the world. With a view to apply that kind of knowledge appropriately, we shall hereafter recur to these branches of our subject.

We have given on the next page a tabular view of the known rocks of the crust of the earth, comprehending the general geological series of beds, of which that crust is composed; and lying in that relative order to each other in the series, according to which they are here enumerated. That is to say, that No. 18 is never found underlying No. 17, or No. 9 overlying No. 34. We take these examples at random, and mean merely to assert, that the order has not yet, in any part of the world, been found inverted; and therefore we reasonably conclude, that each of the beds of the series has successively come into the place it is constantly found to occupy. If we could assert with equal certainty, that all these beds were to be found thus overlying each other in every part of the world, then we might generalize still further, and say, that this observed order of the beds, was an effect of causes general to all the parts of the world; but the present state of geological knowledge does not authorize us to assert universal formations.

Although we know that all these beds of the general geologi-

A TABULAR VIEW

Of the known Rocks of the Crust of the Earth.

		No.		Feet.
TERTIARY	SUPERIOR ORDER.	41	Alluvium	
		40	Diluvium	
		39	Upper fresh Water	60
		38	Upper Marine	160
		37	Lower fresh Water, Gypseous	170
		36	London Clay	110
		35	Plastic Clay	very variable
SECONDARY.	SUPERMEDIAL ORDER.	34	Chalk with Flints Chalk without Flints	700
		33	Upper Green Sand	100
		32	Gualt	150
		31	Lower Green Sand	250
		30	Weald Clay	300
		29	Hastings Sand	400
		28	Purbeck Limestone	250
		27	Portland Oolite	120
		26	Kimmeridge Clay	500
		25	Coral Rag	150
		24	Oxford Clay	600
		23	Cornbrash	30
		22	Forest Marble	50
		21	Bradford Clay	50
		20	Great Oolite	130
		19	Fuller's Earth	140
		18	Inferior Oolite	180
		17	Lias	500
		16	Variegated or red Marle	500
		15	Muschelkalk	300
		14	New red Sandstone	300
		13	Zechstein	500
		12	Exeter red Conglomerate	500
	MEDIAL ORDER.	11	Coal Beds	1000
		10	Millstone Grit and Shale	700
		9	Carboniferous Limestone	850
		8	Old red Sandstone	1500
TRANSITION.	SUBMEDIAL ORDER.	7	Greywacke	
		6	Transition Limestone	
		5	Alum Slate Whetstone Slate Flinty Slate	
PRIMARY.		4	Serpentine Greenstone Slate Talcose Slate Hornblende Rocks Primary Limestone	
	INFERIOR ORDER	3	Mica Slate	
		2	Gneiss	
		1	Granite	

cal series have been found in their respective positions, wherever they have been observed, still in no part of the world have all the beds been found, in any one particular place, thus overlying each other. In every part of the world some of them are wanting. In Europe, that groupe of beds called the oolitic series, or *calcaire du Jura* according to the French, and which includes Nos. 17 and 27, (Lias and Portland oolite)—with the intermediate beds,—of our Tabular View, is very common, but has not yet been observed in North America: this groupe has an average thickness of 2700 feet, in England. The groupe including Nos. 12 and 16, usually called the new red sand stone formation, is common in Germany; but in this last country it includes a member for which no equivalent has yet been found in England, viz. the Muschelkalk, which has an average thickness of 300 feet. The defective distribution of particular beds in various parts of the world, affords, however, no argument against the successive order in which all the beds have come to their places in the series; for wherever they are found, they are constant in their relative succession to each other. The occasional absence then of particular beds, is to be attributed to causes which are the legitimate objects of geological research. Without practical investigations, we are not authorized to say, that the absence of any bed is a casus omissus, occasioned by the local deficiency of the causes which have produced the bed in other places; because the bed may have been deposited, and have subsequently disappeared, through the agency of causes which have frequently changed the condition of the surface of the earth, by wasting extensive portions of it.

The chalk, which in some parts of Europe has an average thickness of 700 feet, is remarkable, above all other beds, for containing, in the upper part of its white mass, irregular beds of nodules of dark coloured flint. We remember standing on the summit of Haldon Hill in Devonshire, England, half way between the city of Exeter and the coast, whence one of the most magnificent views in Europe is to be enjoyed, and replete with geological interest. At the foot of the hill lies a rich and broad valley, with the river Ex flowing through it: to the right lies the ocean. At a great distance in front, the chalk cliffs in Dorsetshire are perceived. Haldon Hill is composed of green sand, No. 33, and is there lying on the red marle, No. 16; all the other beds to No. 30, inclusive, being deficient: it will be remembered that the bed which covers the green sand in the series, is the chalk No. 34. But the chalk is not there; and an unobserving traveller would cross this lofty barrier without being reminded of the chalk. A geologist, however, is at once struck with the immense heaps of flints deposited in various parts of this hill, some in entire nodules, exactly as they are found in the chalk, and others broken up and comminuted into a thousand pieces. His eyes are soon opened to the truth, and he sees that the chalk has once been here, and that some cause has put an immeasurable water power into operation, which has scooped out the vale of Ex, washed out all the cretaceous matter for many miles, in which the flints were embedded, and left them behind as monuments of their former position and its irresistible force. We consider this as one of the remarkable proofs of diluvial action. Neither is this the only part of Europe where chalk flints are found similarly distributed. They occur in other parts of England, and in Scotland, where no chalk has been yet observed. In Lower Saxony, chalk flints are very extensively distributed; the destruction of the chalk beds there has not been so entire as in other places, for Dr. Buckland observed a chalk pit near Luneberg.

The deficiency of beds is not peculiar to Europe, being common to North America. We have seen that the oolitic series so common in the former country is wanting here; yet this circumstance by no means affords ground for an argument, that the general geological system of North America has been established by causes of a different character: if it proves any thing, it proves that the causes to which the absence of particular beds is to be ascribed, have been common to both countries, and hence we may the rather infer that general agreement of geological causes which observation has already established. We propose hereafter to make it appear that a great portion of the beds belonging to the geological series of Europe, is regularly represented in this country, and that the beds, including the granite and the coal beds, Nos. 1 and 11, occur on this continent in the regular order. Taking the estimated thickness of the crust of the earth at 40,000 feet, comprehending all that man has seen in the deepest mines, up to the tops of the loftiest mountains, and deducting from it the aggregate thickness of the beds lying above the coal, No. 11, in the general series, which is about 7,500 feet, we can assert that the geological agreement in relation to mineral structure and succession of rocks between America and Europe, is as 32,500 to 40,000. We shall hereafter show other mineral analogies which raise the scale of agreement of this country with transatlantic geology, and without drawing upon the branches of organic nature.

In relation to the absence of particular beds of the general series, on this continent, we have many curious instances. We have personally examined a geological line, extending from Boston, in Massachusetts, to Washington, in the District of Columbia—and which we know extends much farther, both north and south,—where the extremes of the geological series meet. At Boston, New York, Philadelphia, Baltimore, and Washington, there are no beds between the primary rocks and the superficial soil, No. 40, usually called diluvium. Of the particular causes which have produced this extreme continuous deficiency, we shall not treat here, and shall only observe, that no deduction can be drawn from this circumstance to support an opinion, that any set of causes has been in operation on this continent, in the construction of the primary, other than those which have produced the primary beds in Europe; because at one of the points of the geological line we have spoken of—New York—whilst the compact part of the city is built either upon the diluvium which rests upon the gneiss, No. 2, or upon the gneiss itself; at a very short distance from the city, we find the serpentine, No. 4, branching from Hoboken, in New Jersey, under the Hudson river, and superincumbent upon the gneiss; and a few miles further to the north, the primitive limestone in its proper place, lying upon the mica slate, No. 3. And as in many other instances we find each of the beds of the general series of unequal thickness; sometimes in thick stratified masses, which taper off to a point and then disappear, to re-appear again at unequal distances; so we are not to conclude that deficiencies of this various character are the effect of the absence of causes here, which have operated in other parts; or that the difference between the state of the geological series of rocks in this and in transatlantic countries, is to be attributed to the action of antagonist causes; but rather hold to the opinion, that these deficiencies are in fact interruptions of continuity, occasioned by the irregular action of the causes which have deposited all beds. We have said thus much in relation to deficiencies of beds in the general geological series, knowing how necessary it is for students to have proper views of this branch of the subject; and we take leave of it for the present, with the remark, that our uninitiated readers are to remember that the tabular view we present them with, does not represent any actual section in nature: that we know of no part of the world where all the beds are laid upon each other horizontally in the order here enumerated; but that some of the beds are found in some countries, and others in other countries, and that in England they have all been found with the exception of the Muschelkalk before mentioned, No. 15; and that wherever each and every bed has been found, it has always been found, as to its place in the series, in the same relative position, never above its superior number, never below its inferior; from whence we satisfactorily infer, that each of the beds has come in succession into its place; and that if they were all collected and laid upon each other in one column, the tabular view we have annexed to this article, would be a true representative of it.

We have now to speak of another class of rocks, which we have excluded altogether from the tabular view, on account of the very irregular manner in which they are found in various parts of the geological series. These have received the generic name of trap, a term derived from the Swedish word *trappa*, a stair, from rocks of this kind being sometimes found in prismatic forms, rising in stages above each other, and resembling steps or stairs. We refer our readers to our last number, where, at page 311, they will find some information about these rocks. Their constituent minerals are generally the same as those which constitute modern lavas. The igneous origin of these trap rocks is now universally admitted. Such is the intensity of heat of modern lavas, that they are capable of melting down the older rocks; and indeed the lava of Skapta Jokul, in Iceland, to which we have referred at page 294, did this to a great extent in 1783, spreading itself out into broad lakes of fire, sometimes from twelve to fifteen miles wide, and one hundred feet deep. Eleven years after this period, smoke was still rising from parts of the lava, and hot water was found in several of the fissures. Rocks of this intrusive kind, and of the same mineralogical character, are found in various parts of the geological series, sometimes overlaying in prismatic forms extensive areas; at other times existing in amorphous masses which put out numerous branches into the adjacent rocks, ejected from those masses, as it were, with intense heat and velocity. There is a singular mineral vein of this kind in England, which we have personally traced more than fifty miles, passing easterly from the county of Durham, to the sea in Yorkshire, between Whitby and Scarborough. This *Dyke*, as it is there called, cuts, in its upward course, through the carboniferous limestone, No. 9, the coal beds, and many other superincumbent beds into the oolitic series. It appears to be broader the nearer it approaches to the primary rocks. Mr. Bakewell observed it 30 feet broad at Sillow Cross, and twice that width further west. When we reflect that all modern lavas are poured out from volcanos, which are but the vents of a fierce igneous action striving in profound depths, and that lavas in various parts of the world have been observed to have flowed out to the surface, through the granite, the lowest of all rocks; we can but concur in the now universally received opinion, that these trap or intrusive rocks have an igneous origin, and that they all, at various periods, have been projected from those cavities which are inferior to all the known rocks, and which are unsearchable to man. These ancient eruptions having, like the modern ones, taken place at separate periods, we of course find the evidences of them irregularly distributed through the geological series. It is for this reason we have excluded them from a system of beds remarkable for its regularity in all parts of the world, where its members have been recognized; a systematic regularity, the importance of which no one can be insensible to, who is not disposed to attribute invariable succession to mere chance. The geological phenomena consequent upon the origin and action of these intrusive rocks, forming one of the most conspicuous branches of geology, we shall hereafter have frequent occasion to return to them.

We now feel bound to offer some explanation to our readers, of the nomenclature contained in the tabular view. When we come, in another number, to treat successively of the different beds, we shall offer explanations of the names by which we have at present designated them, being those by which they are known in the various geological treatises in the English tongue. That this nomenclature may be hereafter greatly modified, or entirely merged, together with the modern classification of rocks, in the improved views which may belong to a further progress in the science, is not improbable: we are of opinion, however, that the present state of geological knowledge does not warrant any material interference with the arrangements accompanying the tabular view. No part of the world presents such a complete assemblage of the rocks of the geological series as England, and in an especial manner of the secondary rocks. It is this circumstance which has caused geological knowledge to be pre-eminently cultivated by the English. Mr. William Smith, the father of English geology, was the first to assign a proper importance to the rocks of the oolitic series: many of them received local names connected with the places where he identified them; the term *cornbrash* has been censured as a barbarism; but it was eminently characteristic—as upon a future occasion we shall show—of the rock to which Mr. Smith, in the first instance, applied this designation. Many of these English names thus given by Mr. Smith, have been changed by French geologists. *Kimmeridge clay*, so called from a small place on the English coast where this bed is found, has already received in France the respective names of *marne argileuse havrienne*, and *argile de honfleur*. *Oxford clay* is called *argile de dives*. This perhaps is inseparable from the building up of the science; observations made simultaneously in different countries, will be noted in the respective language of the countries where they are made, and the final simplification of what is really injurious to science, is often retarded by a degree of national feeling it is painful to sacrifice. At some future day, no doubt a more simple character will be applied to classification and nomenclature in geology, and what Lavoisier did for chemistry will be done for this science. We shall receive it with gratitude, whether it comes from the country of Cuvier, Al. Brogniart and Elie de Beaumont, the acknowledged ornaments of the French school of geology, or from any of their celebrated colaborators across the channel; but since we cannot adopt the synonymes of all nations into a tabular view of the geological series—and we foresee that the war of classification and synonymes will be waged among geologists before a treaty of peace is signed amongst the Zoologists—we recommend to our readers to adhere to the established names we present them with, because they are recognised in the treatises most accessible to them, and because we believe there are already more geological readers in our overspreading language than in any other, and that the proportion will greatly increase.

To our uninitiated readers, we think it due to offer a short history of one of those subdivisions of the geological series, which we have connected with our tabular view. Primary, transition, secondary, and tertiary. For an account of the first, we refer them to our last number, page 293, which contains our reasons for substituting the term primary, for primitive. The rocks, 1 to 4 inclusive, are those comprehended in the primary division; they have hitherto been found entirely composed of inorganic matter; whether because organized vegetable and animal beings had not been produced, when these rocks were first consolidated; or whether because the igneous origin of the greater part of these rocks was inconsistent with the preservation of organic forms.

In the early periods of the history of Geology, all rocks were divided into primitive and secondary; the evidences of organic nature being entirely confined to this last and most numerous branch. This last division being evidently too cumbrous, could not escape further subdivision; and it being observed that the lowest rocks in the secondary portion contained the first and the simplest forms of organized bodies, the lowest portion of the secondary got the name of transition, as if at the period of the consolidation of these rocks, the planet was in a state of transition from inorganic to organic matter. The exact line where the transition begins, and where it ends, has not yet been agreed upon universally. Those slates which are subordinate to the transition limestone, are considered, by geologists, as containing the first organic remains, none having yet been found in the serpentine, the talcose rocks and slates; or the hornblende rocks and calcareous deposits, which are superincumbent in the series to the primary. The English geologists have limited the extent of the transition to the graywacke, No. 7, inclusive; whilst the continental geologists would include in it the old red sand stone, the carboniferous limestone, and some of them even the coal beds. As this difference in opinion may, perhaps, at no very distant day, be reconciled by the oblivion into which the transition itself may fall; and as it is a question of organic remains, somewhat of a speculative nature, from the imperfect examination those rocks have received, we shall content ourselves with the explanation we have given of the meaning of the term. The remaining part of the series, from the coal to the chalk inclusive, is universally called secondary.

The tertiary includes that portion of the series from the chalk to the present surface of the earth. It is replete with interest, whether we consider it as the terminating part of a long series of rocks, connecting the present with the ancient order of nature, or as being rich, in an exceeding manner, in marine, fresh water, and organic remains.

The other subdivision of the geological series into five orders, superior, supermedial, medial, submedial and inferior, is from the Rev. Mr. Conybeare. It is disconnected with every kind of theory, and pretends to no merit beyond the very convenient manner in which it arranges the geological series into five subdivisions. There is not a more gifted geologist in Europe, than Mr. Conybeare; nor one more capable, in the present state of the science, of offering to the public a more philosophical arrangement, founded upon natural distinctions.

We have prefixed numbers to the beds, for more convenient reference, beginning with granite, the lowest of the primary rocks, and terminating with No. 41, the superficial alluvium, being the last bed in the series, and that which is constantly forming by the agency of floods, streams, and tides. The other column of numbers represents the average thickness of the respective beds in Europe, as it has been computed by the most reputed geologists.

It is proposed, in the course of these essays, to review each of these beds in detail; explaining their position, mineral structure, and the nature of the organic remains imbedded in them. An opportunity will then be presented of describing the beds in North America, and of comparing the geological phenomena belonging to them, with those of other countries. It is by such means alone, that an effectual progress in general geology can be made; for, to use the language of the Rev. Mr. Conybeare, "*we may be sure that any analogies which are common to localities, geographically so distant, and placed under physical conditions so distinct, are, in truth, analogies belonging generally to the whole globe; and thus we shall obtain a data adequate for the foundation of a general geological theory.*" The attention which has been hitherto paid to North American geology, has been, comparatively, so slight, that it would be absurd to offer the series of North American beds, as we are now acquainted with them, as a general type for students: that course, therefore, will be followed, which promises the greatest general degree of instruction on the subject, and which may lead new observers into the field. When inaccurate statements concerning North American geology are brought forward—and to which we are unavoidably exposed—we shall be gratified if some of our correspondents will furnish us with correct information, relying upon our sense of justice to give them proper credit for it.

In regard to scientific terms and technicalities, where we are obliged to use them, we shall endeavour to accompany them with proper explanations: but as many terms used in geology require a somewhat more elaborate definition, than they hitherto appear to have received, it is our intention, from time to time, to insert such definitions in our Journal, and at appropriate periods.

DESCRIPTION OF A NATURAL TUNNEL, IN SCOTT COUNTY, VIRGINIA.

By Lieut. Col. Long, *U. S. Army.*

During the past summer, I visited a remarkable natural bridge in Scott county, Virginia, to which I have given the name of Natural tunnel, on account of its striking resemblance to artificial structures of that kind. An account of a phenomenon so rare, and hitherto unknown beyond its immediate neighbourhood, appeared to me to deserve a place in the Monthly American Journal of Geology. I esteem myself fortunate in being able to contribute so interesting a novelty to its varied pages.

The immediate locality of this tunnel is upon a small stream called Buck-eye, or Stock creek. This last name owes its origin to its valley having been resorted to by the herdsmen of the country, for the attainment of a *good range*, or choice pasture ground for their cattle. The creek rises in Powell's mountain, and is tributary to Clinch river, which it enters at the distance of between two and three miles below the tunnel. The aspect of the surrounding country, and especially of that to the northward of the tunnel, and constituting the southerly slope of the mountain just mentioned, is exceedingly diversified and broken, by elevated spurs and ridges, separated from each other by deep chasms, walled with cliffs and mural precipices, often presenting exceedingly narrow passes, but occasionally widening into meadows or bottoms of considerable extent. The mural precipices just mentioned, occur very frequently, bounding the valleys of the streams generally in this part of the country, and opposing ramparts of formidable height, and in many places utterly insurmountable. Such are the features peculiarly characteristic of *Wild Cat Valley*, the *Valley of Copper Creek*, of Powell's and Clinch rivers, and of numerous other streams of less note, all of which are situated within a few miles of the natural tunnel.

To form an adequate idea of this remarkable and truly sublime object, we have only to imagine the creek to which it gives a passage, meandering through a deep narrow valley, here and there bounded on both sides by walls or *revetements* of the character above intimated, and rising to the height of two or three hundred feet above the stream; and that a portion of one of these chasms, instead of presenting an open *thorough cut* from the summit to the base of the high grounds, is intercepted by a continuous unbroken ridge more than three hundred feet high, extending entirely across the valley, and perforated transversely at its base, after the manner of an artificial tunnel, and thus affording a spacious subterranean channel for the passage of the stream.

The entrance to the natural tunnel on the upper side of the ridge, is imposing and picturesque, in a high degree; but on the lower side, the grandeur of the scene is greatly heightened by the superior magnitude of the cliffs, which exceed in loftiness, and which rise perpendicularly—and in some instances in an impending manner—two to three hundred feet; and by which the entrance on this side is almost environed, as it were, by an amphitheatre of rude and frightful precipices.

The observer, standing on the brink of the stream, at the distance of about one hundred yards below the debouchure of the natural tunnel, has, in front, a view of its arched entrance, rising seventy or eighty feet above the water, and surmounted by horizontal stratifications of yellowish, white and grey rocks, in depth nearly twice the height of the arch. On his left, a view of the same mural precipice, deflected from the springing of the arch in a manner to pass thence in a continuous curve quite to his rear, and towering in a very impressive manner, above his head. On his right, a sapling growth of buck-eye, poplar, linden, &c., skirting the margin of the creek, and extending obliquely to the right, and upward through a narrow, abrupt ravine, to the summit of the ridge, which is here, and elsewhere, crowned with a timber growth of pines, cedars, oaks, and shrubbery of various kinds. On his extreme right, is a gigantic cliff lifting itself up perpendicularly from the water's edge, to the height of about three hundred feet, and accompanied by an insulated cliff, called the chimney, of about the same altitude, rising in the form of a turret, at least sixty feet above its basement, which is a portion of the imposing cliff just before mentioned.

Desirous of illustrating this paper by a front view of the natural tunnel where the creek issues from it, I have, with the assistance of a particular friend in this city—to whom I am indebted for the accompanying drawing*—been enabled to furnish a sketch which very faithfully represents some of the appearances I have described. The embellishments last mentioned, however, viz. the chimney and its accompaniments, could not be comprised in the landscape.

In order to give a more full description of the magnificent spectacle which forms the subject of this paper, I shall transcribe some of the minutes taken from my private notes, whilst on the ground; but first I shall give an extract from a letter addressed to me by my friend P. C. Johnston, Esq. of Abingdon, in the adjoining county to Scott, a gentleman well acquainted with this interesting locality.

"The rocks through which Stock creek flows, are a light blue and gray limestone, of a subcrystalline character; the strata are nearly horizontal; and this arrangement of the strata is obvious for several miles north-eastwardly; but in every other direction, very near the bridge, (natural tunnel,) they have the dip usual in the country to the S. E. at an angle generally of from 30° to 50°. This tunnel is near what I have believed to be the N. W. boundary of the transition formation, a little within it. I have not been able to discover any organic remains in the limestone there, or in the neighbourhood. On the little projections of the rock which occur on the walls, near the lower (S.) end of the

* See Plate X

tunnel, a crystallized deposit is lodged, which you no doubt recollect, that seemed to my taste to be a mixture of salt-petre and alum. No attempt has been made to analyze it. The earth found near the upper (N.) extremity of the tunnel some years ago, (the first time I visited it,) afforded salt-petre. The crystallized deposit seems to be made from a stratum apparently not more than six inches thick, which is so high that it cannot be reached for examination. The growth of timber is such as is common in the neighbouring country, white, red, spanish, black-oaks; hickory, white-walnut, dogwood, poplar, chesnut, birch, ironwood; some hemlock and papaw (asimina triloba) on the banks of the creek, and the edges of the cliffs fringed with cedar. On the creek, below the tunnel for two miles, is found that variety of ash called the fringe tree, (chionanthus virginica,) the long white fringe-like blossoms of which are so delightfully fragrant."*

The following passages are from my own private journal.

"Saturday, Aug. 13, 1831. Having ascended Cove ridge, we turned aside from our route to visit the natural bridge, or tunnel, situated on Buck-eye, or Stock creek, about a mile below the Sycamore camp,† and about one and a half miles from a place called Rye cove, which occupies a spacious recess between two prominent spurs of Powell's mountain, the site of the natural tunnel being included within a spur of Cove ridge, which is one of the mountain spurs just alluded to. Here is presented one of the most remarkable and attractive curiosities of its kind to be witnessed in this or any other country. The creek, which is about seven yards wide, and has a general course about S. 15 W. here passes through a hill elevated from two to three hundred feet above the surface of the stream, winding its way through a huge subterraneous cavern, or grotto, whose roof is vaulted in a peculiar manner, and rises from thirty to seventy or eighty feet above its floor. The sides of this gigantic cavern rise perpendicularly in some places to the height of fifteen or twenty feet, and in others, are formed by the springing of its vaulted roof immediately from

* This plant, in the natural system, belongs to the *oleaceæ,* or olive tribe. The flowers of the olea fragrans are used for flavouring tea in China. We offer this hint to our readers who have access to the chionanthus. Ed.

† This designation has been given to a spot in the valley of the creek, where formerly stood a hollow sycamore (platanus occidentalis) tree of an enormous size, the remains of which are still to be seen, and in the cavity of which, whilst it stood, fifteen persons are said to have encamped at the same time together.

its floor. The width of the tunnel varies from fifty to one hundred and fifty feet; its course is that of a continuous curve, resembling the letter S, first winding to the right as we enter on the upper side, then to the left, again to the right, and then again to the left, on arriving at the entrance on the lower side. Such is its peculiar form, that an observer, standing at a point about midway of its subterranean course, is completely excluded from a view of either entrance, and is left to grope in the dark through a distance of about twenty yards, occupying an intermediate portion of the tunnel. When the sun is near the meridian, and his rays fall upon both entrances, the light reflected from both extremities of the tunnel, contributes to mollify the darkness of this interior portion into a dusky twilight.

"The extent of the tunnel from its upper to its lower extremity, following its meanders, is about 150 yards, in which distance the stream falls about ten feet, emitting, in its passage over a rocky bed, an agreeable murmur, which is rendered more grateful by its reverberations upon the roof and sides of the grotto. The discharge of a musket produces a crash-like report, succeeded by a roar in the tunnel, which has a deafening effect upon the ear.

"The hill through which this singular perforation leads, descends in a direction from east to west, across the line of the creek, and affords a very convenient passage for a road which traverses it at this place, having a descent in the direction just mentioned, of about four degrees."

The rocks found in this part of the country are principally sandstone and limestone, in stratifications nearly horizontal, with occasional beds of clay slate. A mixture of the two former frequently occurs among the alternations presented by these rocks. A variety of rock resembling the French burr, occurs in abundance on Butcher's fork, of Powell's river, about twenty miles northwardly of the natural tunnel. Fossils are more or less abundant in these and other rocks. Fossil bones of an interesting character have been found in several places. Salt-petre caves are numerous. Coves, sinks, and subterranean caverns are strikingly characteristic, not only of the country circumjacent to the natural tunnel, but of the region generally situated between the Cumberland mountain and the Blue ridge or Apalachian mountain. Bituminous coal, with its usual accompaniments, abounds in the northerly parts of this region; and in the intermediate and southerly portions; iron, variously combined, often magnetic, together with talcose rocks, &c. &c. are to be met with in great abundance.

The mountains in this vicinity, long. 82° to 84° W. from Greenwich, lat. 35° to 36° N. are among the most lofty of the Allegheny range. Several knobs* in this part of the range, among which may be enumerated the Roan, the Unaka, the Bald, the Black, and Powell's mountains, rise to the height of at least four thousand five hundred feet above tide.

REMARKS BY THE EDITOR.

Our acknowledgments are due to that distinguished traveller Col. Long, for having enriched our Journal with a notice of a remarkable phenomenon of this continent, which no man has explored more extensively than himself. The natural tunnel which that gentleman has so well described, is a very rare spectacle, and considering its extent, unique of its kind. It belongs no doubt to that class of natural aqueducts which owe their origin to natural cavities in the rocks, and which are generally subterranean. Col. Long observes that coves, sinks, and subterranean caverns are strikingly characteristic of the whole region adjacent to the natural tunnel. This is the common character of that great limestone formation (carboniferous) which extends over so vast an area in North America, and which abounds in extensive subterranean caverns, whether in Kentucky, Virginia, or the Helderberg hills in New York. These caverns in the two former states, are of a surprising extent, and have been penetrated several miles. Many coves, and curiously complicated dells and vales in the south-western parts of the Apalachian ridges, probably owe their origin to the disintegration of the rocks, and the consequent destruction of the natural caverns. That this natural tunnel has not been worn through the rock by the long continued action of running water, is evident, not from the cavernous structure alone of the general country, but from the form of Powell's mountain, in a spur of which, this natural tunnel passes transversely. Powell's mountain is one of those innumerable knobs, out-liers, or independent hills, divided from the adjacent mountains by dells or vales, which are so numerous in that vast assemblage of Apalachian mountain ridges, which

* Out-liers of any particular ridge.

extends N. E. and S. W. 1200 miles, and has a mean breadth of about 100 miles between the Ohio river and the Blue ridge, in Virginia. In those dells, or vales, the head waters of those rivers which effect the drainage of the country east and west, have their rise. In the south-western corner of Virginia, where the eastern part of Tennessee, and the western part of North Carolina meet, there are slopes which send down the great Kenhawa to the north-west, the Tennessee to the south-west, and the Roanoke to the south-east. The Blue ridge has its north-eastern termination in York county, Pennsylvania, and from thence stretches south-west in an almost unbroken line to Burke county, N. Carolina, a distance of more than 350 miles, where it becomes the main ridge,* dividing between the waters of the Atlantic ocean and the Ohio river. West of this primary ridge lie the other ridges belonging to the transition and secondary The sources of the Roanoke lie at an elevation of about 1500 feet above tide water, on the western side of the Blue ridge, and contiguous to the sources of the great Kenhawa, which traverses the remaining part of the distance to the Ohio river, descending the vales, passing through the gaps of the ridges, and the dells and vales which separate the independent hills.

Stock creek is one of those sources of the Tennessee, and rises in a dell at the foot of Powell's mountain. On its way to Clinch river, to which it is tributary, and which itself is tributary to the Tennessee, it encounters a spur of Powell's mountain, which under the name of Cove ridge, terminates, as Col. Long has remarked, with a slope of about four degrees, affording a very convenient passage for a road. The stream passes through the tunnel not far from the termination of the spur, so that if originally

* It should, moreover, be remarked, in reference to the main ridge dividing between the Atlantic and Ohio waters, which may be regarded as the back bone of the Allegheny or Apalachian mountains, although distinguished by different names in different parts of its range, is nevertheless completely unbroken by ravines or water courses, throughout its whole extent, from its south-west extremity near the sources of the Tombeckbee river, in lat. 34 1-2 N. and long. 88° W. to the point where it is intersected by the west branch of the Susquehanna, in lat. 41 1-2 N. and long. 77 1-2 W. Beyond this point, north-eastwardly, the ridge or back bone ceases to maintain its characteristic continuity; but spreads in that direction into numerous ramifications, dispersed over a large extent of country, and presenting themselves in the form of detached knobs, or out-liers. The crest of this ridge has no where an elevation less than 2000 feet above tide; its course is very serpentine, and its entire length between the points above designated, is about 600 miles.

there had been no natural cavity in the rock, it is evident that the stream would have been deflected from its line; would have followed the base of the hill, and have turned the extreme point. We, therefore, without hesitation, refer the origin of this aqueduct to an original cavity in the mountain, and highly approve of the name of natural tunnel, which col. Long most appropriately has given to it.

We have been led into these remarks chiefly from a desire to draw the public attention to some conspicuous desiderata in the geology of this country. No geological surveys having yet been undertaken, our knowledge of the Apalachian mountains is very limited. The ridges, independent hills, and vales, are very numerous and diversified, and have not yet been geologically disentangled from each other. We are consequently unable to say, with confidence, where the mineralogical structure of the gold region has its precise limits, or where the primary rocks terminate, and the secondary begin. In truth, geologically speaking, very little is known of the details of the Apalachian ridges, even as it respects the place to which their rocks belong in the geological series. Of some portions of them, it is true, we have some information; but among these we cannot include the south-western portion in the country of this natural tunnel.

There is another very interesting branch, and as connected with the Apalachian ridges, of great importance. Many have considered them under their common designation of Allegheny mountains, as the dividing line of the western and eastern rivers. This is by no means so. The Susquehanna rises to the north beyond their area, and traverses obliquely their Pennsylvania terminations, on its way to the coast. The Potomac pursues for a while a north-east course, then turns to the east and penetrates through the greater mass of those ridges, before it takes its regular south-east course; and although the Rappahannock and Roanoke may be said to descend from the eastern slope of the Apalachians, yet the James river rises in their central parts, and the great Kenhawa, which flows north-westward into the Ohio, has its sources interlocking with those of the Roanoke. We want not only the details from which to deduce the causes which have governed the courses of these rivers, but proper data to reason upon, for the cause of those interruptions of continuity in the Apalachians, which have left so many knobs and hills, independent of the ridges, and for the origin of those gaps through which the streams now pass. We want to know whether by far the greater portion of them have been worn, not by the action of advancing streams, but by a retrocessive action, similar in nature to that which has removed the Falls of Niagara from Queenstown to their present station, of which we think to have given the proofs in our number for July, 1831, in an article on the ancient drainage of North America.

It will give us a lively sactisfaction to receive sensible and practical papers from our correspondents, on these interesting subjects.

VISIT TO BIG-BONE LICK, IN 1821.

By C. S. Rafinesque, *Professor of Historical and Natural Sciences, &c.*

Mr. Cooper, in his account of Big-bone Lick, has craved further information from other explorers. I shall, perhaps, add some additional facts to his. He has omitted Mr. John D. Clifford and myself among the explorers. To my knowledge Mr. Clifford visited the place in 1816 or 1817, and dug for bones. He procured many, which I have seen in his museum, in Lexington, among which a fine tusk of mastodon, and some horns of the oxen found there. His collection of bones has been removed, by purchase, to the museum of Cincinnati, and latterly to the Academy of Natural Sciences, of Philadelphia.

We proposed to visit this lick together in 1820; but his death that year prevented us. In 1821, I went with Dr. Short, from Lexington to Northbend, at the mouth of the great Miami. I left him there at his brother's seat on the Ohio, and went on purpose to the Lick by myself to explore it, and wait for him on his return. A horse having been lent to me, I went by the road of Cincinnati, following the banks of the Ohio. I visited in the way a beautiful elliptical mound, near the banks of the river, and the house of major Pratt. It has been preserved intact, with the trees that grow on it. The base measures 550 feet in circumference; it is 25 feet high, and the top is level 100 feet long from N. E. to S. W., by 50 feet broad. This mound, or altar, is nearly half way between the stone fort, at the mouth of the Miami, and the ancient city, temples, circus, and mounds on which Cincinnnati has been built, now mostly levelled and destroyed. All are on the second bank of the Ohio.

Without stopping long in Cincinnati, I crossed there the Ohio to Covington, in Kentucky, on the west side of the mouth of Licking river. I went to survey the singular ancient monument near Covington, at Mr. Jacob Fowle's; the main road passes between two circular mounds of unequal size; the eastern is 12 feet high; the western 25, and has a pavilion on the top; but the singularity consists in a long sickle-shaped esplanade, running out of it to the south, which is 350 feet long, about 80 broad, and 8 feet high.

From Covington to Big-bone Lick, the distance is only 18 miles, nearly S. W. over the limestone upland, gently undulating: near the Lick the ground is more broken into ravines which open into the Big-bone valley.

I remained several days at the Lick, which is a watering place, with ample accommodations; but I found the actual owner a very surly man, who would no longer allow any excavations, having imbibed the notion that digging would take away the water from the spring, around which a pavilion and seats had lately been erected. Seeking for bones was then out of the question, and I spent my time in taking an ample survey of the place, the valley, and the landing on the Ohio, with the surrounding hills and monuments, now only two miles from the lick, where steam boats land their passengers. I made some maps and drawings, and collected several plants and fossils.

Mr. Cooper's account of the place is tolerably correct, but his map does not show all the streams, ravines and springs around the place, and omits entirely the remarkable ancient mound, connected with the Indian traditions mentioned long ago by Jefferson, in his notes on Virginia. Yet this mound is only 300 yards from the large boarding house, but in the woods on the steep hill behind it, towards the S. E. It is elliptical, 10 feet high, 430 feet in circuit at the base, 150 feet long, from N. to S. and is level on the top, with a hollow in the centre, which I ascribe to some late excavation, but am not positive, as no rubbish is seen.

This was the mound from which the Great Spirit destroyed the last mastodon, according to the tradition recorded by Jefferson.

Behind this mound, and towards the landing, are three small sepulchral mounds near one of the springs of the western branch of Gunpowder creek, which empties itself into the Ohio at the landing; but the main branch comes from the north. The ridge separating the waters of Gunpowder and Big bone creeks, is not very high, and forms a kind of gap where the road crosses it: the lick may have once communicated with the Ohio by this gap.*

I walked to the landing, where there was a very inconvenient landing place; near it was a farm house only, the cliffs being there very near to the Ohio, quite steep, and subject to avalanches. I was told by the farmer, that not long ago, in a storm at night, he was frightened by a dreadful noise like an earthquake, which lasted a long while; and in the morning found a small ravine south of his house almost filled up by an avalanche of huge stones from the cliffs. I went to see the place, and found it so; the stones were of all sizes and shapes, but all angular; some must have weighed many thousand pounds, and yet had rolled 200 yards or more. These cliffs, as usual, are of limestone, in horizontal strata, and 200 feet at least above the river.

The water at the Lick springs contains salt and sulphur; it has a bluish cast, like that of the Blue licks, on Licking river; both are limpid, but of an abominable taste, although readily drank by the idlers who come there to loiter, drink, bathe, and kill the game—very plenty yet on the hills.

I should have wished to follow Big-bone creek to its mouth, but had not time. I have since regretted it, when I heard some years afterwards that a very singular ancient tomb had been found there. It was formed by two large slabs uniting into an angle above, and covered by the soil; some human bones were found in it, the fate of which I could not learn. I am inclined to believe it situated in the alluvion of the creek, which is ample in some places, and even contains many fossil shells, or unios, the same as those now inhabiting the creek and the Ohio. It would be interesting to know what connection may exist between this tomb, the mound on the hill, and the regular arrangement of the fossil bones at the lick, although I should myself be inclined to believe in the diluvial eddy which may have brought the bones there in a regular heap, in the bend of the valley.

At Blue licks, in a rocky valley, no bones and no monuments are found, but Drennon's lick has bones and mounds. Out of the

* Which is badly laid out in the map, as well as Gunpowder creek, erroneously called River creek.

limestone region, in the sandstone hills, many licks are found with fossils, but no bones and no monuments. Is it not strange that there should be an apparent connection between them, or rather their locality? as if some Indian tribe had collected these bones as relics.

The valley of Big-bone creek is nearly a mile wide at the lick and above it, but becomes much narrower below it, as if the lick had been formerly a basin, or small lake. All the hills are of horizontal blue limestone, with some shells, chiefly terebratulites, productus, &c. But the valley, with the sides of the hills, are of clay. This clay is of various hues and consistency, often mixed with sand and gravel, damp in the middle, dry and arid on the sides of the valley. It contains in the ravines several fossils, chiefly alcyonites and entrochites. The hills rise 120 to 180 feet above the valley. They are wooded and full of game, but with a very thin soil. The soil in the valley, near the lick, is rather sterile, but higher up becomes fruitful, and is well cultivated.

Many pretty plants are found in the valley and hills, but no saline plants. The stream of Big-bone often changes its course, and washes away its banks when it overflows in the spring. The back-water of the Ohio, when very high, comes near to the lick, and may have reached it formerly.

No bones were protruding or visible in the banks, in 1821; but some were visible as late as 1810, at least. The first European discoverer of this place was Longueuil, in 1739, who took away many bones to Louisiana and France. They were then quite out of the ground. He was led there by the Indians, who held the place as holy, and never took away the bones.

Having well explored the lick and valley, I returned to Lexington with Dr. Short, as soon as he called for me. This was in September, 1821.

NO. 1.—LETTER FROM AUDUBON TO THE EDITOR.

St. Augustine, East Florida, Dec. 7, 1831.

I AM now seated in earnest to give you an unceremonious summary of my proceedings up to this time, since we left Richmond, in Virginia. As a geologist, I venture to suppose you would have been but indifferently amused, if you had been with us in our journey from this latter place to Charleston, in South Carolina; and as an ornithologist, I cannot boast of the enjoyment I found; poor coaches, dragged through immense deserted pine forests, miserable fare, and neither birds or quadrupeds to be seen. We at length approached Charleston, and the view of that city from across the bay, was hailed by our party with unfeigned delight. Charmed as we were with having terminated our dreary journey, it did not occur to us to anticipate the extraordinary hospitality which awaited us there, and which led to a residence of a few of the happiest weeks I ever passed.

I had passed but one night in the city, when I was presented to the Rev. Mr. ——. This benevolent man, whom I am proud to call my friend, would not suffer the 'American woodsman' to repose any where but under his roof; and not him alone—all his assistants too. When I tell you that he was an old friend of Alexander Wilson, that he shoots well, is an ornithologist, a philosophical naturalist, and that during the time we enjoyed his hospitality, he took us all over the country with his carriages and servants, in search of specimens, and that he was every thing that a kind brother could be to me, you may suppose that it is with great sincerity I say, and ever shall say, God bless him! When I first saw this excellent man, he was on horse-back; but upon my being named to him, it seems the love of ornithology rose within him, he leaped from his saddle, suffered his horse to stand at liberty, and gave me his hand with a pressure of cordiality that electrified me. I saw in his eyes that all he said was good and true; and although he spoke of my labours in terms far exceeding what is due to them, I listened to him, pretty well assured that he did not intend me to play the part of Gil Blas over again; for myself, my assistants George Lehman and Henry Ward, our arms, with our baggage, were removed in a jiffy to his own mansion, introduced to the family, and at work the very next morning. Whilst there, the weather, to be sure, was shockingly hot great part of the time; we nevertheless shot a vast quantity of birds, without meeting with any thing new. The picked specimens, after preparation, were despatched to our mutual friend H—, where great care will be taken of them until my return. I believe we prepared about 300 specimens, consisting of about sixty species of land and water birds. I jumped at once into my wood-hunting habits. All hands of us up before day-break, and soon at work, either in the way of shooting, taking views, or drawing birds: after sunset—scribbling in our journals. At Mr. ——'s, our evenings were passed in a very agreeable manner. I received a great deal of information from him respecting the migration, residence, and nidification of many species, whose habits I was but partially informed of. In the early part of November, the alligators had gone into their winter quarters; the migratory birds were passing swiftly on towards the south, although we had had no frost. The planters considered the country as still unhealthy, and resorted to the city at night. If I had been governed by the practice and advice of many, I should not have put a foot in the mud, either salted or fresh; but difficulties of this character must be disregarded by the American woodsman, while success, or the hope of it, is before him.

It is impossible to do justice to the generous feelings of the Charlestonians, or to their extreme kindness towards me. Many of the gentlemen took the greatest interest in my pursuits; one, Dr. ——, presented me with an excellent New-Foundland dog, and other valuable memorials of his regard. Another, Dr. ——, gave me a collection of shells, from the adjacent waters. The ladies presented me with a capital supply of snuff. Desirous of going to Cole's Island, distant about 25 or 30 miles, to look after some marine birds, a boat, four hands, and a pilot, were immediately offered to me, free of all expense, with liberty to detain them as long as it was agreeable to me. It is not possible for me to express properly the sense I feel of the kindness I received from that warm-hearted and intelligent people.

And now, as you have good naturedly listened to what I have felt bound to say on the score of gratitude, I will tell you what I know you are impatient to come to—something about my proceedings at Cole's Island. It lies south from Charleston, about 25 or 30 miles; there we arrived and encamped for the night: certain beef-steaks we brought with us, we roasted upon sticks, and the adjacent shore provided us with excellent oysters: gaiety, good appetites, and our hearts all right, made the time pass pleasantly, and it was with some reluctance we spread our blankets, and arranged the fire preparatory to going to rest. Nothing is more valuable to a naturalist, and particularly to an ornithologist, than the first hours of day; therefore, long ere the sun had glowed over the broad sea that lay before our camp, we had reached another island where birds resort to roost by thousands; but, notwithstanding these multitudes, not a new species did we procure. We, however, had the pleasure of observing two noble "birds of Washington," sailing majestically over the broad watery face.

But it was necessary to bring my stay in Charleston to a close, and it was somewhat difficult too. My friends had increased in number, they were in the habit of accompanying me in my shooting excursions, I was becoming very much attached to them, invitations poured in from various parts of the country; and I really believe, that had I been willing, we might have remained there and in the neighbourhood, if not all our lives, at least as long as would have caused a rare scarcity of the feathered tribes, in that portion of the Carolinas. But my mind was among the birds farther south; the Floridas, Red river, the Arkansas, that almost unknown country California, and the Pacific ocean. I felt myself drawn to the untried scenes of those countries, and it was necessary to tear myself away from the kindest friends.

We embarked in the schooner Argus, the wind was fair, and we hoisted all sails for the Floridas. Our passage was not short, the wind changed, and we put back into St. Simon's Island Bay. This was one of the few put backs in life of a fortunate kind for me. I made for the shore, met a gentleman on the beach, presented him my card, and was immediately invited to dinner. I visited his gardens, got into such agreeable conversation and quarters, that I was fain to think I had landed on some one of those fairy islands said to have existed in the golden age. But this was not all; the owner of this hospitable mansion pressed me to stay a month with him, and subscribed to my Birds of America, in the most gentlemanly manner. This was T. R. K., Esq. But the wind shifted, and I was sent for, and our voyage for St. Augustine resumed.

St. Augustine, whatever it may have been, is far from being a flourishing place now. It lies at the bottom of a bay, extremely difficult of access, even for vessels of light draft, which seldom reach the "city" in less than a day. I cannot say much for the market, nor for the circumjacent country. Oranges and plenty of good fish, seem to constitute the wealth of the place. Sands, poor pine forests, and impenetrable thickets of cactus and palmettos, form the under growth. Birds are rare, and very shy; and with all our exertions, we have not collected one hundred skins in a fortnight that we have been here. I have received many kind attentions, and numerous invitations to visit plantations, on our way to the south, where I shall direct my steps in a few days. I have drawn seventeen species, among which one *mongrel vulture,* which I think will prove new. You will see it, I hope, very soon.

I will give you a sketch of our manner of passing the time. We are up before day, and our toilette is soon made. If the day is to be spent at drawing, Lehman and I take a walk, and Ward his gun, dog, and basket, returning when hungry, or fatigued, or both. We draw uninterruptedly till dusk, after which, another walk, then write up journals, and retire to rest early. When we have nothing on hand to draw, the guns are cleaned over night, a basket with bread and cheese, a bottle with old whiskey, and some water, is prepared. We get into a boat, and after an hour of hard rowing, we find ourselves in the middle of most extensive marshes, as far as the eye can reach. The boat is anchored, and we go on wading through mud and water, amid myriads of sand-flies and musquetoes, shooting here or there a bird, or squatting down on our hams for half an hour, to observe the ways of the beautiful beings we are in pursuit of. This is the way in which we spend the day. At the approach of evening, the cranes, herons, pelicans, curlews, and the trains of blackbirds are passing high over our heads, to their roosting places; then we also return to ours. If some species are to draw the next day, and the weather is warm, they are *outlined* that same evening, to save them from incipient putridity. I have ascertained satisfactorily that *feathers* lose their brilliancy almost as rapidly as flesh or skin itself, and am of opinion that a bird alive is 75 per cent more rich in colours than twenty-four hours after its death; we therefore skin those first which have been first killed, and the same evening. All this, added to our other avocations, brings us into the night pretty well fatigued. Such, my dear friend, is the life of an active naturalist; and such, in my opinion, it ought to be. It is nonsense ever to hope to see in the closet what is only to be perceived—as far as the laws, arrangements and beauties of ornithological nature is concerned—by that devotion of time, opportunities, and action, to which I have consecrated my life, not without hope that science may benefit by my labours.

As to geology, my dear F., you know as well as myself, that I am not in the country for that. The instructions you gave me are very valuable, and I shall be vigilant. The aspect of the country will soon begin to change, and as I proceed, I will write to you about all we see and do. Whatever I state to you, you may rely upon; and if you think my letters, such as they are, are worthy of a place in your valuable Journal, there you are at liberty to place them, or any part of them. Do not be afraid of my safety; I take a reasonable care of my health and life. I know how to guard against real difficulties, and I have no time to attend to that worst of all kind of difficulties, imaginary ones. Circumstances never within my control, threw me upon my own resources, at a very early period of my life. I have grown up in the school of adversity, and am not an unprofitable scholar there, having learnt to be satisfied with providing for my family and myself by my own exertions. The life I lead is my vocation, full of smooth and rough paths, like every vocation that men variously try. My physical constitution has always been good, and the fine flow of spirits I have, has often greatly assisted me in some of the most trying passages of my life. I know that I am engaged in an arduous undertaking; but if I live to complete it, I will offer to my country a beautiful monument of the varied splendour of American nature, and of my devotion to American ornithology.

JOHN JAMES AUDUBON.

Ther. this day at 2, P. M. 78° Fahr.

ON THE GEOLOGICAL CHARACTER OF THE BEDS UPON WHICH THE CITY OF PHILADELPHIA STANDS.

By PETER A. BROWNE, ESQ.

DR. TROOST, in his geological survey of the environs of this city, has stated, that it is placed on an alluvion. I am of an entirely different opinion; and the distinction between alluvial and diluvial, is important, and has been well pointed out by Conybeare, and other geologists. These two deposites should never be confounded. The superficial soil upon which the city is built, consists of boulders, gravel, sand, loam, clay, and iron. All these appear to have been derived from the primitive rocks. The boulders are granite, gneiss, mica, schist, hornblende, and quartz. The gravel stones are principally quartz. There are a few rolled pieces of chert, old red sandstone, &c.; but their numbers are so comparatively small, that their presence may be considered as accidental, and they can lay no claim to giving a general character to a deposite which is manifestly diluvial in its origin.

The boulders and gravel stones are partially rounded, indicating that they have not been brought from a great distance, and the nearest rocks in place are *primitive*. The felspar in the granite boulders is a dull opaque white, and in a state of partial decomposition. So it is in the neighbouring mica schist. Dr. H. Hayden, author of the geological essays, is of opinion, that the rolled pebbles of the diluvial districts of this country, lie generally from three to five miles, and sometimes more, from their original gangue, or locality. Guided by these considerations, we may venture to pronounce the superficial deposite upon which Philadelphia stands, to be a "primitive diluvial."

The next subject of inquiry is, by what means it was transported to where it is. The magnitude of the boulders, and the immense quantity of diluvial matter, preclude the idea that they have been brought by the Delaware and Schuylkill, even aided by any freshes, judging from present appearances, with which these rivers have ever been agitated. That a mighty current of water has, at no very distant period, passed over this continent, in a direction from N. and E. to S. and W., appears to be a fact well proved. The able manner in which Dr. Hayden has examined this subject, precludes any discussion of it here; I would, however, remark, that when Coats street and Fair Mount street were digging down to the regulation, I inspected the upper surface of the mica schist rock, as it was laid bare, and discovered furrows upon it, all tending from N. E. to S. and W., as if something hard or heavy had been dragged over it. This current was probably consequent upon a flood of a general character, and to which the diluvial matter owes its origin, being the comminuted materials of the rocks it had torn and abraded.

The materials of which this diluvial deposit is composed, are now found, according to observation and the best information, in the following order.

1st. A vegetable sod, or mould, which, where the ground is level, and has not been disturbed by cultivation, is generally from four to six inches deep.

2d. When the situation is not very low, ten or twelve inches of a yellow, tough, silico-argillaceous earth, called "loam." When the situation is very low, this is of a gray colour.

3d. In some places, gray and yellow sand and clay; the sand sometimes coarse, and at others nearly impalpable; silicious pebbles, from the size of an egg to mere grains, are found here. In other places, under the yellow loam, the substance becomes hard and sandy, first of a slightly brown colour, and afterwards changing to gray sand. The depth of this stratum varies from three to six feet. Between this and the next stratum is sometimes found six or seven inches of black clay, in the lower side of which embedded pebbles are commonly found, some as large as paving stones.

4th. A fat, tenacious, and plastic clay, containing very little silicious sand, and very few pebbles. The depth of this varies; it is sometimes six or seven feet. Not more than one fourth of the site of Philadelphia has any of this stratum; where there is no clay, the place is supplied by sandy loam, mostly running into gray colour, as it approaches the next stratum. When the clay is regular, its depth is, on an average, three to four feet. This clay is what is called potter's clay. The three last strata mixed together form what is called brick clay. When the potter's clay is superabundant, it is sold to the potters, or reserved to mix with the sand and loam of other places, to make brick clay.

5th. A yellowish, and frequently dark brown mixture, partly chemical, and partly mechanical, of silicious, argillaceous, and ferruginous particles, passing into a sort of imperfect iron ore. This seldom exceeds in thickness two or three inches.

6th. Gravel, containing boulders as before stated. The gravel is coloured red with iron, and contains a small quantity of clay, which imparts to it an adhesive quality, and renders it a fine material for making gravel walks, or covering roads. Near the Schuylkill the boulders are large, and the gravel coarse; but the boulders gradually diminish in size and quantity, and the gravel gradually becomes finer as you approach the Delaware river. At Seventh street it is a fine sand. It is difficult to ascertain the depth of the gravel; water is generally found in it, at the depth of sixteen feet.

As to organic remains, while digging a cellar in Oak street, in the Northern Liberties, a large mass of madrepore was found in sand, eight feet below the surface. This happened so near to the Delaware, that I conjecture it came there with alluvial matter. I have never been able to detect any organic remains in the gravel; but in digging a well at the south end of the naval asylum, built by the United States, after passing the various strata above described, about on a level with the Schuylkill river, the workmen struck upon a bed of black alluvial, resembling river mud, in which was found wood, leaves, and bark; the latter so sound that it retained its natural colour, and upon inspection it was pronounced by good judges to have belonged to the hemlock. Before reaching this stratum of mud, the workmen found some pretty large stones, resembling paving stones.

It would then seem, that before the deposit of this diluvial matter, there was a vast valley at this place, through which the Schuylkill river ran its peaceful course; that the bed of the river was strewed in the usual way with pebbles, and its banks shaded with hemlock trees.

About 38 years ago, a friend of mine dug a sink in a cellar, at the N. W. corner of Cherry and Seventh street, Del.: at the depth of about thirty feet from the bottom of the cellar, which was eight feet below the surface of the earth, the workmen found black marsh mud, in which were buried hickory nuts, acorns, leaves, and a log of wood; the latter in a high state of preservation. Before coming to the mud, the workmen passed through a stratum of plastic clay, a stratum of gravelly sand, coloured with iron, and a stratum of fine white sand. This furnishes an additional proof, that the present site of Philadelphia was, in ancient times, a hollow basin, or valley.

How gratifying thus to withdraw the curtain of time, and penetrate into the secrets of a remote antiquity. The apparently insignificant gravel stones which we indifferently tread under foot, when submitted to the scrutiny of the geologist, are found to be so many historical medals. They are indeed mute; but when compared with their parent rocks, and the beds which they now occupy, they speak eloquently of important changes this planet has experienced, and which tradition has confirmed.

In the clay of the site of Philadelphia are found some objects which are supposed by many to be fossil remains; others believe

As to organic remains, [illegible] [illegible]

[illegible] question it was pronounced by [illegible] the hemlock [illegible] found some pretty large stones [illegible]

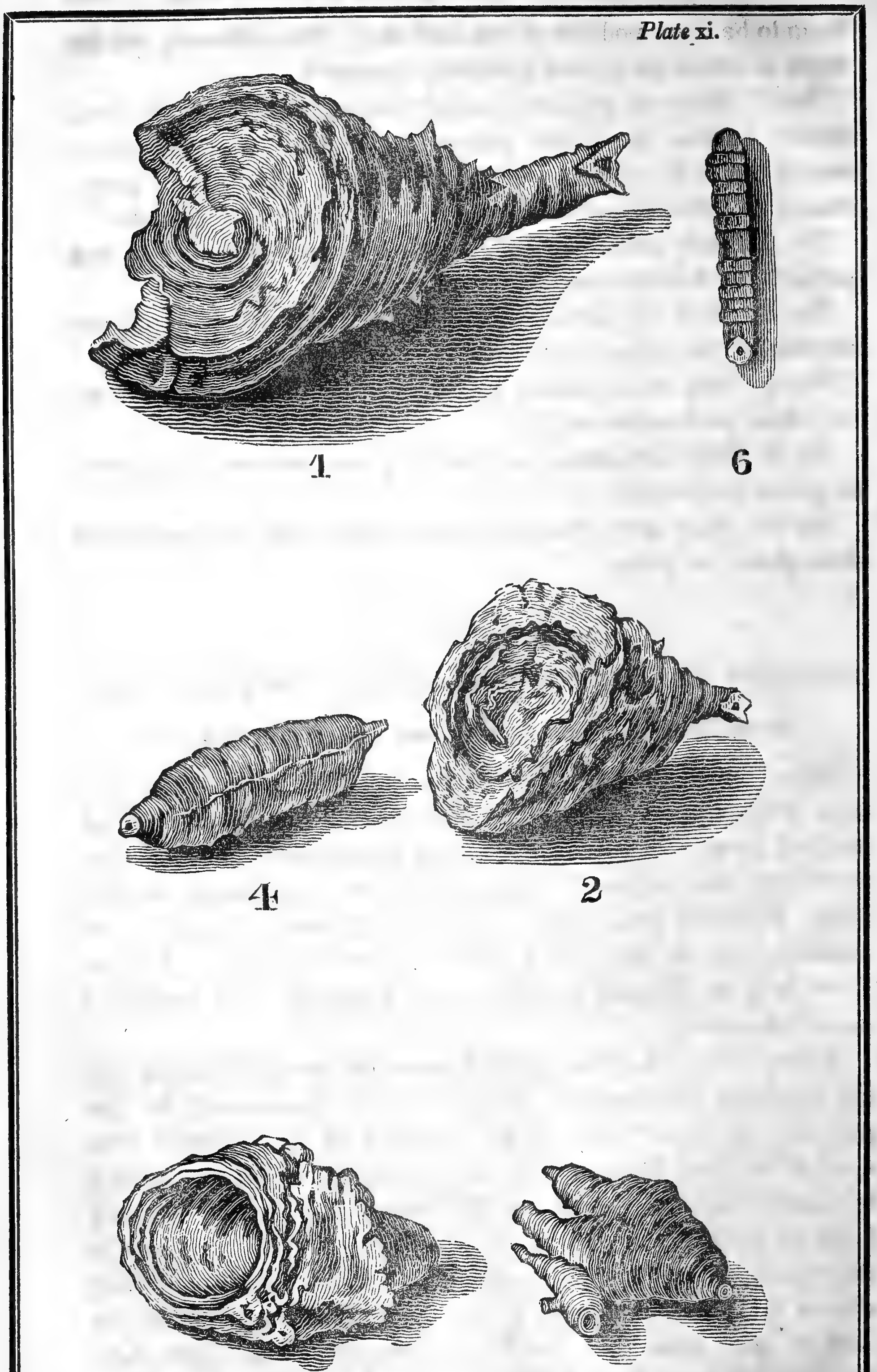
[illegible] the usual way with [illegible]

[illegible] proofs that the [illegible] times, a hollow beam [illegible]

[illegible] thus to withdraw the curtain [illegible] of a remote antiquity. [illegible]

In this state of [illegible] Philadelphia [illegible]

Plate xi.



them to be mere nodules of iron and clay. The following are the forms in which they most generally appear.*

No. 1. Body simple, free, funnel formed, concentrically laminated; interior filled with extraneous matter; exterior rather smooth; pedicle rather long, tapering, bent slightly, and perforated; the whole beset with a few, remote, thorn-like points.

No. 2. Body tuberose, hollow; pedicle very short, bent, and perforated. Laminæ and points as in No. 1.

No. 3. Body cup-formed, hollow, and termination papillous; no pedicle, the points *very* remote.

No. 4. Body ovato-oblong, apex obtuse, smooth, pedicle short, no points, perforation entire.

No. 5. Body subglobose, with many protuberances; no pedicle or points, perforated.

No. 6. Body sub-cylindrical, transversely striated, perforated throughout, no points.

THOUGHTS UPON THE NATURE OF HEAT AND ELECTRICITY.

To the Editor of the Monthly American Journal of Geology, &c.

Sir,—The following remarks are drawn up rather with the hope of attracting attention to an obscure subject, than to display original views. They are the sum of considerable reading upon electricity, &c. without claiming scientific experiment as their basis. But hints often strike out sources of thought; and if these remarks can do that, they effect the whole design. I place them in your Journal because I wish it success, and because I am a subscriber.

Among many other bodies, the tourmaline is capable of displaying electrical phenomena. Heat, however, is necessary for this purpose, apparently offering an evidence of the intimate connection between heat and electricity, though it does not extend to a satisfactory argument, for the theory that they are distinct forms of matter. It may be presumed that electricity exists in the crystal, and that heat developes it. There is certainly nothing absurd in this view, though it may appear too exaggerated an idea to arise from such insufficient reasons. The connection, however, between them is immediate, and something more than

* See Plate.

an influence exerted by one over the other. For it is difficult to suppose that any natural phenomena could be caused, so entirely distinct from any of the known results produced by the agency of heat, where a similarity in nature and in function existed. There is certainly combustion, heat, light, &c., effected by electricity, in common with caloric; and this is a fair cause for supposing at least a direct reaction between them, a mutual interchange of duties, and almost that the one is a modification of the other. But no operation of mere caloric will discharge the pistol containing hydrogen, or decompose water, or display opposite effects at the same moment, by one portion of an instrument, or original form of matter becoming negatively or positively electrified. In developing the electricity of these substances, heat is necessary, though not a high temperature, and their electricity thus acquired, lasts while the body cools, though the polarities become changed. It would almost seem sufficient evidence that heat and the electric fluid were independent forms of matter, by this assuming of polarities. The cause of their formation it would require a deep insight into nature to discover. We can see no analogy between this result and any of the properties of caloric. An iron poker becomes magnetized by standing in a perpendicular position, and the magnetism is lost by heat. Now it would be a natural suggestion, that two fluids, thus reciprocally affected, were entirely opposite; that heat, destroying the magnetic property, could not of course exist with it. Yet it has been asserted that the green ray magnetized a needle exposed to it; and it is not doubted that heat and light co-exist; so that caloric and magnetism may be combined in the same kind of matter; and as caloric and electricity are more intimately related than light and magnetism, they may, for a strong reason, be found together. There is some connection, as yet unknown, and I believe unsuspected, between magnetism, perhaps caloric electricity, and the principle of gravitation; for the attraction of gravitation can only be considered as an effect of some undiscovered power. If any division could be made of these subjects, electricity might be considered as a property of the air, magnetism of the earth, and caloric an universally existing principle through the globe, and essential to the very being of matter. Heat may be presumed the result of a reaction among the particles of bodies; and one philosopher has gone so far as to suppose that a calorific atmosphere exists around the particles of bodies, and that when excited, it produces expansion; if left at rest, the body contracts. Such an idea would follow immediately, from the knowledge of latent heat, whose discovery proves that caloric is a component part of all matter. If this be true, can matter remain the same after its removal? A body is made to yield caloric by being hammered, and in time becomes brittle by its abstraction; but it can exhibit the same phenomena if heated. Here the idea is at once formed, that the beating has driven the caloric out of it, and that this has been renewed by the application of fire. I see no objection to such a conception, though Davy calls it rude; yet it follows as a direct inference, from the assertion of the calorific atmosphere, which must partake of the usual habitudes of matter, and be liable to destruction. There is something so obscure in all relating to caloric, that it is almost useless to speak of it; for how can one comprehend that caloric is matter, and yet renewed faster than we can destroy it. Suppose a wheel had been put in motion at the moment of the creation, would it or not be capable of heating the axle on which it turns? A carriage wheel is probably as hot in five minutes after it commences motion, as at any time, and will continue so during a thousand miles, growing hotter and hotter, according to the speed, till it could be inflamed and consumed. Now if caloric be a component part of matter, why is it not wasted at once—and whence is it renewed? from the air, or the wood and iron? Speculations like the above may, by practical men, who deal—perhaps are only capable of dealing—with facts, be considered useless. They are so, when an immediate advantage is considered; they are not so when an enlarged view is taken, and remote ends anticipated. In this nation of common sense, there is a vast mass of humbug spouting from the ignorant and superficial, upon what they call practical utility. He who attempts any science, without a capacity for facts, can make nothing of it; but he who engages with nature, possessing that alone, is a mere day labourer, a compiler of crudities. There must be, in a contest with so subtle and protean a jade, intellect, powerful and comprehensive; invention, rapid and unceasing; habits of quick observation and zeal, with an entire devotion to the pursuit. When these are found united, America may rank among other nations in her contributions to science, but not till then. Lest, however, there should be a sneer at my love of a fine and well woven speculation, I will plant a loaded battery at such a breach in knowledge, and just say, no man has ever been quick in any thing without a mind that grasped effects, and originated causes. Bacon speculated, Newton, Locke, Galileo, Davy, Dalton, and every man who will wave a flag over the ruins of the future.

OHIO SHELLS.

Notices of Western Botany and Conchology.—By C. W. Short, M. D. and H. Hulbert Eaton, A. M. (R. S.)

Monograph of the Bivalve Shells of the River Ohio.—Translated from the French of Professor Rafinesque, by C. A. Poulson, Esq.

The interesting paper under this head, which we find in the Transylvania Journal of Medicine and the Associate Sciences, published at Lexington, Kentucky, deserves to be transplanted from the medical journal we have named, that it may be more generally accessible to the lovers of natural history. The opportunities which naturalists enjoy, who are residents of the western country, of personally investigating—and *in place*—all those objects of so much interest to the now numerous body of inquirers, must always give them great advantages over their colaborators in natural science, who, bound to the Atlantic shores, by various urgencies, must study, and of course describe at the greatest disadvantage, objects that are often transmitted to them in a defective state, and that are accompanied by the ambiguous relations of the inexperienced persons who transmit them; for such we may generally suppose them to be, taking it for granted that resident naturalists choose always to announce their discoveries, rather than put their friends at a distance to the unnecessary trouble of doing it in a less effective manner. Remembering how exceedingly deficient we were once ourselves, it is by no means with the intention of speaking slightly of the imperfect attempts of the zealous uninitiated, to convey their views, that we make these remarks: the elementary course of geological instruction we have adopted for this Journal, is a proof of our solicitude to favour, as much as we know how, the incipient efforts of all lovers of nature. We have rather intended to mark our deference and respect for the labours of those naturalists who are resident in the western country, and to express our regret that we have not more frequent opportunities of noticing them. They have a boundless field of inquiry; they are on the spot, and a host of anxious naturalists in Europe and America, ever ready to receive information from them. These are great inducements, and are sure to operate beneficially in the end; but we are of the present day, and are desirous of possessing all the information which the actual spirit of natural science solicitously calls for.

We take occasion to repeat here, that we shall always be ready to notice, in the most favourable manner, the discoveries and opinions of the naturalists of the western country; and the article now under consideration would not, perhaps, have escaped our attention so long, if it were not that a paper devoted to natural history, which is corked up, as it were, in a medical journal, although of the greatest respectability, was not likely to come under the notice—at the earliest day—of an editor who is not medical, and who has enough to do to keep up with the journals devoted to natural science.

Messrs. Short and Eaton made an excursion to the Ohio river, about eighty miles due north from Lexington. They directed their attention to the vegetable productions of the intermediate country, and to the shells of the Ohio, and the great Miami river. Of these objects they have given catalogues, restricted to those found during the excursion. The summer and fall had been unusually hot and dry; the catalogue, however, is represented to be a fair specimen of the latest autumnal flora of that part of the country, no plant being mentioned in it which was not found in flower, and the severe frosts which had commenced (16th Sept. 1830) before their return from the excursion, having finally arrested the florification of plants. This was, however, favourable to their other branch, conchology; the waters of the Ohio and Miami, being unusually low, and the shores more easily searched for some distance into the beds of the streams. The localities which were particularly resorted to for shells, were "those portions of the Ohio river, on the northern side, lying a mile or two above and below the mouth of Muddy creek, fifteen miles below Cincinnati, and the eastern borders of the great Miami, contiguous to the village of Cleves, in Hamilton county, Ohio." In the botanical catalogue, fifty plants are enumerated. Lycopus europœus.

L. virginicus. Collinsonia canadensis. Commelina communis. Schollera graminifolia. Ceresia fluitans. Isnardia palustris. Chenepodium botrys. C. anthelminticum. Gentiana quinqueflora. G. saponaria. Impatiens pallida. I. fulva. Lobelia syphilitica. L. inflata. L. Cardinalis. Onosmodium hispidium. Elodea petiolata. Mimulus ringens. M. Alatus. Mentha borealis. M. tenuis. Gerardia tenuifolia. Verbena hastata. Zapania nodiflora. Capraria multifida. Lindernia attenuata. Chelone glabra. Hyssopus nepetoides. Scrophularia marilandica. Erisimum palustre. Cleome dodecandra. Strophostyles angulosa. Rudbeckia triloba. R. fulgida. Coreopsis tricosperma. Bidens bipinnata. B. chrysanthemoides. Actinomeris squarrosa. Conyza camphorata. Eupatorium perfoliatum. E. Celestinum. Aster conyzoides. Prenanthes. Gnaphalium uliginosum. Helenium autumnale. Eclipta procumbens. Acnida cannibina. Ambrosia trifida. Asplenium angustifolium.

Of the shells collected in this excursion, we find thirty-six species of bivalves enumerated, and four species of univalves; but as we are desirous of making a few remarks on this branch of the paper, we shall now take up the neat monograph whose title appears at the head of our article, and which is entirely devoted to that subject.

We mentioned in our last number, "a continuation of a monograph of the bivalve shells of the river Ohio, and other rivers of the western states," which that veteran naturalist professor Rafinesque had just published. Since that period a translation of the monograph itself has been published by Mr. Poulson, and we have never seen any thing of the kind done with more ability, or with less ostentation. A well executed figure of the *unio verrucosa* is prefixed to it, which is sufficiently explanatory of the progressive motion of the animals which inhabit these bivalves, and about which there has been a great deal of misunderstanding. Conchologists, we believe, are agreed now, that the laws of physics may be as appropriate to the motion of shell fish as to that of dray horses; and that it is as well not to have the load too far from the draft power of the animal. We are glad of this, as it must have been the iron age to these little mollusca, whilst men of science gave them such prodigious long trace ropes.

Mr. Poulson dedicates his translation to William Hembel, esquire. It is not our place here to pronounce the eulogium of this gentleman; but when so appropriate an occasion presents itself, of expressing our most sincere respect for the virtues and talents of a venerable and untiring friend to science, in all its various branches, we should be conscious of an omission if we were to say less than we do upon this occasion. From this neat and appropriate dedication, we extract the following passage, which will bring us at once in *medias res.*

"In publicly addressing to your notice a translation of professor Rafinesque's monograph of the bivalve shells of the river Ohio, and its tributaries, it seems proper to remark, that this paper was originally published at Brussels, in September, 1820, in the '*Annales Generales des Sciences Physiques.*' Extra copies were transmitted to the author in this country, who distributed them among individuals, and the libraries belonging to scientific institutions in this city and elsewhere. It is therefore a curious circumstance in the history of American conchology, that this singular evidence of the author's acumen, zeal, and industry should have thus existed for more than eleven years, *while but four of the numerous species discovered and described by him*, are known by his names, either in the works of American authors, or in our collections."

Now, four species out of sixty then made known, is $6\frac{3}{4}$ per centum; and although $6\frac{3}{4}$ per centum is very good interest in money matters, yet we have but an indifferent opinion of dividends of this character, in natural history, particularly when by adroit arrangements of others, this $6\frac{3}{4}$ per centum is only once paid, and must figure away ever after as all the capital the original holder is entitled to. This is pretty much the predicament in which professor Rafinesque has been placed by the management of others, according to the account of himself and his friends. He paid into the hands of the commissioners of conchology, sixty species, dead and alive; and lo! and behold! when he comes to ask for his annual interest out of the reputation fund, he is told that no more than four species appear entered in the books to his credit. If this had been a money transaction, there would have been a great noise about it; but as it is only about shells without any oysters in them, people disregard it, nay, even laugh at it; which is very wrong. Now we love fair play, and what is better, we love shells better than oysters, and therefore we feel disposed to get up a little noise about this matter, but in a good natured way, and with a view to justice and future harmony.

That our readers may have professor Rafinesque's statement from himself, we extract from his "Continuation of a Monograph," published in Philadelphia, October, 1831, the following passages.

"Hardly a dozen species of North American fluviatile bivalve shells had been mentioned by Bosc, Lamark, Say, and Lesueur, before 1820, when I described, in a special and ample monograph, 75 species of them, with 40 varieties, mostly discovered by myself, in my travels of 1818 and 1819, and figured 28 of them."

"Since 1820, several American conchologists have attempted to notice, describe, or figure these shells. Barnes in 1823. Lea, Say, and Eaton, later still. They had a fine field before them, in elucidating them by good figures, and describing the new kinds; but led astray by various motives, they have neglected to verify, or properly notice my previous labours, *although they were known to them.* Mr. —— is, above all, inexcusable. I had respectfully noticed, in 1820, his previous labours; but he has never mentioned mine, and knows so little of the animals of these shells, as to have mistaken their mouth for their tail, and their anterior for the posterior part of the shells!

"*If he had seen these animals alive, feeding, moving, and watched their habits, as I have done repeatedly*, he would not have fallen into such a blunder."

"This continuation will be a supplement to Mr. Poulson's translation of my monograph of 1820. I mean to give in it my shells, under my own names, imposed as soon as found in 1821 and 1822 chiefly; the undoubted right of a previous discoverer and explorer. If some of them are already well named and described, let their names be compared, and the oldest or best prevail, as those of my old monograph ought in all cases."

The whole question as to the quantum of injustice done to professor Rafinesque, lies in the compass of a nutshell; either his discoveries in 1820 preceded those of the conchologists he has alluded to, or they did not; and they have been describing and naming shells he had previously described and named, or they have not. We must presume his monograph was known to them, as it was notorious, both in Europe and this country; and a true son of nature never pretends to occupy ground with permanent views, of which the pre-emption rights have not been examined into, and extinguished. Those who act otherwise, are conchological squatters, and are subject to a declaration of ejectment being filed against them. Into this matter we shall not further enter, as we have reason to believe that one of our correspondents, better fitted to do justice to the subject, is likely to give us his views on it ere long.

Professor Rafinesque has no reason to reproach Messrs. Short and Eaton with injustice to him, as they have given him full credit; there is an air of candour and intelligence about their paper, which recommends it highly. They appear to be familiar with the labours of all the American conchologists, and their own *practical* remarks upon the shells whose structure they have studied in their native beds, have a somewhat satirical cast. We hope these practical remarks will be continued; they will prove an admirable corrective to that fault of extensive generalization from slender premises, which inexperienced and ardent persons are apt to fall into. Our readers, perhaps, understand that the characters which some writers on these shells have resorted to, upon which to found their species, are derived from their shape, and the external marks which they bear. Thus the *unio plicatus* is so called from having inequalities on the shell, which are called *folds;* the *unio sulcatus,* from its having indents or *furrows;* the *unio cornutus,* from protuberances, which are called *horns;* the *unio verrucosus,* from protuberances, thought to resemble *warts;* the *unio tuberculatus,* from protuberances resembling *tubercles;* the *unio securis,* from a resemblance to the edge of an *axe:* then there is the *unio circulus, unio orbiculatus, unio subrotundus, unio triangularis,* from their approximation to a round or angular shape. It is usual to find the unios of the Ohio, very much decorticated at the beaks; one, from being particularly so, has been called *unio cariosus,* or the *carious unio.*

Messrs. Short and Eaton lay the axe at the root of all these hasty attempts at classification, by showing that the *carious unio* of the Ohio, is also found in the Miami, where *it is not in the least degree carious;* and that some of these shells are nearly *circular,* some *quadrangular,* some *ovate,* and some almost perfectly *eliptical,* so that here we have a unio which is without its own specific characters, whilst it has got those of almost every other shell; for it has got its place in the books as *unio cariosus,* whilst it is never carious in the Miami, and has the distinctive cognominal characters of the *unio ellipsis,* the *unio circulus,* the *unio orbiculatus,* the *unio subrotundus,* the *unio ovatus,* &c. &c. &c.

Thus we see how insecure are the grounds upon which men build, who trust to the external forms of shells, as the sole means of giving to an important family of molluscous animals their proper place in the scale of animal existences. These animals could not pursue the same object with less effect, if it were given to them to attempt to assign a natural place to our biped race, by describing all the dwelling houses between the Delaware and Schuylkill, where some are amorphous from want of taste, some mean from the poverty of the owner, others ornamented and spacious, for the contrary reason; and where all the varied forms have grown out of the indispensable wants, the abilities and taste of the inhabitants, whether these have been acquired in America, Europe, or in China. Decorticated beaks would not be wanting; yet Chesnut and Arch streets—those Miami's of houses—would furnish abundant exceptions; and then as to cornutus, horns, as long as chimneys were standing, would not be wanting, long or short. In regard to the unio cornutus, it fares no better in the hands of Messrs. Short and Eaton, than *unio cariosus.* They remark on this shell, to which they have assigned professor Rafinesque's original name of *unio torulosus:* "all possible varieties of this heteramorphous shell were found in the Ohio: the *unio foliatus* of Hildreth, which Mr. Lea thinks nothing more than a variety of the *unio cornutus* of Barnes, was found, and among our numerous specimens of this variety, *not one had hardly the rudiment of a horn.*"

Here we have horned shells without horns, as we before had carious shells perfectly sound. What would be said of the want of sense of cattle breeders, if they were to talk of long horned cattle with no horns, and Durham short horns with long horns. These practical men know that the Durham short horn, and the Bakewell breed of sheep, both of which, externally, differ from all other animals of the same races, are artificial varieties produced by particular treatment; but that if the circumstances to which the varieties were owing, no longer influenced them, the varieties would disappear. We have seen that the same shell can differ greatly in its shape; that it is sound in one river, and carious in another. What the particular causes of such cariousness are, we know not at present; but we do know that mollusca repair their own shells when injured, and may infer that the degree of intelligence requisite for that act, may govern the young mollusca in modifying the primary form of its shell, according to the exigences of the circumstances which surround it; and that when it is much varied, it is but evidence of what the animal is capable of doing for conservative purposes.

When conchologists study the animals more, and the shells less, or rather when they consider the animals themselves as the proper objects of study, every accession to our knowledge of this branch, can be carried to the general account of natural history, to the honour of the discoverer. Writers who contend for priority in naming shells, even when they succeed in establishing their claims, will acquire no lasting reputation, unless they show they have studied the animals too. We mean no offence in our remarks to any one. Several of the most conspicuous conchologists of this country, Say, Barnes, Lea, and others, have made important remarks on the structure and habits of the mollusca; but at present the general pursuit appears to be after the shadow, rather than the substance; and we regret it both for the sake of zoology and for the sake of our conchologists.

METEOROLOGICAL OBSERVATIONS,

Made at Wilmington, Delaware, by Henry Gibbons, M.D.

SUMMARY FOR DECEMBER, 1831.

	Therm.	*Barom.*		
			Proportion of clear weather,	*days* 18
Average at sun-rise,	19°.39	*in.*29.83	Proportion of cloudy,	13
Average at mid-day,	28°.94	29.76	Whole days clear,	12
Average at 11 o'clock,			Days on which rain fell,	1
P. M.	20°.77	29.77	Days on which snow fell,	8
Monthly average,	24°.16	29.795	Quantity of rain,	*in.* 2
Maximum, 21st,	41°.	30.20	Depth of snow,	6.75
Minimum, 16th,	0°.	29.23	Of water,*	2.10
Range,	41°.	97	Northerly winds prevailed,	*days* 16
Warmest day, 24th,	35½°.		Easterly,	6
Coldest day, 16th,	6½°.		Southerly, (S. to W.)	9

Auroras, none. The month rather dry: snows frequent, but not deep; rain fell only once, and then in very small quantity. Temperature uniformly cold; much below the usual standard for this month. The thermometer was above the freezing point at sun-rise on one day only, and at noon on nine days. (See the review of the year.) Winds occasionally high, and mostly unsteady, flowing from no one quarter of the compass so long as two successive days, except on two occasions. No electrified clouds. Four easterly storms, three of them with snow, the other dry; none of them severe.

General Review of the Weather for the year 1831.

THE last month of 1830 was mild, and the weather continued open till the 9th of January, 1831, when winter set in with a storm of sleet and snow, from N. E. This was followed by the memorable snow-storm which commenced on the evening of the 14th, and terminated at noon on the 16th, after a duration of 42 hours, exceeding in violence any thing that had before oc-

* Nine inches of *light* snow are equivalent to one inch of water; the proportion, however, varies with the character of the snow.

curred within the memory of the oldest inhabitants. The snow was excessively drifted; its average depth being about two feet. The storm extended beyond the Alleghanies, but was there unattended with wind; so that the snow fell calmly to the depth of near three feet. After much severe cold, and several other storms of snow and rain, the winter quietly broke up towards the latter end of February. The navigation of the Christiana creek, and of the Delaware river, near Philadelphia, was closed, or rendered impracticable by ice, from the 12th of January, to the 3d of March—a period of seven weeks.

The spring of 1831 was rather forward, and generally mild. In the second week of April, however, several severe frosts occurred, which injured much of the earlier fruit, then in bloom. A good deal of rain fell in March and April; but in May, there was only one rain of consequence, and that one not very heavy. The month of May was, of course, very dry, so as to injure materially some of the crops. The few last days were unseasonably hot.

After the middle of June, the summer of 1831 was remarkable for damp weather, and excessive rains, which extended over a great part of the United States. The grass crops had been injured by drought; and now the crops of grain were very much damaged by wet. So moist was the atmosphere, that the "dry-goods," of store-keepers, became mouldy on the shelves, in many instances. Two feet of rain fell in July and August. There was no hot weather, though it was often oppressive, on account of the moisture which loaded the atmosphere. In the third week of August, a dense haze obscured the sky, imparting a peculiar colour to the sun and moon—a yellowish green tinge. From the beginning of July to the termination of the year, the air was scarcely clear of a haziness for an hour at a time. It appeared to have a close connexion with the tendency to produce clouds, which was observed at the same time to exist in the ærial laboratory of nature. Doubtless its cause must be referred to the precipitation of vapour. The ruddy haze of Indian summer is a phenomenon very analagous; but when we consider the vast quantity of vegetable exhalations which must result, at this season, from the decomposition of plants, and the desiccation of the foliage of the immense American forests, we cannot but grant to the effluvia of decaying vegetation, some agency in the formation of the haze of our autumnal sky.

The temperature of the autumn months was seasonable. In September and October, much rain fell; but not so much in November. On the whole, the fall of 1831 may be considered very pleasant. Not a single severe frost occurred till after the middle of November; but winter then set in, without any preliminary steps, at least one month earlier than usual.

The year 1831 exhibits several calamitous events in the history of the weather. The unrivalled snow-storm of January, rendered the roads, for a time, impassable. The drought of May, (which, however, was not very extensively felt,) excited the reasonable apprehension of the husbandman; whilst the subsequent torrents of rain were still more injurious. Finally, the sudden onset of winter, for which many were unprepared, put a period to the navigation of the rivers, and gave rise to much suffering among the crews of vessels on the coast.

The month of December, 1831, will hold a conspicuous place in the annals of meteorology, and will require more particular notice, in connexion with the winter of which it forms a part. I will take the liberty of remarking in this place, that the *meteorological year* ought to consist of four successive seasons, commencing with December, or with March. According to the Julian calendar, the year which begins with January, comprises only three entire seasons, and portions of two winters.

For the present, it will suffice to say, that the thermometer has never before sunk to zero, in this month, since the commencement of the 19th century—that the December of 1818 was the only one which equalled it in its average degree of cold since 1807, and perhaps for a longer period—that during the same term of 24 years, there was not so much snow in any one December, nor so small a quantity of rain. Before the termination of the month, the ‘old fashioned" winter was a topic of general remark; and it was discovered by many *savans*, that the "goose's bone" predicted a hard winter!

In the following table, the mean given for each month is the average of two series of observations; the one taken at sun-rise, and the other at noon, or a little after. The yearly temperature of 51°, is at least one degree below the average standard of this latitude, which may be ascribed almost entirely to the cold of the last month of the year. In one column is given the number of days in each month, on which high winds occurred, which will be found to bear some relation to the range of the barometer. In the column of easterly storms, are included those which were unaccompanied with rain, amounting to about one third of the whole number. The column of electrified clouds indicates the number of days on which electrical phenomena occurred, to any considerable extent. In some remarks, published in the 5th No. of this Journal, the manner of obtaining the results in most of the remaining columns, is explained. For the sake of comparison, the summary for the year 1830 has been added.

General Summary for each Month of 1831, and for the whole Year; and also for 1830

Months.	Thermometer. Mean.	Thermometer. Maximum.	Thermometer. Minimum.	Thermometer. Range.	Thermometer. Warmest day.	Thermometer. Coldest day.	Barometer. Mean.	Barometer. Maximum.	Barometer. Minimum.	Barometer. Range.	Days. Proportion of clear weather	Days. Proportion of cloudy do.	Days. Whole days clear	Days. No. of days rain.	Days. No. of days snow	Inches. Quantity of rain	Inches. Do. of snow.	Inches. Do. of water.	Days. Northerly winds	Days. Easterly winds,	Days. Southerly winds.	Days. High winds.	Days. Easterly storms	Days. Auroras.	Days. Electrified clouds
Jan'y.	25.05	65	4	61	51	10.5	29.66	30.17	28.99	1.18	15	16	13	3	11	2.50	33.5	7.35	16	9	6	4	5	2	1
Feb.	26.94	45	7	38	39.5	13	29.82	30.63	29.14	1.49	22	6	20	4	1	3.30	3.	3.65	17	5	6	0	2	1	1
March	43.91	67	22	45	63	31.5	29.73	30.31	29.27	1.04	20	11	17	8	1	2.65	2.	2.65	7	4	20	1	2	1	1
April,	51.56	72	28	44	62.5	35.5	29.64	30.05	29.13	.92	14	16	11	8	0	5.90	0	5.90	10	12	8	1	4	1	1
May,	62.25	87	38	49	77	48	29.74	30.12	29.25	.87	22	9	21	1	0	1.00	0	1.00	7	6	18	0	2	1	0
June,	71.93	88	47	41	79	57	29.86	30.10	29.67	.43	17	13	14	7	0	1.98	0	1.98	6	10	14	0	0	1	5
July,	73.74	87	53	34	80.5	61	29.87	30.17	29.53	.64	20	11	16	13	0	12.07	0	12.07	9	6	16	1	0	3	9
Aug.	72.95	85.5	52	33.5	80	60.5	29.91	30.15	29.68	.47	18	13	13	8	0	11.90	0	11.90	8	10	13	1	1	0	4
Sept.	64.46	83	44	39	77	55	29.84	30.04	29.44	.60	16	14	12	10	0	7.25	0	7.25	11	7	12	2	4	0	6
Oct.	55.65	75	36	39	67.5	44	29.85	30.18	29.39	.78	23	8	19	8	0	8.00	0	8.00	12	6	13	4	1	1	2
Nov.	40.26	61	20	41	54	26	29.69	30.03	28.73	1.30	21	9	16	4	4	2.52	4	3.02	21	6	3	7	4	0	1
Dec.	24.16	41	0	41	35.5	6.5	29.79	30.20	29.23	.97	18	13	12	1	8	.02	16.75	2.10	16	6	9	3	4	0	0
1831,	51.07	88	0	88	80.5	6.5	29.78	30.63	28.73	1.90	226	139	184	75	25	59.17	59.25	66.87	140	87	138		29	11	
1830,	52.23	92.5	4	87.5	84	11	29.72	30.52	29.08	1.44	205	160	148	87	9	49.90	16.	51.90	143	84	138		34	14	

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SCIENTIFIC AND GENERAL MEMORANDA.

Limestone Caves in Schoharie, State of New York.—Some of those extensive and irregular cavities, which are so conspicuous in the carboniferous limestone of the United States, and of a few of which—situated in the Helderberg hills, near Albany—descriptions have been given, have been lately explored in the continuation of the same chain, near the village of Schoharie. Mr. John Gebhard, with some enterprising mineralogical friends, visited, in September last, one of those interesting natural phenomena. Mr. Hubbard was let down one, a perpendicular fissure, about ten feet long, and six feet broad, a distance of about seventy-five feet, where the descent declined to the south, and where he awaited the arrival of Mr. Branch. They followed this new direction at an angle of about sixty degrees, for about fifty-five feet, when the descent became again perpendicular, for fifteen feet. Overcoming this, and resuming the preceding direction for about thirty feet, they reached the bottom, where they found a stream of limpid water, running south. Whilst pursuing the course of this stream, they visited a spacious apartment, about twenty feet broad, and more than a hundred feet high. In this room they found the skeleton of an animal, believed to be a fox, which, perhaps, having fallen through in some part, had died for hunger. The stream led to a body of water, which, having no means of exploring, they returned upon their steps, and rejoined their friends.

In October, Mr. Gebhard, Mr. Bonny, and Dr. Foster, having constructed a boat, contrived to get it afloat upon this subterranean lake, and with other friends, having manned the boat, navigated the lake for three hundred feet, through various passages, in one of which the water was thirty feet deep, and transparent to the bottom. At a shelving ascent on the right shore of the lake, the water appeared to be lost by an invisible drainage. They were here rewarded by the discovery of a very magnificent apartment, the description of which we shall borrow from an account of the adventure, drawn up, we presume, by one of the party, and which a friend has forwarded to us in a number of the Troy Centinel.

"Advancing up the shelving ascent, about twenty feet, they entered an aperture in the rock, directly in front, of about the size of an ordinary entrance to a house, where a scene, grand beyond description, burst upon the view. They advanced through this opening into a vast amphitheatre, hitherto untrod by mortal foot, which, from its perfectly regular and circular form, obtained at once the name of the rotunda. Upon giving this apartment a particular examination, after the first feelings of surprise had subsided, they found it about one hundred feet in diameter, and apparently more than a hundred feet in height, regular in its form, the floor descending on all sides, gradually, to the centre, and forming a spacious gallery around its whole circumference, and enclosed above by a horizontal roof. The vast size of this apartment, the magnificence of the gigantic walls, and fretted roof, both entirely encrusted with transparent crystals, which sent back the blaze of the torches in a thousand different dyes, at once satisfied the beholders, that they had penetrated into the very temple, in these hitherto unexplored realms."

After freighting their little bark with a rich cargo of mineralogical curiosities, they returned to the upper world, delighted with the success of their voyage.

Zoological Weather Glass.—"At Schwitzingen, in the posthouse, we witnessed, for the first time, what we have since seen frequently—an amusing application of zoological knowledge, for the purpose of prognosticating the weather. Two frogs, of the species rana arborea, are kept in a glass jar, about 18 inches in height, and six inches in diameter, with the depth of three or four inches of water at the bottom, and a small ladder reaching to the top of the jar. On the approach of dry weather, the frogs mount the ladder; but when wet weather is expected, they descend into the water. These animals are of a bright green, and in their wild state, climb the trees in search of insects, and make a peculiar singing noise before rain. In the jar, they get no other food than now and then a fly, one of which, we were assured, would serve a frog for a week, though it will eat from six to twelve in a day if it can get them. In catching the flies put alive into the jars, the frogs display great adroitness."—*Mr. Loudon.*

Attachments between Animals.—Mrs. Bowditch relates, in the Mag. of Nat. History, that when she was in Paris, there were two remarkable fine ostriches, male and female, at the Jardin du Roi, and that one of them died in great agony, after swallowing a broken piece of glass. From the moment his companion was taken from him, the male bird had no rest; he appeared to be incessantly searching for something, and daily wasted away. He was moved from the spot, in the hope he would forget his grief; he was even allowed more liberty, but nought availed; and he literally pined himself to death. Upon another occasion, she states, that a curious expedient was resorted to, to prevent a similar catastrophe. A gentleman had, for some years, possessed two cranes, (ardea pavonina;) one of them died, and the survivor became disconsolate. He was apparently following his companion, when his owner introduced a large looking glass into the aviary. The bird no sooner beheld his reflected image, than he fancied she for whom he mourned had been restored to him; he placed himself close to the mirror, plumed his feathers, and showed every sign of happiness. The scheme answered completely; the crane recovered his health and spirits, passed almost all his time before the looking glass, and lived many years after. These are curious instances of the strength of the social principle in birds.

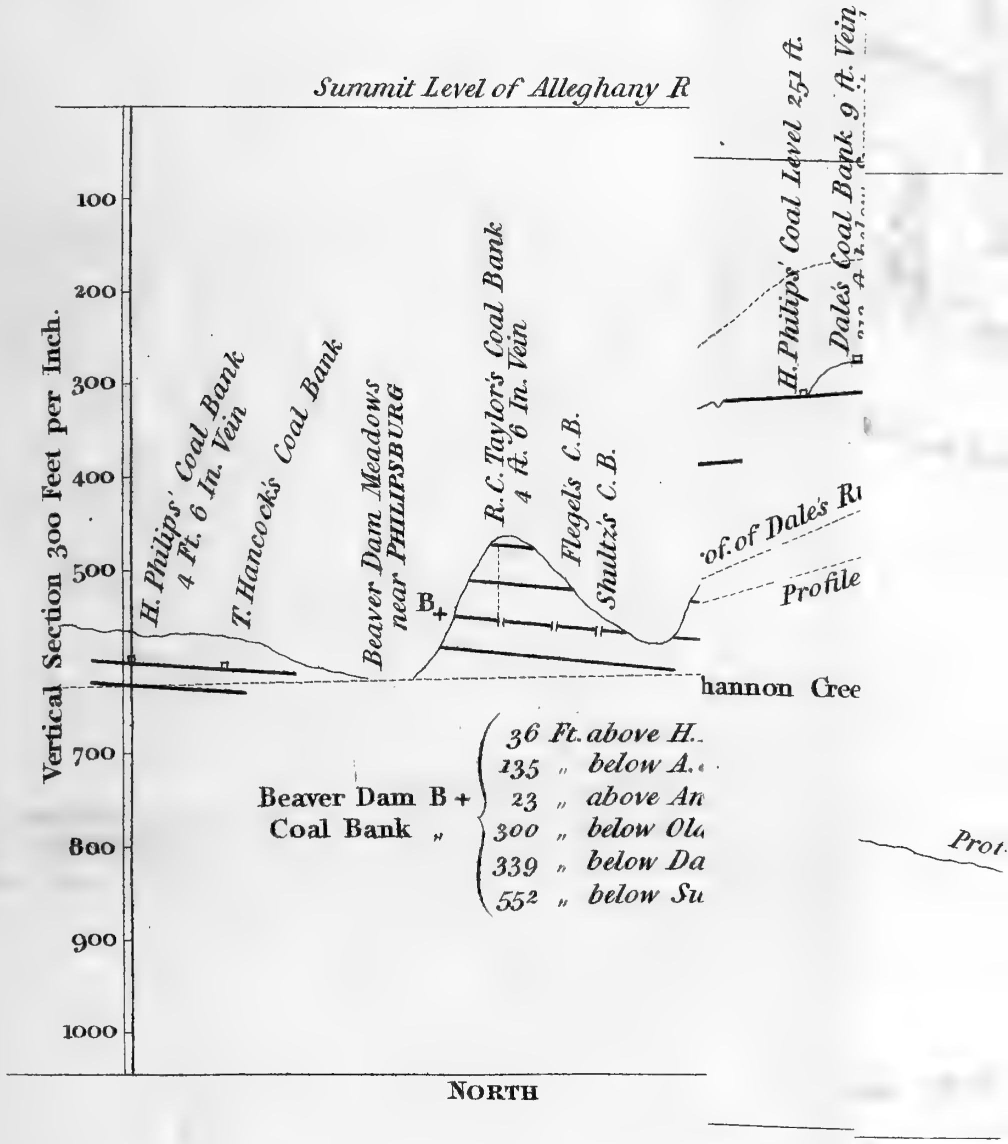
Presentiment in a Goose.—The following anecdote is from the Mag. of Nat. History. " An old goose, that had been sitting upon her eggs for two weeks, in a farmer's kitchen, was perceived, on a sudden, to be taken violently ill. She soon after left the nest, and repaired to an out house where there was a young goose of the first year; this she brought with her into the kitchen. The young one immediately scrambled into the old one's nest, sat, hatched, and afterwards brought up the brood. The old goose, as soon as the young one had taken her place, sat down by the side of the nest and shortly after died." The young goose had never been in the habit of entering the kitchen before, and the person who relates the transaction, received the account the same day it occurred, from his sister, who witnessed it.

Delta of Oroonoko and Maragnon.—M. Gutmuths states the increase of the mud, which is encroaching on the sea, on the Guiana coast, is aided by the tangled roots of the Rhizophora Mangle, which extend to the very edge of the waves, and even under the water. The sea is muddy along the shore, 200 geographical miles in length, by 10 in breadth, whilst at the same time the rivers are limpid. The Maragnon no doubt contributes a great portion of the alluvial matter; it has a course of 1350 miles, a great depth, and a breadth of 50 miles at its mouth; and during the freshes occasioned by the rainy season, and the melting of the snow upon the Andes, it exhibits the inundations of an immense sea of water, charged with earthy detritus and vegetable remains. The current is then so strong, that it is perceptible at sixty miles from the coast; and this, being opposed by the usual current of the Atlantic, from east to west, gives origin to vast banks of sand towards the shores of Brazil, on the north-west of Guiana. One of the circumstances which contribute so powerfully to this effect, is the *pororoca*, or high flux, which occurs at the mouth of the Maragnon, three days before every new and every full moon. It arrives in two hours at the beach, in mountainous waves, of 12 to 15 feet high. The sea is then driven more violently towards the north-west, and, along the coast of Guiana, forms very strong currents towards Esequibo and the gulf of Paria, becoming still stronger as they approach the Amazon river. The pororoca destroys the shores entirely, between Fort Macapa and Cape North; and, if there were no rocks, the beach would be still more dismantled, and the mouth of the Maragnon turned altogether to the north.—*Mag. Nat. Hist.*

ERRATA.

In the January Number, p. 303, 18th line from the bottom, for "Emys decupata," read *Emys decussata*.

Same page, 10th line from bottom, for "habits," read *habitat*.



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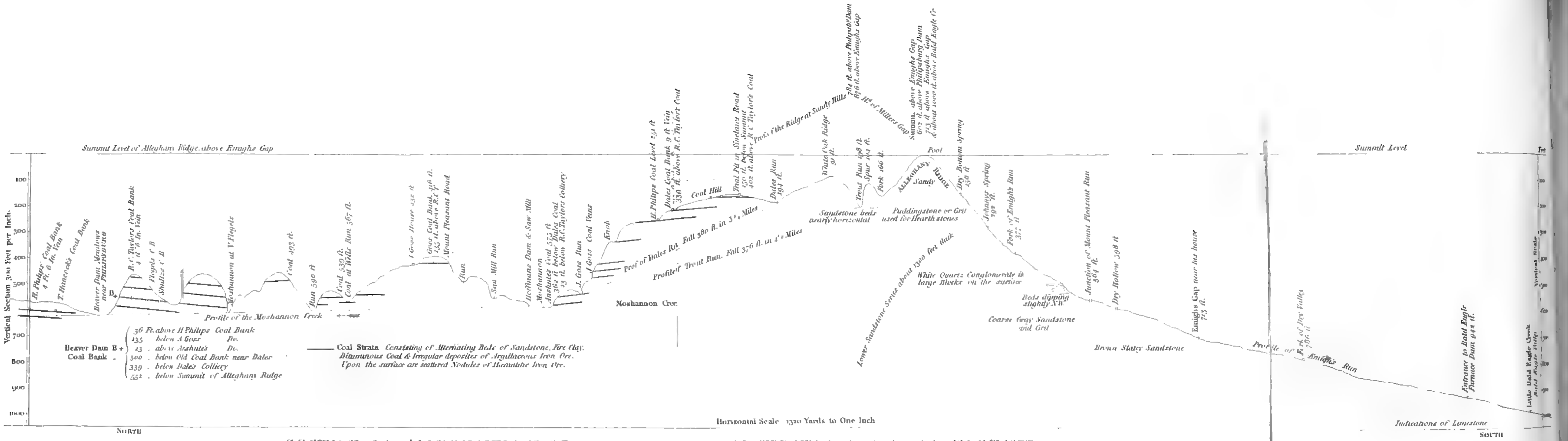
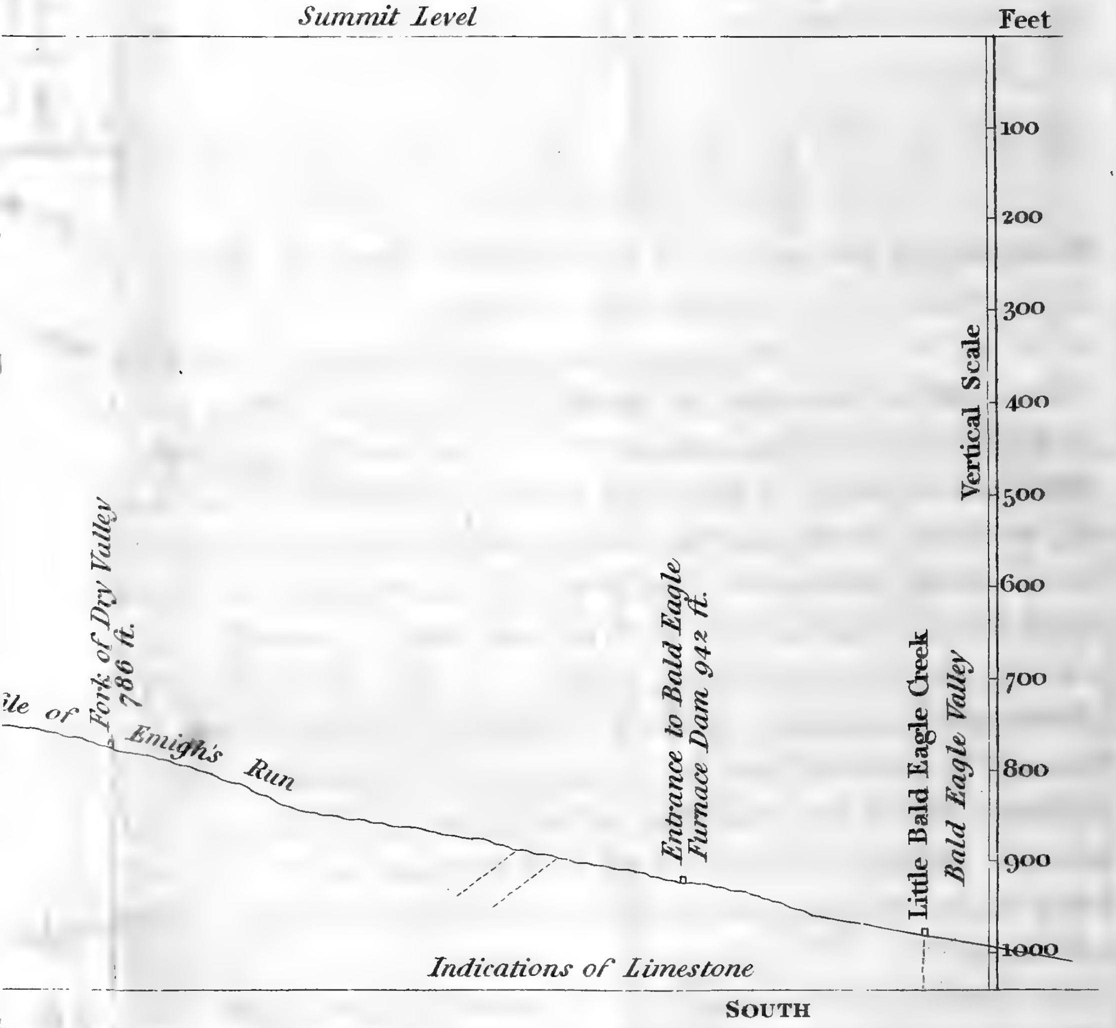


SECTION of the ALLEGHANY RIDGE, and of a portion of the COAL STRATA in the vicinity of the MOSHANNON VALLEY, Centre County, Pennsylvania.

Surveyed by R. C. Taylor F.G.S.

Engraved for the Monthly American Journal of Geology and Natural Science.


Summit Level
Feet
100
200
300
400
500
600
700
800
900
1000
Vertical Scale
Fork of Dry Valley
786 ft.
ile of Emigh's Run
Entrance to Bald Eagle
Furnace Dam 942 ft.
Little Bald Eagle Creek
Bald Eagle Valley
Indications of Limestone
SOUTH

'vania.

THE

MONTHLY AMERICAN JOURNAL

OF

GEOLOGY

AND NATURAL SCIENCE.

Vol. I. PHILADELPHIA, APRIL, 1832. No. 10.

SECTION OF THE ALLEGHANY MOUNTAIN, AND MOSHANNON VALLEY, IN CENTRE COUNTY, PENN.

By Richard C. Taylor, F. G. S. and Associate Fellow of the Institution of Civil Engineers of London.

Philipsburg, Centre Co. Penn. March 15, 1832.

Dear Sir,—You ask for some information relative to the geology of this neighbourhood, and I lose no time in complying with your request. I believe I cannot do better than furnish you with the accompanying section, which I feel some satisfaction in doing, because its details result from a series of careful observations, made during last summer, whilst pursuing an exploring survey, to determine a rail-way route. I have preferred introducing a number of details into the section, rather than transfer them into a lengthened explanatory memoir. Until the investigation of the country bordering on the Alleghany chain be more extensively entered upon, I propose to occupy but a brief space in your Journal, with the requisite explanatory references.

My section illustrates only a very small portion of the central bituminous coal field of Pennsylvania; but it occurs in an interesting quarter, and it is well to make a beginning, where the area is so vast, and so little known to men of science. The direction of our course is north and south, exhibiting profiles of a part of the Moshannon valley, its creek, and some of its tributaries; and then crossing the Alleghany ridge or mountain, at the lowest depression we have been able to ascertain in this direction, we descend by Emigh's gap, and by the ravine and run or rivulet called Emigh's, to Bald Eagle valley, and Little Bald Eagle creek. The levels have not been taken of this creek, and of the little Juniata, into which it falls, as far as the junction with the Pennsylvania canal, near Huntington; consequently, until those data be obtained, we cannot fix the precise elevation of the Alleghany ridge, with reference to that canal, and the sea.

Returning to Bald Eagle valley, at the southern extremity of our section, we will retrace, more in detail, the route I have rapidly sketched. Here we are deep enough to touch the limits of the mountain limestone, although the intervening Bald Eagle ridge separates us from the main body of that formation. Its course is S.W. parallel with the Alleghany chain, and its prevailing dip is E. or S. E. This inclination is inconsiderable at the distance of ten or fifteen miles from the outcrop, and at twenty miles from the Alleghany, I have observed its beds to be nearly horizontal. At the foot of the Bald Eagle, or Muncy ridge, they curve up to an angle as high as 60° to 75°, and occasionally may be noticed almost vertical, resting upon their edges.

Ascending the ravine, by Emigh's run, from little Bald Eagle creek, we arrive, in succession, at a variety of sandstone beds, upon which repose the coal measures, unless we view the entire series, as comprehended in the carboniferous formation. These lower beds may be estimated at about thirteen hundred feet, in their aggregate thickness. They are numerous, and as variable in structure, colour, and density, as rocks of this class generally are. Many of them contain casts of producta, spirifers, and unios; but the prevailing indication of fossils, is simply the hollow cavities formerly occupied by these shells. One of the most prominent of the lower beds, is a red, laminated, slightly micaceous sandstone, with subordinate seams of red clay and shale, which, after rains, give a red tinge to the surface waters, like those in the red sandstone districts of England. Their inclination is toward the W. and S. W. On some of the subordinate ridges, parallel with the Alleghany chain, and on that side nearest the limestone, the angle or dip of the slaty beds is sometimes as great as 60° to the west; that is, at right angles to the main ridge, and exactly contrary to the prevailing dip of the limestone.

Hereafter we hope to illustrate with greater precision, the position of those vast disturbed masses, which constitute the singularly uniform ridges, and long straight valleys of central Pennsylvania, east of the Alleghanies; a subject on which the attention of a geologist would be fitly employed; which heretofore has remained unnoticed, and which involves some extremely interesting and extensive examples of displacement.

The progress of such an investigation is as slow as laborious, and the geologist contends with many natural difficulties. These will ever be found in a country like that under consideration, where the surface is obscured with a dense forest vegetation; where the operations of man have scarcely commenced; where neither artificial excavations, nor natural sections, nor exposed escarpments, relieve the monotony of the mountain side, or the gloomy ravine; and where those elevated valleys, ramifying amidst the intricacies of the mountain chains, have continued from remote ages, and in all probability, for ages will remain, an impenetrable wilderness, and an impracticable labyrinth.

On account, therefore, of these impediments to ordinary and individual examination, it is especially desirable, that geological observations, made under the advantageous circumstances attending public surveys, by engineers, and what is still better, of the completion of the works committed to their charge, and conducted at their leisure, should be faithfully recorded. This can be advantageously effected by communications with Geological Societies in the separate states, like that now coming into existence in Pennsylvania: but better still, upon the principle suggested at page 130 of your Journal, if conducted under the auspices of the government, as a branch of duty strictly in connexion with the engineer department. In this respect, your remarks are well deserving attention from the parties to whom they have reference; from those whose professional operations place them in situations so particularly favourable to scientific research, and more especially from the department whose province it is to direct their movements.

Reverting to our section, from which I have wandered, it will be obvious, that on approaching the summit of the Alleghany ridge, after intersecting the lower series to which I have referred, and estimated at upwards of 1300 feet in thickness, we arrive at a conglomerate rock or pudding-stone, composed of white quartz pebbles, set in a coarse grit. This bed is fifty to one hundred feet thick. Large displaced fragments cover the surface, and have even been transported several miles in abundance, to the bottom of Bald Eagle valley, many hundred feet below. We occasionally see this breccia disintegrated, its pebbles occurring loosely, in the form of gravel, in extensive beds. In its compact state, this rock is sought for the purpose of fire or hearth-stone, for the neighbouring iron works. The position occupied by the conglomerate, is sometimes conspicuous, in its lofty site, at the distance of several miles; and in those cases, it appears as a bare and steep ledge, on the eastern slope of the Alleghany mountain; pursuing its course parallel with the summit, and commonly from one hundred to three hundred feet below the crest. In winter, when all other parts of the mountain are enveloped in snow, this dark ledge of gritstone is singularly discernible, forming the most striking exception to the general remark I have previously made. Its presence is no less distinguished by the change in vegetation, above the limits of this parallel. From the valleys, (which are occupied by hemlocks, white pines, and other dark evergreens,) white oaks, and some other deciduous trees, ascend upwards, to the base of the conglomerate, and are then succeeded by red, or pitch pines, whose dark foliage, and stunted forms, arise amidst a thick brushwood of chestnuts, forming those wild and worthless tracks, called barrens.* These upper strata consist of sand and beds of soft, white, porous, sandstone. The aggregate thickness of the beds above the limestone, up to this point, can scarcely be less than 1600 or 1800 feet. This estimate, of course, must be received as an approximation, the accuracy of which, is materially influenced by the inclination of the lower members of the series.

Descending from the sterile region above the conglomerate, we now perceive, in the sandstone which succeed, innumerable proofs that we have entered the limits of the great central coal-field. The first vein of bituminous coal is here discovered at an elevation, only one hundred and fifty feet below the crest of the

* It may be observed, that, in these mountainous regions, the season of winter and snow is, in some respects, particularly favourable to the display of its broader and most characteristic geological features, which are commonly obscured, at other times, by a luxuriant forest vegetation. At no time or place have I seen geological changes more distinctly indicated, or more influential on the character of the scenery, when viewed from great distances.

ridge we have just crossed. At present no coal has been extracted from this vein. Sixty feet lower, at Dale's farm, is a second, and larger vein, consisting of three seams, and comprising nine feet altogether, having two partings, of three inches each. The upper seam only, four feet thick, has hitherto been worked. At thirty-nine feet lower, is another large vein: and at least six other veins of coal occur, in descending to the level of the Moshannon creek, at Hoffman's dam. This is 324 feet further down, and at this point in our section, we have arrived at 575 feet below the Alleghany ridge, at its lowest part. These coal seams, and the subjacent strata of sandstone and fire clay, so far as we have been able to extend our observations, appear, with tolerable uniformity, to decline at a small angle towards the north, or rather the north-west.

It would be irksome to proceed with the details. Our profile exhibits the intersection of several other coal veins; but how many of them are distinct from those we have previously noticed, cannot readily be determined, as they have not all been proved or worked; and moreover, there is an obvious change of inclination. Those near Philipsburg, at the Beaver dam and neighbouring collieries, or coal banks, as they are locally termed, dip to the S. and S. W., to meet the more elevated beds and strata we have before mentioned, which incline to the N. and N. W. Some other veins, more to the northward than our section exhibits, crop out with a similar inclination to the S. W. along the banks of the Moshannon, extending toward its junction with the west branch of the Susquehanna. This inclination seldom forms a greater angle than one or two degrees, and affords great facilities for obtaining the coal. Fifteen miles westward of Philipsburg, and further within the interior of the basin, the coal veins incline to the E. and N. E., that is, toward the Alleghany chain, its apparent boundary.

Faults, if any occur, are rarely observable, within such a vast unexplored area. There is probably one of several feet, on or near the Beaver dams, as shown by the letters A and B on the section, the vein being the same at both points.

In regard to quality, there are variations in these veins, as I believe occurs in all coal basins; but here all are bituminous. The coal which is chiefly raised near Philipsburg, is in considerable repute, and is conveyed, in some quantity, over the Alleghany mountain, to the iron works, eastward.

Fossils are not very abundant in the coal measures. Impressions of flags and reeds may be noticed in all the sandstones, even almost up to the western summit of the ridge; and ferns occur in the shales near the coal veins. Hollow cavities, formerly occupied with producta, and a few other species of cotemporary fossils, are occasionally to be seen in every part of the sandstone series, within the coal field.

THE BROWN LEAD ORE OF ZIMAPAN.

Communication from Professor Del Rio, on his discovery of a New Metal in the brown Lead Ore of Zimapan.

I should not again have brought forward my analysis of the brown lead ore of Zimapan, which now rather *redolet antiquitatem*, if the interest excited about the metal, called by some chemists in Europe, Vanadium,—after, as it is said, some Scandinavian mythological personage,—had not induced one of my friends to ask me to translate the passage concerning my analysis, from my Spanish translation of the mineralogical tables of Kersten, printed at Mexico in 1804, and which passage I here subjoin.

"Having distilled half an ounce of the brown lead ore three or four times with diluted sulphuric acid, and washed the residuum every time, I got a green solution, which, being saturated with excess of ammonia, gave, in a few days, crystalline crusts formed by needles on the surface of the liquid, or stars, composed of very acute pyramids, on the sides of the cup. These white crystals being washed with some water and dried in the air, became a most beautiful scarlet red as soon as they were touched by a single drop of an acid somewhat concentrated. When diluted, they became at first yellow, and afterwards red. These acids* dissolved them without decomposition. I experienced the same with potash, soda, and lime, excepting that the rhombohedrons of potash only became yellow. The excess of ammonia being saturated with nitric acid, and concentrating it somewhat by evaporation, I got square prisms, pointed, with four faces upon the edges, of a pretty aurora red, the taste of which was pungent and metallic. The same was done with soda, and I got squares of a red colour, and oblique sided ones with potash, and of a yellow colour.

"Having put in a porcelain test below the muffle, 17.75 grains of the

* As far as I remember they were the sulphuric and nitric.—*A. D. Rio.*

needles formed by ammonia, they became a most beautiful red without losing their form, and they melted afterwards into an opaque mass, between liver-brown and lead grey, with very fine stars on the surface, of a semi-metallic lustre, its weight 11.75 gr. I put it into the forge in a small crucible with charcoal, for an hour and a half; the mass became only black with charcoal, and the increase of weight was 1.25 gr. I put it into a small retort with nitric acid, red vapours were formed at last, and the matter was red. I repeated the same twice, and I augmented the fire in the end, to disengage all the nitric acid: on pouring some water on it, it became emulsive or milky. The emulsion being cleared off at length, it did not redden the tincture of radish, though it precipitated, with a yellow colour, the solutions of nitrate of silver, mercury and lead: it precipitated also prussiate of lime of an emerald green, and tincture of galls of a blackish green. The olive green sediment became immediately red with some nitric acid, and the yellow solution with zinc and iron gave a green oxide.

"By the blow pipe the glass became grass green. I could not amalgamate with mercury its combination with ammonia. [Other experiments which I made at the time were not inserted in my translation.]

"The proportion then of the constituent parts of the brown lead ore, are 80.72 of yellow oxide of lead, and 14.80 of the new substance, the rest being a little arsenic, oxide of iron, and muriatic acid.

"*Presuming that it was a new substance*, I called it *Pancrome*, on account of the universality of the colours of the oxides, solutions, salts, and precipitates: and afterwards *Eritrone*, on account of its singular property of forming with the alkalies and the earths, salts which became red at the fire, and with acids; but *being informed that the chrome gives by evaporation red and yellow salts*, I believe that the brown lead ore is a yellow oxide of chrome, combined with an excess of yellow oxide of lead."

Slight deviations sometimes occasion great inconveniences. If the justly celebrated Baron Humboldt, to whom, when in Mexico in 1803, I gave a French copy of the preceding experiments, had thought them worthy of publication, they would have excited, doubtless, the curiosity of European chemists, and of Descotils himself, who had more knowledge than myself of the properties of chrome; *so that thirty years would not have elapsed before the new metal was acknowledged.* Humboldt, apparently, did not think so; because, as I have said somewhere else, European monopolists have not always appeared solicitous to sustain the merit of discoveries effected in the Americas.

I am quite astonished to hear that Kersten has analysed the brown lead ore of Poullaouen and found it to be phosphate of lead. I determined that of Zimapan to be brown lead ore, only by its external characters, which were entirely identical with those of the lead ore of Poullaouen in Brittany, and of Hodristsch in Hungary; so that if this last is a phosphate also, we must conclude that they are the opposite of the isomerous bodies. Who can rely now on crystals being the basis of a mineralogical system? A. Del Rio.

REMARKS.

We venture, for the third time, to call upon European chemists to do justice to Professor Del Rio, whose just claims, up to the present moment, have been remarkably overlooked. That the nature of those claims may not be misapprehended, we shall briefly state them, confining our observations strictly to the facts which have occurred. We feel it necessary to do so, since we perceive that the merit of Professor Del Rio's discovery of the new metal in question, is becoming more and more obscured, by the slight weight which has been attached to it by names of great eminence, and especially by the powerful name of Berzelius. The evidence of this is very abundant, but we shall go no further on the present occasion than to the pages of Dr. Brewster, and to those of the Philosophical Magazine and Annals of Philosophy, on the new metal, called Vanadium, in Europe.

In the July number for 1831, of the Edinburgh Journal of Science, Mr. James F. W. Johnson has the following passage:

"It is a remarkable circumstance, and illustrative at once of the wide diffusion of chemical knowledge, and of the progress of scientific chemistry, that the new metal *Vanadium* has been discovered in three different countries nearly at the same time, and without any communication between the several individuals by whom it has been observed and detected. First in order of time, Professor Del Rio, of the school of Mines of Mexico, detected a new metallic substance in the brown lead ore of Zimapan, to which, probably from its forming red salts, he gave the name of Erythronium. *His results were not published* however, M. Collet Descotils, to whom specimens were transmitted, having pronounced it to be an impure chromium. Meantime Professor Sefström, of the School of Mines at Fahlun in Sweden, detected in an ore of Iron, a simple metallic body, which he named Vanadium, and of which he announced some of the properties about the end of the past year. The metal of Del Rio, it now appears, is the same with that of Sefström."

We take the following passage from the Philosophical Magazine for November, 1831:

"*On Vanadium.* By M. Berzelius. Vanadium was discovered in the year 1830 by Sefström, in a Swedish iron, remarkable for its ductility, obtained from the iron mine of Jaberg, not far from Jönköping in Sweden.

The name of this metal is derived from that of Vanadis, a Scandinavian divinity. It is not yet known under what form, or in what state of combination, vanadium occurs in the ore of Jaberg. It is also found in Mexico, in a lead mine at Zimapan. Del Rio, who analysed it in 1801, announced the discovery of a new metal in it, which he called Erythronium; but the same mineral having soon afterwards been analysed by Collet Descotils, he asserted that Erythronium was merely impure chromium. Del Rio himself adopted the opinion of the French chemist, and considered the mineral as a subchromate of lead; thus the metal, so near being discovered, remained thirty years unknown to chemists. Since the discovery of Vanadium by Seftström, Wohler has ascertained that the mineral of Zimapan contains vanadic and not chromic acid."

Our readers will observe, that in both these passages Del Rio's prior discovery of the new metal is admitted. Yet Berzelius, who says expressly, "*Del Rio, who analysed this mineral in* 1801, *announced the discovery of a new metal in it*," most inconsistently asserts that "*Vanadium was discovered, in the year* 1830, *by Sefstrom.*" Mr. Johnston, who no doubt is disposed to be just, appears to have written without proper information respecting the history of this metal; for he says, that it "has been discovered in three different countries *nearly at the same time*;" and further on, speaking of Del Rio's discovery, he says "*his results were not published.*" Words have very absorbent powers, and time and space will have very little chance with them, if "*nearly at the same time*" can shut up, like an opera glass, all the interval between 1801 and 1830. As to the non-publication of Del Rio's results, we refer Mr. Johnston to this eminent chemist's translation of Kersten's Mineralogical Tables, p. 61, printed at Mexico, 1804, where he will find the original of the passage of which Professor Del Rio has sent us an English translation, with the preceding communication.

We proceed now to state why Del Rio was induced to assent to the opinion of Descotils, and apparently to abandon his discovery.

He had, as Berzelius truly says, made the discovery of this new metal, previous to the arrival of Humboldt in Mexico, in 1803. They had been fellow students together at Freyberg, in Saxony, at the great school of Werner, where some of the most celebrated analysts acquired the first rudiments of mineralogical knowledge. Humboldt's arrival in Mexico was preceded by the brilliant reputation he had acquired. He was considered, to use very plain words, *to be up to every thing*, and to be quite *au fait*, respecting the experiments of Vauquelin and Descotils, concerning the metallic nature and properties of chrome. He found Del Rio far removed from Europe, almost without any kindred minds to assist or encourage him, diffident as his character always has been, and disposed, by many prepossessions, to pay much deference to the opinions of Humboldt. To him Del Rio communicated his discovery, *and gave him a copy in the French language*, of his experiments, as they were subsequently published in his translation of Kersten. Humboldt, however, informed him that chrome gave by evaporation, red and yellow salts, and induced him to suppose that the phenomena he had observed, were due to the action of chromic acid. Confiding in the superior information of his friend, he accordingly, with great modesty, forbore to press his own opinions; and in 1804, in his translation of Kersten, submitted that it should be thought a sub-chromate of lead. Descotils himself, sometime after, expressed the same opinion; a circumstance which took from Del Rio every inducement to revive the subject, which remained buried in error, until Sefström discovered the same substance, in 1830, in iron, in Sweden. Mr. Johnston discovered it in Scotland, in the winter of the same year. In the meantime, subsequent to Sefström's discovery, Wohler re-examined the brown lead ore of Zimapan, and found that it was not a sub-chromate, but that it contained a new metal; that Del Rio had been perfectly right from the first, and that Sefström had merely reproduced in 1830, what Del Rio had discovered in 1801.

Now we would contend, that under these circumstances, any man who attempts to wrest this trophy from Del Rio, is altogether unjust, and that he alone is entitled to wear it. In matters of this kind, the motto "qui meruit, ferat," is of universal application. It certainly cannot be asserted by European chemists, that Del Rio is not entitled to the honours of his own discovery, because he has not done all he might have done, to vindicate his own claim to them. The fair way of considering the matter, is, that his discovery would never have been disputed, if Baron Humboldt, coming to America as a sort of legate *in partibus*, on the part of European science, had not misled him, whose only fault has been a diffidence in his own superior attainments. Baron Humboldt, of whom we always wish to speak with the respect due to so distinguished a philosopher, has not, as the case now stands, been just to his friend Del Rio; and it is evident that more is felt on this subject, than has been expressed. Why did not Baron Humboldt publish the analysis, of which he received a copy from Del Rio, in 1804? Certainly it was not given to him to suppress; and he must have known that the Spanish translation of Kersten was made for Mexico, and not for Europe, where, perhaps, there are very few copies. At any rate, it appears not to be common, since Mr. Johnston has not seen it. We think the chemists of the present day, must see that Del Rio was a very able analyst at that time, and had Humboldt published it, or transmitted it to Europe, it could not, as Del Rio states, have failed to excite the curiosity of those who have paid particular attention to the combinations of chrome: they would have examined it with attention, and the result would have been, long ago, a universal acknowledgment of the new metal, and of Del Rio, as the discoverer of it. We wish that Baron Humboldt, when he stated in Paris, in February 1831, the principal facts in the history of this metal, as they have been stated in the passages we have given from Berzelius and Mr. Johnston, had also stated *the reasons* which had induced Del Rio to suppose it not a new substance, but an impure chrome. He had an excellent opportunity to do so, which, if he had availed himself of, we should probably not have felt ourselves called upon to dissuade European chemists from naming a new metal,—not discovered by themselves, but by a Mexican,—after a ridiculous Scandinavian deity that never had any real existence. If the progress in knowledge is of the right kind, if there is nothing deceptive in the extraordinary and very active demonstrations in the pursuit of science in Europe, then those whom it concerns to give proofs that they have learnt how to stand up voluntarily for truth and justice, will be just, upon this occasion, to America; and will, as we hope, and have before suggested, restore Del Rio to his rights, by calling the metal discovered by him *Rionium;* a name which, we think, Mr. Johnston will agree with us, will be found quite as *manageable* as vanadium.

We have every disposition to defer to the learned chemists and mineralogists of Europe, and gratefully and eagerly receive the numerous contributions which science is constantly owing to them. We believe that the tree of knowledge flourishes most, where the love of justice is strong: various as are the blossoms of that tree, they produce but one fruit, truth; which is to justice, what the pericarp of the cherimoyer among the anonaceæ, is to its seed. If we would have truth, we must plant justice. Had Del Rio been in Europe, this matter would have been properly arranged long ago. The smallest innovation there, upon a pre-emption right in the metacarp of even a coleopteral, will set a whole *Versammlung* in arms, and produce a hundred pages of sur-rejoinders, at least. Let it be an additional motive to those to whom we now appeal for justice, that, as the face of nature seems to smile, when the setting sun breaks through a troubled sky, so it would cheer the declining days—which are not sunny ones—of the venerable Del Rio, to learn that men have done that justice to his name, which fortune has never done to his merits.

ATOMIC WEIGHT OF MERCURY.

Mr. Editor,—Your correspondent, A. B. H. will find a solution of his inquiries, respecting the atomic weight of mercury, in a recent work of Dr. Thompson's, viz. "Chemistry of Inorganic Bodies." As the book has but just come from the author's hands, and probably will not be reprinted in this country, it may be worth while to extract such parts of it as relate to the matter in question. It ought to be premised, that as Dr. T. adopts oxygen for his unit, his atomic numbers must be multiplied by eight, to reduce them to a hydrogen basis.

"In many cases it is not easy to fix upon the true number denoting the atomic weight of a body. We can always infer, that the weight of one body that enters into combination with another, either denotes the atomic weight of the body, or at least a multiple, or sub-multiple of that weight; but, in some cases, it may be very difficult to determine which of the three. Thus, for example, we have two compounds of mercury and oxygen, the constituents of which by weight are as follows:—

Black oxide,	Merc. 25 + 1 Oxy.
Red oxide,	" 25 + 2 "

"We might consider the atoms of mercury to be 25. On that supposition, the black oxide would be a compound of 1 atom mercury plus 1 atom oxygen; and the red oxide of 1 atom mercury plus 2 atoms oxygen.

"But we might also consider the atom of mercury as only 12.5 or the half of 25. In that case, the red oxide would be a compound of one atom of mercury and one atom of oxygen, and the black oxide of two atoms of mercury, and one atom of oxygen. There is nothing in these compounds that can determine which of these views is the right one. Both oxides are capable of combining with acids, and of forming salts. The red oxide is the most permanent and intimate combination, but the black is always first formed when we attempt to combine mercury with oxygen. In such cases as this we are left to conjecture or analogy to assist us in deciding what number should be taken to denote the true atomic weight of the body. We see that the atom of mercury weighs either 25, or the half of 25, but which of the two, it might, in the present state of our knowledge, be impossible to determine. In such a case, we may be allowed to refer to analogy, to enable us to decide the point. It was first observed by Dulong and Petit, that when the atomic weight of a body is multiplied into its specific heat, the product is a constant quantity. And I have shown, in my treatise on Heat, that this product is always 0.376. Therefore, if we divide .376 by the number denoting the specific heat of mercury, the quotient should be the atomic weight of that body. But the specific heat of mercury is .03 and $.376 \div .03 = 12.52$. This circumstance furnishes a reason for considering the true atomic weight of mercury to be 12.5."—*Vol.* 1, *p.* 9.

"The specific gravity of the vapour of mercury, as determined by Dumas, is 6.976. From this determination, which must be very near the truth, it follows as a consequence, that the atomic weight of mercury is 12.5. For the atomic weight of a gaseous body multiplied by .5555, is equal to the specific gravity in the gaseous state. Now $12.5 \times .5555 = 6.9747$ a number which almost coincides with that found by Dumas."—*Vol.* 1, *p.* 612.

"I have shown (Ann. of Phil. 2d series, ii. 126,) by experiments which I consider as decisive, that the real atomic weight of mercury is 12.5."—*Vol.* 1, *p.* 615.

If the arguments* advanced by Mr. Allinson, are added to

Which are briefly these: the protoxide of mercury is decomposed more readily than the deutoxide; the protochloride than the deutochloride, &c: these facts contravene the universal law, that compounds (of elements) consisting of one atom of each constituent are less easily decomposed than those consisting of one and two. Hence, there is a strong probability that what is called the deutoxide is, in reality, the protoxide, &c.

those above given, there can be no reasonable doubt left but that the true atomic weight of mercury is 100; (hydrogen basis;) and although these would not of themselves be sufficient to establish this fact, yet Mr. A. is fairly entitled to the credit of having shown that to be highly probable, which Dr. Thompson's investigations have rendered certain.—Very respectfully, yours,

J. B.

New York, February 38th, 1832.

ARVICOLA NUTTALLI.

Description of a new species of quadruped of the genus Arvicola, of Lacepede, or Hypudœus, of Illiger.—By R. Harlan, M. D.

Arvicola *Nuttalli*.—Fawn-coloured above, whitish beneath; ears long and hairy; toes sparsely hairy; tail nearly the length of the body.

Dimensions.—Length of the body three inches, of the tail, two and a half inches.

Habitat.—Southern States.

Description.—Crowns of the molars similar in the arrangement of the enamel to those of the type of the genus, as represented by F. Cuvier—"Dents des mammiferes;" but the roots are mostly cleft into four prongs: the inner surface of the inferior incisors, grooved longitudinally; ears very large, hairy within and without; legs small and weak, sparsely hairy; fore feet with four toes, armed with hooked nails; thumb rudimentary, with a flat nail; hind feet with five toes, armed with hooked nails, all with sparse hairs extending to the roots of the nails; a callous tubercle at the inferior base of each finger, and two others on the wrist; tail long, cylindrical, and sparsely hairy; eyes large, black, and prominent. General colour of the body above, plumbeous, each hair being tipped with brownish yellow, presenting a fawn-coloured surface; beneath white. Whiskers composed of very long, fine, black and white hairs.

Like the musk-rat, (Ondatra, Lacep. or Fiber, Cuv.) this quadruped differs from the arvicola principally in the possession of roots to the molar teeth; but for the existence of these roots, in the former, M. F. Cuvier remarks, that he would consider the genus as merely forming a third division of arvicola: we doubt if the existence of a single character of this nature, should indicate even a specific distinction.

The specimen under consideration is a young male, just full grown; in colour it displays a striking resemblance to the Gerbillus *canadensis;* it was recently taken in Virginia, by Mr. Nuttall, (the eminent botanist,) in the vicinity of Norfolk, near the river shore, and was one of several he discovered under the bark of a hollow tree, where they had built a fine nest.

M'MURTRIE'S TRANSLATION OF THE "REGNE ANIMAL."

Sir,—That a translation should be undertaken and published in the United States, of so elaborate a work as *Cuvier's Regne Animal*, at a time, too, when the English language, at its head quarters, is acquiring another, from the united labours of Mr. Griffith and his co-adjutors, argues a great deal for the apparent advances we are making in the study of natural history. It was a spirited undertaking on the part of the publishers, and deserves success. I confess, I had supposed the limited number of persons amongst us who might wish to possess an English translation of the Regne Animal, was far short of the encouragement such a work requires: in this I find I was mistaken; for whether the translation has been executed well or ill, the appearance of the work is sufficient evidence of the confidence of the publishers in the demand for it. The remarks I am about to make, have not been suggested by the habit of critical severity, nor by hostile feelings to any one. I hope to show that it is the love of science which guides my pen, as well as a desire to vindicate the literary reputation of the country. It will be doing something towards that, if one American corrects the errors into which another has fallen.

I also wish to show the publishers of this country, how much it is their interest, when they are about to publish translations of foreign scientific works, to employ competent persons. It is a wretched economy, both for publishers and purchasers, to have any thing to do with translations, merely because they can be procured at a cheap rate; any man capable of giving a correct version of a scientific work, extending to 2000 pages, deserves to be well paid for his labour; for knowledge of that various kind, is procured by long application and much expense.

The first duty of a translator is, to give the meaning of his author; and to do this, he must thoroughly understand the subject of which his author treats.

Let us see how Dr. M'Murtrie's translation conforms to this rule.—Vol. I. page 18, of preface to the first edition, we have,—"In the mammalia I have brought back the solipedes to the Pachydermata, and have divided the latter into families upon a new plan; the ruminantia I have placed *after* the quadrupeds, and the sea cow near the cetacea." Here the camel, the deer, the goat, the sheep, the ox, all these important ruminating animals being placed *after* the quadrupeds, of course are not included in them. What is then to become of them—are they to be considered as annihilated, by the readers of this translation? Cuvier says, "Dans la classe des mammiféres, j' ai ramené les solipedes aux pachydermes; j' ai divise ceux-ci en familles d' aprés de nouvelles vues; j' ai rejeté les ruminants à la fin des quadrupedes, j' ai placé le lamantin prés des cetacés." Now previous writers had placed the sea-cow, (*manatus*, or *lamantin*,) morse, &c. among the quadrupeds; but as the sea-cow, &c. although warm-blooded animals, and chewing the cud, possess but two extremities in the form of anterior fins, Cuvier very properly separated them from the ruminating quadrupeds, and placed them at the head of the whales, to form the first division, or the cetacea herbivora. Dr. M'Murtrie would have spared some confusion to the young student in zoology, if he had said, "I have rejected the ruminants, which were at the end of the quadrupeds, and have approximated the sea-cow to the cetacea."

At page 12, line 28, we have, "Vegetables derive their nourishment from the *sun*, and from the circumfluent atmosphere in the form of water, &c." Cuvier says, "*Le sol* et l'atmosphére presentent aux vegetaux, pour leur nutrition, de l' eau, &c." It does not appear to have occurred to this *naturalist*, that the *soil*, which is the obvious meaning of the word *sol*, has any thing to do with the nourishment of plants. Griffith, in his translation of this passage, makes precisely the same mistake. If it will be any comfort to Dr. M'Murtrie, I can truly tell him, that my copy of Griffith is scored with worse blunders than this: I will instance one of them. Cuvier, at page 15, of his introduction,* says, "Tous les êtres organisés produisent leur semblables; autrement la mort étant une suite necessairè de la vie, leurs especes ne pourroient subsister;"—which he has rendered, "All organized beings produce their like, *otherwise death would be a necessary consequence of life, and the species must become extinct;*"—than which, nothing can be more absurd. The true version is, "*All organized beings produce their like; if it were not so, death, being a necessary consequence of life, their species would become extinct.*" Dr. M'Murtrie's translation consists but of four volumes, and is to be preferred, on this account; for there is no end to the production of the other, which has already reached the thirty-first number, and upwards of 6000 pages. This work will eventually be swelled out to forty numbers, containing at least 8000 pages, and will cost the subscribers, in this country, one hundred and thirty dollars. But this cannot be fairly called a translation of Cuvier; the supplements and notes of the translator and his coadjutors, have increased the bulk of the work beyond all expectation, and have turned Griffith's version of the Regne Animal, into a job of an indecent length, and an exorbitant expense, for which the work by no means compensates in its intrinsic value; the translation being frequently very carelessly and blunderingly executed; the original matter often very erroneous; and the engravings, many of which are beautifully executed, especially those of the genus cervus and felis, being superfluously expensive; many genera not having a single species given, whilst in other instances, numerous figures are given of the same species. The errors in the supplementary matter are not only numerous, but often brought forward ex cathedrâ, as if they were the ne plus ultra of observation in the anatomy, physiology, and habits of animals. At page 32, Reptilia, part 1, he says "poisonous snakes are harmless to their own kind," which is inconsistent with observation; for the poison of the rattle snake is not only fatal to its kind, but to itself, when accidentally self-wounded. At page 40, he says, the intestines of the tadpole are "destined to digest vegetable nutriment;" when we know the tadpole feeds on animal food; for there is no better method of cleaning the skeletons of small animals, than by employing tadpoles.† But it is useless further to multiply instances;

* Regne Animal, Vol. I. Paris 8vo. 1829. † Vide p. 239, Month. Am. Jour. of Geol.

they are any thing but creditable to the persons engaged in the work.

But to return to Dr. M'Murtrie, who, in the very next page to his blunder about the sun, has the following passage:—"The relations of vegetables and animals to the surrounding atmosphere, are therefore in an inverse ratio—the former *reject water* and carbonic acid, while the latter produce them." As there is not a tyro in the elementary lessons of chemistry, who will not be puzzled at this singular statement, which may reasonably discourage any one from looking any further into this translation, I feel called upon, by a sense of what is due to Cuvier, and to the reputation of this country for more correct knowledge, to expose what seems to have grown out of pure ignorance, both of the language and the subject. Cuvier, in a beautiful passage, is treating of the mutual action of the vegetable and animal systems, for the preservation of each. He states, that the soil and the atmosphere, present to plants for their nourishment, water, and air; that the first is composed of oxygen and hydrogen, the second of oxygen, azote, and carbonic acid, which itself is a combination of oxygen and carbon: that plants select from all these, hydrogen and carbon, for their own composition, and reject the superfluous oxygen, by the aid of light. That animals, besides these elements, devour organized bodies, of which hydrogen and carbon form the principal parts; thus, whilst animals retain azote, they reject the superfluous hydrogen and carbon, by means of respiration; and this is accomplished in the following manner. The oxygen of the atmosphere combines with the superfluous hydrogen and the carbon of their blood, becoming in the first instance water, in the second carbonic acid." He then proceeds to say, "that the relations of vegetables and animals with the atmosphere are inverse; the first decomposing (defont) water and carbonic acid, the second reproducing them." Dr. M'Murtrie has ignorantly reversed the whole arrangement of nature, by stating that vegetables *reject water*.

Cuvier had stated that medullary matter appeared to the eye like a soft boiled pulpy substance, (de bouillie molle) where nothing but globules *infinitely small* could be discovered. Dr. M'Murtrie, at page 14, says, "it appears like a sort of *soft bouillie*, consisting of excessively small globules." This is not English.

The word bouillie, it is true, has made a sort of lodgment with us, as a representative of boiled beef; but we hardly think his readers will be much edified by learning that the molecules of the spinal marrow resemble *excessively small* pieces of boiled beef. To translate "infiniment petits," by "excessively small," is to throw away the whole philosophic force of the passage.

At page 31, is another instance of unfaithful translation, and want of knowledge in the physiology of invertebrated animals. Of these he says, "the muscles are merely attached to the skin, which constitutes *a soft contractile envelope*, in which, in many species, are formed stony plates, called shells, whose position and production are analogous to those of the *mucous body*." Cuvier says, "les muscles sont attachés seulement à la peau, qui forme une enveloppe molle, *contractile en divers sens*, dans laquelle s' engendrent, en beaucoup d' especes, des plaques pierreuses, appeleés coquilles, dont la position et la production sont analogues à celles du corps muqueux." A competent translator would have translated the phrase "contractile en divers sens;" for these lights and shades of great masters, are sacred in the eyes of men of science; and a physiologist would have said, "are analogous to those of the rete mucosum," the position of which, between the epidermis and cutis vera, is clearly expressed by Cuvier.

As a specimen of errors attributable to sheer carelessness, we have, at page 49, the following strange assertion, under the head of "physical and moral developement of man," and which has hitherto been supposed only applicable to that eccentric sect of the bimana, called Shaking Quakers. Speaking of the external marks of puberty in young persons, Dr. M'Murtrie says,—for Cuvier does not say so—"and neither sex, (very rarely at least,) is productive, before, *or after* that manifestation."

At page 143, speaking of the rat, mus rattus of Linnæus, we have, "of which no mention is made by the ancients, and which appears to have entered Europe *in the middle century*." Cuvier says, "dans le moyen age," "in the middle ages." In the name of old Chronos, what does the middle century mean?

Few persons in this country have seen the giraffe, and books must be relied upon, of course, for a general knowledge of the structure of this interesting animal. Dr. M'Murtrie, at page 186, Vol. I, in treating of the horny prominences on the heads of many of the ruminants, says, "In others, the prominences are only covered with a hairy skin, continuous with that of the head; nor do the prominences fall, *those of the giraffe excepted.*" Cuvier says, "la seule giraffe en a de telles," "*the giraffe alone has such prominences:*" i. e. with a hairy skin, and which never fall. Here the translator has stated precisely the reverse of what his author says.

Whatever opinion Dr. M'Murtrie may entertain of his own qualifications as a translator for such a work as Cuvier's Regne Animal, I will do him the justice to suppose, he would not deem any other individual capable of so important an undertaking, who could commit the errors I have animadverted upon. It would be deemed a bold thing of any man now living, in a translation of Cuvier's work, to make important changes in the nomenclature, to suppress it in some instances, and to frequently impute to this great naturalist, "*this is a mistake.*" Dr. M'Murtrie has felt confidence enough in himself to do all these things. There are, it is true, a few blemishes in Cuvier's work, as there are spots in the sun; but the important ones have, for some reason or other, escaped the vigilance of his translator. Speaking of the suricats, (*ryzœna* Iliger,) Cuvier says, at page 158, 8vo. edition, 1829, Vol. I, "they are distinguished from the mangousts and from all the carnivorous animals which have hitherto been spoken of, *because they have only four toes to each foot,*" forgetting that he had just before, at page 154, said, "the hyena may be placed after the dogs, as a fourth sub-genus, distinguished by the number of its toes, *which is four to every foot.*" This error we find translated, without remark from Dr. M'Murtrie.

The third order of the mammalia, is called by Cuvier *carnassiers,* from their being addicted to flesh. This order was formerly called carnivora; but as some animals are merely addicted to flesh, whilst others are voracious after flesh, Cuvier has transferred the term carnivora to these last. Dr. M'Murtrie has substituted carnaria for carnassiers, without giving his reasons, and without apparently considering, whether there is any essential difference between the meaning of the two words, carnaria and carnivora. It was the duty of such a translator to have left matters as he found them. In other instances this translator has totally omitted important terms, apparently because he could not make them bend to his classical powers; this is a source of serious inconvenience to his readers, who are thus obliged to refer to the original text, to know what species are under consideration: thus, at page 292, not knowing what to make of "les mesanges," (titmouse or tom-tit,) he has omitted it altogether, although in the original it stands at the head of several of the species, whose descriptions follow; and indeed, when he comes to translate those descriptions, we find the following references: "la M. à téte bleue. Le M. huppé. Le M. à longue queue;" whilst it is impossible for students to know what the letter M refers to, because the generic term *mesanges* is entirely omitted.

At page 373, is another monstrous blunder: speaking of the family cultirostres, he says, "we subdivide it into three tribes; the cranes, the true herons, *and the swans*." And he then proceeds to describe the grus, or crane; the cancroma, or herons, and—the swans of course—no, he describes the ciconia, or storks; and without perceiving his previous error: this, too, from a Latinist, who draws distinctions between carnaria and carnivora. We must remark, here, that if the translator had understood the French or Latin languages, he never would have translated cicognes, (ciconia, storks,) into swans; and if he had had but a sprinkling of knowledge of the subject, he would have known that swans belong to the great duck genus, (anas L.) which his author has placed in the family lamellirostres, and not in that of cultirostres.

At the end of the first volume, we find an "Appendix, by the American Editor," of which much cannot be said in favour: it is very imperfect, and fails, in numerous cases, to establish specific distinctions. The worst feature of this appendix is the reiteration of species previously described under different names, and by naturalists, whose labours have been, in other instances, overlooked or neglected. The *vespertilio lucifugus*, of Le Conte, is the *v. subulatus* of Say. See Long's Expedition to the Rocky Mountains, Vol. II. p. 62. The *v. noctivagans* of the same naturalist, is not sufficiently characterized, and its habitat not mentioned. The plecotus macrotis of L. C. is most probably the megalotis of Rafinesque. The *nycteris noveboracensis*, is quoted as figured in Wils. Orn. vi. pl. 4; and the translator adds, "whence it has been quoted by M. Cuvier as the *taphizous*." I venture to assert that this may be classed among the numerous inconsiderate insinuations of this work, and that Cuvier is entirely correct in this reference of the taphizous from Wilson.

At paragraph vi., the two wolves described by Say, in Long's Expedition, *canis latrans*, and *c. nubilus*, are stated to be probably varieties of *c. lupus*. A visit to the Philadelphia museum, where individuals of these two species are preserved, would have satisfied him of Mr. Say's correctness. Indeed, *c. nubilus* resembles *c. lycaon*, more than *c. lupus*.

The catalogue of the "mammalia and birds of the United States," which closes the first volume, is exceedingly defective, and exhibits an almost entire ignorance of the labours of American naturalists. The genus sorex is mentioned, with the following note: "We have many species of this genus in the U. States, but not one that has yet been properly determined." And at page 88, there is a note on this subject, signed *Am. Ed.* which has a very learned appearance. Who the friend behind the curtain is, I do not pretend to say; but it has occasionally been drawn up high enough to show, at least, the legs of a friend. Whether intentionally or not, Mr. Say is treated with great injustice. More complete descriptions of an animal have never been given, than those we owe to him of the *sorex parvus*, and sorex brevicaudus, for which I refer to Long's Expedition, Vol. I. pp. 163, 164. Traits of this kind deserve animadversion. It is not to be endured, that the labours of so distinguished a traveller as Col. Long, and of so able a naturalist as Mr. Say, should be obscured in this unjustifiable manner. Of the illiberal slights which other American naturalists have received upon this occasion, I forbear at present to speak.

The translator has not thought proper, at the end of his first volume, to give a list of errata: this he ought to have done, since they are numerous enough, and occasionally affect the meaning of his author; the typographical errors, too, are sufficiently obvious to catch the eye of a rapid reader. At page 29, *honogeneous* for *homogeneous*,—p. 69, *siamiri* for *saimiri*,—p. 72, *every* for *very*,—p. 80, *shaved* for *shaped*,—p. 111, colour *on* the eye, for *to* the eye,—p. 113, *black* for *back*,—p. 126, *black* for *back*,—p. 139, *watered* for *waved*,—p. 142, *poessig* for *poeppig*,—p. 238, *morhpnus* for *morphnus*,—p. 258, *tanaers* for *tangara*,—p. 277, *mœura* for *mœnura*,—p. 297, *maugeur* for *mangeur*,—p. 331, *birds passage* for *birds of passage*,—p. 347, *larger* for *longer*,—p. 392, *roges* for *rouges*,—p. 402, *beak* for *neck*,—p. 405, *when* for *where*.

I shall not pursue, at present, these remarks into the subsequent volumes. If the publishers are men of sense, they will be obliged to me for enabling them to render a future edition of their work more deserving the patronage of the public. It has had its share of puffing in the newspapers, and it is now the turn of purchasers of the work, of which I am one, to speak of it as they have found it. I have taken the trouble to do so, out of pure regard for the reputation of the country; nor should I have drawn up these observations, if I had not believed, from the independent and correct course you have hitherto pursued in your Journal, that I might reasonably expect them to be inserted in it. I consider your Journal as a scientific periodical, not infected by the spirit of puffing and quackery, and independently and intelligently standing up for the true interests of science, and the scientific reputation of the country. I regret that I am not able to give this honest praise to Mr. Silliman's American Journal of Science and Arts, which certainly, upon this occasion, has not deserved it; having voluntarily lowered itself to the level of common puffers, by announcing Dr. M'Murtrie's translation in the most eulogistic terms, "as very faithful and able." I perceive that the publishers of Dr. M'Murtrie's work, have appended to their advertisements this recommendatory certificate of Professor Silliman. The principal effect of this wretched puff, will be to strengthen the increasing want of confidence in its author. In one sense, it may serve the purposes of the publisher; for the public, puzzled by such different accounts of the work, may purchase, and in order to judge for itself, may read the work. I wish it may occur also to Professor Silliman, to look into the work; as I cannot but infer, he has never read a line in it. I give you his passage.

"Dr. M'Murtrie is entitled to the thanks of the cultivators of natural history, for *his very faithful and able translation* of this most perfect system of zoology. The publication of the present work, we are confident, will form an era in this country."—*Silliman's Journal, Vol.* XXI, *p.* 388.

Taking it for granted that you will examine into the truth of my averments, I place it with cheerful confidence in your hands, reserving my remarks upon the subsequent volumes, which are by no means without merit, for a future occasion.

A Subscriber.

We have had the preceding communication sometime in our possession, and publish it with reluctance, although we have verified, by personal examination, the accuracy of "A Subscriber," in relation to the errors and omissions it adverts to. Much praise is due to those through whose enterprise this translation has been undertaken; and every naturalist is aware, that a translation of the Regne Animal is a very arduous undertaking; one that could scarce be completed without some deficiencies. It appears to us, to have been sent to the press with too much haste, and that if the translator had required of some intelligent friend, to revise it before it was printed, he would have been spared these remarks, which will perhaps give him pain. The greater portion of the work is well done, and bears testimony both to the intelligence and industry of the translator. We feel exceedingly, that we cannot accord to it all the praise, we had hoped it would deserve at our hands; but justice must be done, and we shall never shrink at the performance of any act, by which the cause of science may be substantially advanced. We think that the remarks of "A Subscriber" will be permanently beneficial, both to the public, and to the parties themselves.

EDITOR.

AUDUBON,

Author of "THE BIRDS OF AMERICA," and "ORNITHOLOGICAL BIOGRAPHY."

JOHN JAMES AUDUBON, of French descent, was born in the State of Louisiana:—but as no words can tell his early history so eloquently as his own, we shall proceed to select such passages from the "Introductory Address," to his Ornithological Biography, as cannot fail to excite in our readers, a deep interest for the writer of this most interesting, but too short auto-biographical sketch. After calling himself an "American woodsman," he proceeds:

"I received life and light in the New World. When I had hardly yet learned to walk, and to articulate those first words always so endearing to parents, the productions of Nature that lay spread all around, were constantly pointed out to me. They soon became my playmates; and before my ideas were sufficiently formed to enable me to estimate the difference between the azure tints of the sky, and the emerald hue of the bright foliage, I felt that an intimacy with them, not consisting of friendship merely, but bordering on phrenzy, must accompany my steps through life;—and now, more than ever, am I persuaded of the power of those early impressions. They laid such hold upon me, that, when removed from the woods, the prairies, and the brooks, or shut up from the view of the wide Atlantic, I experienced none of those pleasures most congenial to my mind. None but aerial companions suited my fancy. No roof seemed so secure to me as that formed of the dense foilage under which the feathered tribes were seen to resort, or the caves and fissures of the massy rocks to which the dark winged Cormorant and the Curlew retired to rest, or to protect themselves from the fury of the tempest. My father generally accompanied my steps, procured birds and flowers for me with great eagerness,—pointed out the elegant movements of the former, the beauty and softness of their plumage, the manifestations of their pleasure or sense of danger,—and the always perfect forms and splendid attire of the latter. My valued preceptor would then speak of the departure and return of birds with the seasons, and would describe their haunts, and, more wonderful than all, their change of livery; thus exciting me to study them, and to raise my mind towards their great Creator.

"A vivid pleasure shone upon those days of my early youth, attended with a calmness of feeling, that seldom failed to rivet my attention for hours, whilst I gazed in ecstacy upon the pearly and shining eggs, as they lay imbedded in the softest down, or among dried leaves and twigs, or were exposed upon the burning sand or weather-beaten rock of our Atlantic shores. I was taught to look upon them as flowers yet in the bud. I watched their opening, to see how Nature had provided each different species with eyes, either open at birth, or closed for some time after; to trace the slow progress of the young birds toward perfection, or admire the celerity with which some of them, while yet unfledged, removed themselves from danger to security.

"I grew up, and my wishes grew with my form. These wishes were for the entire possession of all that I saw. I was fervently desirous of becoming acquainted with nature. For many years, however, I was sadly disappointed, and for ever, doubtless, must I have desires that cannot be gratified. The moment a bird was dead, however beautiful it had been when in life, the pleasure arising from the possession of it became blunted; and although the greatest care was bestowed on endeavours to preserve the appearance of nature, I looked upon its vesture as more than sullied, as requiring constant attention and repeated mendings, while, after all, it could no longer be said to be fresh from the hands of its Maker. I wished to possess all the productions of nature, but I wished life with them. This was impossible. Then what was to be done? I turned to my father, and made known to him my disappointment and anxiety. He produced a book of *Illustrations.* A new life ran in my veins. I turned over the leaves with avidity; and although what I saw was not what I longed for, it gave me a desire to copy Nature. To Nature I went, and tried to imitate her, as in the days of my childhood I had tried to raise myself from the ground and stand erect, before Time had imparted the vigour necessary for the success of such an undertaking.

"How sorely disappointed did I feel, for many years, when I saw that my productions were worse than those which I ventured (perhaps in silence) to regard as bad, in the book given me by my father! My pencil gave birth to a family of cripples. So maimed were most of them, that they resembled the mangled corpses on the field of battle, compared with the integrity of living men. These difficulties and disappointments irritated me, but never for a moment destroyed the desire of obtaining perfect representations of nature. The worse my drawings were, the more beautiful did I see the originals. To have been torn from the study would have been as death to me. My time was entirely occupied with it. I produced hundreds of these rude sketches annually; and for a long time, at my request, they made bonfires on the anniversaries of my birth-day."

As the bent of such inclinations could not be mistaken, he was sent to France, when very young, and applied himself with great patience and industry to drawing. But at the age of seventeen, when he returned to his native country, although he was familiar with those rudiments of the higher branches of the art, heads and noses of giants and horses; and although the celebrated David had guided his hand, he cast them all aside at the sight of his native woods, and with great ardour commenced that unrivalled collection of drawings, "The Birds of America," which Cuvier has pronounced "*the most magnificent monument which has hitherto been raised to ornithology.*"

"In Pennsylvania, a beautiful state, almost central on the line of our Atlantic shores, my father, in his desire of proving my friend through life, gave me what Americans call a beautiful 'plantation,' refreshed during the summer heats by the waters of the Schuylkill river, and traversed by a creek called Perkioming. Its fine woodlands, its extensive fields, its hills crowned with evergreens, offered many subjects to my pencil. It was there that I commenced my simple and agreeable studies, with as little concern about the future as if the world had been made for me. My rambles invariably commenced at break of day; and to return wet with dew, and bearing a feathered prize, was, and ever will be, the highest enjoyment for which I have been fitted.

"Yet think not, reader, that the enthusiasm which I felt for my favourite pursuits was a barrier opposed to the admission of gentler sentiments. Nature, which had turned my young mind towards the bird and the flower, soon proved her influence upon my heart."

He married; passed twenty years of his life in vain commercial attempts to become rich, "after the ways of men," and after many unhappy struggles with the opinions of his friends, and irritated at the restraint they sought to impose upon his inclinations, he broke away from them all, and gave himself up to his own favourite pursuits. Unknown, without fortune, and in opposition to the wishes of his friends, he abandoned every thing for nature; led by that irresistible passion, which, at a ripened age, and in possession of those advantages which usually bind men to society, has again drawn him into the unfrequented wilds of the remote shores of his native America. In April, 1824, he visited Philadelphia, which gave him an opportunity of exhibiting his drawings, and forming a few valuable acquaintances. Dr. Mease presented him to Charles Lucien Bonaparte, one of the most learned ornithologists of the present day, and to whom the world owes the splendid continuation of Wilson's ornithology. By this gentleman he was greatly encouraged to persevere in his pursuits, with a view to future independence and eminence; and after exploring the State of New York, in "the wildest solitudes of the pathless and gloomy forests," he after an absence of eighteen months, returned to his family, then in Louisiana, and "explored every portion of the vast woods around."

But his port folio, at length,—after having been destroyed, as he relates at page 13,—became full; and remembering the encouragement he had received from his friend, Charles L. Bonaparte, his somewhat ambitious mind was turned to Europe, as the only country where his labours would be cherished.

"America being my country, and the principal pleasures of my life having been obtained there, I prepared to leave it, with deep sorrow, after in vain trying to publish my Illustrations in the United States. In Philadelphia, Wilson's principal engraver, amongst others, gave it as his opinion to my friends, that my drawings could never be engraved. In New York, other difficulties presented themselves, which determined me to carry my collections to Europe.

"As I approached the coast of England, and for the first time beheld her fertile shores, the despondency of my spirits became very great. I knew not an individual in the country; and although I was the bearer of letters from American friends, and statesmen of great eminence, my situation appeared precarious in the extreme. I imagined that every individual whom I was about to meet, might be possessed of talents superior to those of any on our side of the Atlantic! Indeed, as I for the first time walked in the streets of Liverpool, my heart nearly failed me, for not a glance of sympathy did I meet in my wanderings, for two days. To the woods I could not betake myself, for there were none near.

"But how soon did all around me assume a different aspect! How fresh is the recollection of the change! The very first letter which I tendered procured me a world of friends. The Rathbones, the Roscoes, the Traills, the Chorleys, the Mellies, and others, took me by the hand; and so kind and beneficent, nay, so generously kind, have they all been towards me, that I can never cancel the obligation. My drawings were publicly exhibited, and publicly praised. Joy swelled my heart. The first difficulty was surmounted. Honours which, on application being made through my friends, Philadelphia had refused, Liverpool freely accorded.

We knew Audubon in London, being on a visit there, as well as himself, and know how much his feelings were wounded, by the refusal alluded to, of the social honours of Philadelphia. This slight is by no means to be imputed to his countrymen at large, to whom he was comparatively unknown. The transaction grew out of the spirit of jealousy, which is always illiberal, and the frequent parent of misrepresentation and calumny. Some of the friends of Wilson did not view, with the most cordial spirit, those evidences of transcendent merit, which others willingly accorded to Audubon's drawings; then arose the spirit of party, and with it malevolence. A few small minds, who knew little or nothing of nature, and who had officiously intruded themselves into this matter, endeavoured to make up for their want of knowledge on the subject, by excess of bad zeal. Opinions were industriously circulated, that Audubon had, in many instances, attempted to impose upon the credulity of the world, by inventing stories which had no foundation in truth, because they were contrary to the known habits of the animals they concerned; as if the habits of the animals of this vast continent, could possibly be known to any other class of men, but that adventurous one, which, like Audubon, had passed their whole lives in observing them; and because he had executed a drawing of inimitable force and beauty, of "*mocking birds defending their nest from a rattlesnake*,"—a picture which cannot be contemplated without the liveliest emotions, and of which one of the best judges in Europe, Mr. Swainson, in an elegant encomium, has said, "every part of the story is told with exquisite feeling;" they selected this to exercise their detraction upon; and concluding, because the books of systematic naturalists, had not mentioned this habit of the rattlesnake of climbing up bushes, that it was a fair presumption the animal did not and could not climb; they industriously circulated a report, that he had imposed a deliberate lie upon the world, and that no doubt he had done so in many other instances. Thus overwhelmed with calumny, and absent, his friends,—and he had a few, both true and steady,—had the mortification to witness the temporary success of this bad combination, and see the name of this great naturalist, that would do honour to any society, rejected, and in a scornful manner. It is painful to allude to this circumstance, which is somewhat notorious; but that the shame, which belongs to a very few, may not be imputed to all, we have here given a true history of a conspiracy, got up to utterly break down and ruin the reputation of one of the most remarkable men America ever produced: a man, whom the Royal Society of London, nearly all the distinguished societies of Great Britain, and many others in France, have subsequently lavished their highest honours upon. We have the satisfaction to add, that previous to his return to his native country, in September last, atonement was made to him for this persecution. The American Philosophical Society, at a full meeting of its most respectable members, disregarding the calumnies yet assiduously circulated by a few, elected him an associate, and subscribed for a copy of his magnificent work; and the society from whence he had formerly been rejected, paid him the same tribute of respect.

This Journal has always been prompt to repel unfriendly imputations directed against Audubon; his claims to public confidence were vindicated in our September number.* There is a communication from Col. Abert, of the U. S. Topographical engineers, where the most conclusive evidence is given from officers of high rank in the U. S. service, that the rattlesnake has those habits of climbing, and has been seen by others, in the situation depicted by Audubon.† These gentlemen have been able to offer their testimony of his fidelity to nature, because they too have had rare opportunities of observing the habits of animals, in the distant and unfrequented territories of our country.

The remainder of the introductory address, from which we have made our quotations, is devoted to an account of the cordial manner with which he was received in Liverpool and Edinburgh, of the grateful attentions paid to him by some of their most distinguished inhabitants, of which a list is given. No sooner was his great merit perceived, than he was spontaneously and gratuitously enrolled a member of their first societies. Audubon was now about to enter upon the fruition of those anticipations which so long had borne him up; and encouraged from every quarter, he opened an exhibition of his drawings. We extract the following from Blackwood,‡ a periodical which has been eloquent in the commendation of Audubon.

"Soon after his arrival in Edinburgh, where he soon found many friends,

*See Month. Am. Jour. of Geology, Sept. 1831, p. 138. † Do. Nov. 1831, p. 221.
‡See Blackwood's Edinburgh Mag. July 1831, p. 14.

he opened his exhibition. Four hundred drawings,—paintings in water colours—of about two thousand birds, covered the walls of the institution hall, in the royal society buildings, and the effect was like magic. The spectator imagined himself in the forest. All were of the size of life, from the wren and the humming bird, to the wild turkey and the bird of Washington. But what signified the mere size? The colours were all of life too—bright as when borne in beaming beauty through the woods. There, too, were their attitudes and postures, infinite as they are assumed by the restless creatures, in motion or rest, in their glee and their gambols, their loves and their wars, singing, or caressing, or brooding, or preying, or tearing one another into pieces. The trees too, on which they sat or sported, all true to nature, in hole, branch, spray, and leaf; the flowering shrubs, and the ground flowers, the weeds, and the very grass, all American—so too the atmosphere and the skies—all transatlantic. 'Twas a wild and poetical vision of the heart of the new world, inhabited as yet almost wholly by the lovely or noble creatures, 'that own not man's dominion.'"

We know not in what more expressive language, we could have sought to do justice to the magic drawings of Audubon, than that of the quotation we have just made.

The complete success of this exhibition, decided Audubon upon the great undertaking he has, in part, most admirably accomplished; that of engraving these magnificent drawings. We should not do justice to them, if we were to omit the following passage in the introductory address:—

"Merely to say, that each object of my illustrations is of the size of nature, were too vague—for to many it might only convey the idea that they are so, more or less, according as the eye of the delineator may have been more or less correct in measurement simply obtained through that medium; and of avoiding error in this respect I am particularly desirous. Not only is every object, as a whole, of the natural size, but also every portion of each object. The compass aided me in its delineation, regulated and corrected each part, even to the very fore-shortening which now and then may be seen in the figures. The bill, the feet, the legs, the claws, the very feathers as they project one beyond another, have been accurately measured. The birds, almost all of them, were killed by myself, after I had examined their motions and habits, as much as the case admitted, and were regularly drawn on or near the spot where I procured them. The positions may, perhaps, in some instances, appear *outre;* but such supposed exaggerations can afford subject of criticism only to persons unacquainted with the feathered tribes; for, believe me, nothing can be more transient or varied than the attitudes or positions of birds. The Heron, when warming itself in the sun, will sometimes drop its wings several inches, as if they were dislocated; the Swan may often be seen floating with one foot extended from the body; and some Pigeons, you well know, turn quite over, when playing in the air. The flowers, plants, or portions of trees which are attached to the principal objects, have been chosen from amongst those in the vicinity of which the birds were found, and are not, as some persons have thought, the trees or plants upon which they always feed or perch."

Taking it for granted, that the patronage which this great work has begun to receive in this country, will soon be so much extended, as to enrich every considerable town in the United States with at least one copy,—for what town or neighbourhood is there, which does not possess patriotic, wealthy, and liberal friends to the arts, who can unite in a subscription for this purpose?—we shall not repeat the encomiums it so well deserves: we imagine there are few of our readers, who will not be able to have access to this unrivalled work; to those, however, who hitherto have not had an opportunity of seeing it, we shall state,—what they may already have conceived, knowing the objects described to be as large as life,—that the first volume, already published, containing one hundred plates, is truly a gigantic volume. We saw a copy of it, recently, bound in calf, brought by Mr. Audubon from England, which weighed forty-five pounds. The pages are three feet three inches long, and two feet two inches broad. Each number, the price of which is two guineas, or about ten dollars, contains five plates: one hundred and twenty-four plates have already been published, of which one hundred form the first volume: the others will appear gradually; so that the total amount of the cost of this unrivalled work, is progressively paid, and in small sums. The intention is, to publish at least five numbers annually. To each volume of plates, consisting of twenty numbers, is annexed a descriptive and narrative volume of "Ornithological Biography."*

This book, which was first published in London, has been reprinted in Philadelphia, and is perhaps the handsomest octavo ever got up in America. But this is its slightest merit; it is in the contents we find what is truly inimitable. Every thing there is communicated in an earnest and simple manner, sometimes with a vivid eloquence and beauty that is touching. There is not one of the one hundred descriptions contained in this volume, where evidences of this may not be found. We open the book at random at page 96, at the head, "Bewick's Wren."

"The bird represented under the name of Bewick's Wren, I shot on the 19th October, 1821, about five miles from St. Francisville, in the state of

‡ *Ornithological Biography*, Royal 8vo. p. 506. Philadelphia, Judah Dobson.

Louisiana. It was standing, as nearly as can be represented, in the position in which you now see it, and upon the prostrate trunk of a tree, not far from a fence. My drawing of it was made on the spot," &c.

And again, at page 91, "The Carolina Turtle Dove."

"I have tried, kind reader, to give you a faithful representation of two as gentle pairs of Turtles as ever cooed their loves in the green woods. I have placed them on a branch of Stuartia, which you see ornamented with a profusion of white blossoms, emblematic of purity and chastity.

"Look at the female, as she assiduously sits on her eggs, embosomed among the thick foliage, receiving food from the bill of her mate, and listening with delight to his assurances of devoted affection. Nothing is wanting to render the moment as happy as could be desired by any couple on a similar occasion.

"On the branch above, a love scene is just commencing. The female, still coy and undetermined, seems doubtful of the truth of her lover, and virgin-like resolves to put his sincerity to the test, by delaying the gratification of his wishes. She has reached the extremity of the branch, her wings and tail are already opening, and she will fly off to some more sequestered spot, where, if her lover should follow her with the same assiduous devotion, they will doubtless become as blessed as the pair beneath them.

"The Dove announces the approach of spring. Nay, she does more:—she forces us to forget the chilling blasts of winter, by the soft and melancholy sound of her cooing. Her heart is already so warmed and so swelled by the ardour of her passion, that it feels as ready to expand as the buds on the trees are, under the genial influence of returning heat."

But to do perfect justice to his genius, we must, at the same time, see the beautiful drawing where these turtle doves are represented; then, indeed, we perceive that nature has not spoken to him in vain, and that he can express the feelings she has inspired him with, with great force.

Even the dear little house-wren, he has given us a most pleasing and minute account of. What can be more amusing, cheerful, and ridiculous, at the same time, than the family picture of plate 83, where the nest is in an old hat, stuck on a twig, the male beginning his song on the edge of the hat, and the anxious mother arriving with a fine fat spider, which one of the pets is squeezing himself through a hole to get at: and then this family history is followed up, so as to give us a direct interest in all the wren family, wherever we may meet them.

"When the young issue from the nest, it is interesting to see them follow the parents amongst the currant bushes in the gardens, like so many mice, hopping from twig to twig, throwing their tails upwards, and putting their bodies into a hundred different positions, all studied from the parents, whilst the latter are heard scolding, even without cause, but as if to prevent the approach of enemies, so anxious are they for the safety of their progeny." See page 428.

In some remarks on Audubon's works, contained in the Edinburgh New Philosophical Journal, for April 1831, it is said:

"It is not enough to say, that our author has invented a new style in the representation of natural objects; for so true are his pictures, that he who has once seen and examined them, can never again look with pleasure on the finest productions of other artists. To paint like Audubon, will henceforth mean, to represent Nature as she is. The birds are represented such as Nature created them, of their full dimensions, glowing in all the beauty of their unsullied plumage, and presenting the forms, attitudes, and motions peculiar to the species. In no case do they appear before us in the stiff and formal attitudes in which we find them in other works, perched upon an unmeaning stump or stone. On the contrary, they are seen in all imaginable positions, pursuing their usual avocations. The fore-shortenings and varieties of attitude which induce painters generally to present side views only, *seem to have been accounted as nothing out of the ordinary course of drawing*; with so much delicacy, grace, and vigour, have the most difficult positions been managed. A peculiar charm is given to these representations, by the circumstances that the trees, plants, and flowers of the districts in which they occur, are all represented, generally with surprising accuracy, and always with great taste. The flowing festoons of climbing shrubs and creepers, hung with broad leaves, garlands of flowers, and clustered berries, the lichen-crusted branches of the forest trees, and the decayed stumps on which the woodpeckers seek their food, are in themselves objects of admiration."

This is just praise, and many are the British periodicals in which we find language of this kind. The same may be said with great truth, of his biographical descriptions: in them he does not appear as the dry, systematic naturalist, the manufacturer of the barbarous Latin jargon, after the manner of the old school, but as the delightful historian of those birds, of which he is the unrivalled painter. In his descriptions, we find the persuasive power of a mind, which has not been moulded in the conventional forms of society, but taught by its own unrestrained experience, acquired in nature's most retired solitudes, where she was sought, and wooed, and won. For proofs of this, we refer our readers to page 372, where the wood-thrush is described with a train of eloquent thought, that does him honour as a man and a writer. But we think that it is in his account of the mocking-bird, at page 108, that the power and happy gracefulness of his language are most conspicuous.

"It is where the great magnolia shoots up its majestic trunk, crowned with evergreen leaves, and decorated with a thousand beautiful flowers, that perfume the air around; where the forests and fields are adorned with blossoms of every hue; where the golden orange ornaments the gardens and groves; where bignonias of various kinds interlace their climbing stems around the white-flowered Stuartia, and mounting still higher, cover the summits of the lofty trees around, accompanied with innumerable vines, that here and there festoon the dense foliage of the magnificent woods, lending to the vernal breeze a slight portion of the perfume of their clustered flowers; where a genial warmth seldom forsakes the atmosphere; where berries and fruits of all descriptions are met with at every step."

This is the eloquent introduction to one of the most fascinating descriptions of the bird himself, his courtship, his song, and the thousand cares between the construction of the nest, and the fledging of their young.

We trust we have said enough to inspire those of our readers who have not read this charming book, with a desire to acquire it: and to it we refer them for the noble descriptions of the larger birds. The bird of Washington, the stately hawk, the black warrior, (falco Harlani,) called after his tried friend, Dr. Harlan, the wild turkey, and its other various contents. But besides these attractions, it contains the most interesting narratives of his adventures, and local descriptions, judiciously interspersed through the work, to the number of twenty. They are as follows: *the Ohio, the great pine swamp, the prairie, the regulators, improvements in the navigation of the Mississippi, a flood, Meadville, the cougar, the earthquake, the hurricane, Kentucky sports, the traveller and the pole-cat, deer hunting, Niagara, hospitality in the woods, the original painter, Louisville in Kentucky, the eccentric naturalist, Scipio and the bear, and Col. Boon.* These narratives are many of them so powerful, that we rise from the repeated reading of them, almost as familiar with the subject, as if we had been the companions of Mr. Audubon in his romantic adventures.

Audubon is now in Florida, leading the woodman's life he is so partial to; from thence he will either ascend the Mississippi, or strike into the unfrequented wilds of Texas. It is his intention to penetrate, if possible, into California, to whose natural history we are almost entire strangers. He is furnished with all the protection the American and British governments could afford him, having the most powerful recommendations to all the posts on the distant frontiers. We shall continue, whenever we are able to do so, to give information of his progress and adventures. May our opportunities be frequent and fortunate, until we can greet him again on our Atlantic shore. We most sincerely hope, that the life of this adventurous and accomplished naturalist will be spared. He has already done enough to secure a lasting renown; but such is his unextinguishable spirit, that when his great work, the "Birds of America," is all engraved, it is only to be the precursor of a still greater; a gallery executed in oil, as large as life, of all the subjects of his masterly drawings. This gallery is already in progress. What a splendid acquisition for the congress of the United States of America!

Ere we leave, for a while, this attractive subject, we desire to say one word more on the encouragement this magnificent work has received in the native country of its gifted author. On the arrival of Audubon in the United States, in September last, we believe he had only six subscribers, including the national library at Washington. Since that period, the number, we understand, has increased to twenty-four. Of these, we believe, five are received in literary and scientific societies. Two copies have been ordered by the legislature of the State of Louisiana, and one by the legislature of S. Carolina. Philadelphia possesses four copies, Baltimore three, Boston, we believe, one. *New York*, we think, at least we have heard so, one. There is one subscriber in Kentucky; Charleston in S. Carolina, possesses three copies. Where Audubon is known, he is sure to make friends, and we have conceived a high idea of the intelligence and liberality to be found in the State of Georgia, from the fact, that in a town with so limited a population as Savannah, he has no less than seven subscribers. All these, which do not constitute one fifth of the patronage Audubon deserves from the United States, will greatly increase the opportunities which individuals will have, of seeing this magnificent work. There is but one obstacle to its perfect success, and that consists in the duties the work is subjected to, on arriving in this country. Those who have the spirit to appreciate and acquire it, deserve every praise, knowing as they do, *that foreigners have the privilege of possessing the works of their gifted countryman, at a much less expense than they do themselves.* We intend no allusion to either tariff or anti-tariff opinions; under any laws, exceptions should be made in favour of works of acknowledged genius of the first order; and we think this duty will be a reflection upon every succeeding congress, as it is upon the present one, until the "Birds of America" are permitted to come in without duty, and free as the animated beings of which they are the beauteous resemblances. We think, also, that every department of the government ought to subscribe for a copy of this truly national work; and we hope, ere long, to learn that every legislature in the union will follow the examples set by Louisiana and S. Carolina.

BRITISH ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.

In our December number, for 1831, we gave an account of the meeting at Hamburgh, in Germany, of the *Cultivators of Natural Science and Medicine,* and expressed our intention to lay before our readers an account of a proposed scientific meeting of a similar character, to be held at York, in England, in September 1831.

This we should have done before the present time, but for the temporary suspension of our journal, and the confusion attendant upon so unexpected a circumstance.

We are indebted to one of our best friends, who was a conspicuous member of that *great scientific meeting*, as it has been properly called, for a very interesting account of it, together with numerous papers relating to its proceedings. Added to these, we have Mr. Johnston's excellent paper in the January number of Brewster, and the notice of its proceedings in the Philosophical Magazine. From all these sources we propose to condense an account, that we are sure will be acceptable to our readers.

This first attempt to establish what is, in fact, a scientific parliament, with locomotive powers, free to range where it may please, and authorized to convene annually in one of the cities of Great Britain, has eminently succeeded, although some pains had been taken to create doubts as to its usefulness. Many things, however, conspired in its favour. It had originally been proposed by Dr. Brewster, and many of the best names in England had cordially assented to the project. The place of meeting too, was well calculated to induce the members of the association to pursue their object *con amore.* The ancient city of York was a Roman station of importance; many interesting remains of the Roman period in England are extant there at this day. Upon the skirts of the city, and near to the mouldering remains of the ancient Roman walls, are the truly venerable ruins of a Christian temple, which, perhaps, yield the palm in extent more than in beauty, to that fine character, which Time, who puts the true finish to cathedral architecture, exhibits more beautifully and profusely in England than in any other country. On this interesting spot of ground, which slopes down to the river Ouse, and which is pregnant with such fine remembrances, the Yorkshire Philosophical Society have constructed an admirable and most convenient building, of classic and elegant proportions, and have placed it between the Roman and cathedral ruins of which we have spoken.

That the most intellectual men in Great Britain could meet at such a place, and upon such an occasion, without being influenced by these associations, could not be; and a week was passed there, consecrated to the interests of science, in the most harmonious and profitable manner. A few of the most distinguished scientific men were not able to attend. The presence of Buckland, Herschell, Sedgewick, Babbage, Airy, and a few other celebrated persons, would have completed an assemblage strong in the names of Dalton, Brewster, Murchison, Witham, Scoresby, Smith, Daubeny, Vernon Harcourt, Greenough, and a host of intellectual men, of established reputation. It added greatly to the interest of the meeting, that several men of rank assisted at the deliberations, and evinced a strong desire to forward the great object of the association. The Archbishop of York paid a marked attention to the members, attended the meetings, and enrolled his name on the list. Lords Milton, Morpeth, Dundas, Sir George Cayley, Sir Thomas Brisbane, Sir Philip Egerton, Sir C. Ibbetson, Mr. Justice Parke, Mr. Archdeacon Wrangham, all eminent patrons of science, became members of the association.

The first assemblage was on the evening of the 26th September, 1831. The ladies and gentlemen of the city and neighbourhood attended in great numbers, for the purpose of giving a cordial welcome to the scientific strangers. During that evening Mr. Phillips, the able secretary of the Yorkshire society, and nephew to Mr. Smith, the father of English geology, delivered a lecture on some of the geological phenomena of Yorkshire. The next day the first regular meeting was held, to form the association; about three hundred and fifty persons enrolled their names. Lord Milton, who is the eldest son to Earl Fitzwilliam, was placed in the chair. The Rev. Vernon Harcourt, Vice President of the Yorkshire society, delivered an able address, which was ordered to be printed. At 5 P. M. they dined together, and in the evening re-assembled, when Mr. Abrahams, of Sheffield, delivered a lecture on magnetism, illustrated by curious experiments. On the 28th, a paper by Dr. Brewster was read, on the progress of mineralogy and on the crystallographic system of Mohs. On account of the great number of mineral structures discovered by the agency of polarized light, he proposes a "*composite system*," where the crystalline forms which cannot be taken into any of the received systems, may be classed. To this succeeded the reading of a valuable paper on the philosophical character of Priestley, by Dr. Henry of Manchester. In the evening Mr. Potter, of Manchester, exhibited his improvement on the reflecting microscope of Newton. Dr. Brewster also communicated an account of the theory and construction of a lithoscope, to characterize precious stones, by the colours reflected from their surfaces.

On the 29th, the organization of the association was completed. Lord Milton was chosen the first president by acclamation. Oxford was fixed upon as the place of the next meeting, and Dr. Buckland was unanimously chosen President elect. Dr. Brewster, of the University of Cambridge, and Professor Whewell, were also unanimously chosen Vice Presidents elect; and Dr. Daubeny of Oxford, Secretary. Mr. Dalton read a paper "*on the quantity of food, and insensible perspiration.*" He afterwards stated, that it contained a series of experiments made upon himself forty years ago, relating to the weight of food taken, and the secretions, insensible perspiration, and other animal products. He pointed out the utility of such inquiries to physicians. This important paper is to be published in the transactions of the Manchester Literary and Philosophical Society. Mr. Potter then read a paper, the object of which was to point out objections to Fresnel's Theory of Light, deduced from certain experiments on light reflected from metallic surfaces both simple and compound. Sir George Cayley remarked that the difficulties on this subject were connected with the speculations on the identity between heat and light.

An interesting discussion now arose on the reading of a paper by Mr. William Hutton of Newcastle, on the great "*Whin Sill,*" or trap dyke of the northern counties of England. This related to the geological age of the intrusive rocks connected with the whin, (a provincial name for trap.) Mr. Hutton had explored and examined this dyke through a line of one hundred miles between the confines of Northumberland and Yorkshire: he exhibited a section where beds of limestone and shale were superincumbent to it, inferring thence, that these last were posterior to the trap, which he considered to be the overflowing of ancient volcanic action. Mr. Murchison, the President of the Geological Society of London, entertained a different opinion as to the relative age of these rocks. He had personally examined the district. He considered Mr. Hutton's paper to be a very able one; it was true that the basaltic matter was found in beds between the strata alluded to; but he had reason to believe there was a connection between the whin dykes of Durham, and those stratified beds, which he considered to be intrusive, and that they had been injected laterally not only into the carboniferous limestone, but into later rocks. He thought it important that further examinations should be made in relation to the general connection of all this basaltic matter. He was entirely of opinion that all this matter had been laterally injected since the deposit of the rocks which enclosed it. [*This is also the opinion of Professor Sedgewick, who has made a profound study of these phenomena. We propose in the plate to our next number to give a figure from Mr. M'Culloch's Western Islands, of the manner in which the trap is found in Trotternish, laterally injected, between the strata of sandstone.*]

Mr. Johnston now read a paper upon the metal provisionally called vanadium, and exhibited some beautiful crystals formed by gradual cooling. We trust that this gentleman will be induced, by our present number, to do perfect justice to this subject.

Mr. Witham, of Lartington, next gave a very interesting sketch of the fossil flora. Nothing could happen more fortunately for the cause of fossil botany,—which is so much indebted to M. Adolphe Brogniart,—than the application of Mr. Witham's ingenious method of detecting the structure of fossil vegetables; we think it will, ere long, be generally applied to all doubtful fossil substances.

Mr. Phillips concluded the morning with a paper from Dr. Henry, on the roasting of the copper ore of Anglesea. The ore, when roasted, gives lumps, which contain from thirty to fifty per cent. of copper; these are picked out and then smelted. The Archbishop of York was present during a part of these proceedings. In the evening the Rev. Mr. Scoresby delivered to a very numerous assemblage of ladies and gentlemen, the result of his experiments on the law of magnetic induction: the magnetic force diminishes with the square of the distance; and he has invented a method of applying the magnetic influence to the admeasurement of rocks and solid substances in situations where these are not, by known methods, measureable. The application of this curious branch will probably become of great value in mining operations. Many rocks occasion a sensible deviation of the needle, and it is probable that when we are better acquainted with the magnetic intensity of the various rocks, we shall be able to measure their thickness. Mr. Scoresby has found that he can, by his own magnets, cause an angular deviation of the needle, from a distance of sixty feet, through the most solid substances.

On the morning of Friday the 30th, Dr. Brewster communicated an interesting paper *on the structure of the crystalline lens in the eyes of fishes*. The various arrangements of this structure, adapted to the wants of these animals, through their extensive distribution in the waters of the globe, are extremely instructive and curious. To this communication succeeded a very lively geological discussion, in relation to certain marine shells, of existing shells of mollusca, found in gravel pits about Preston in Lancashire, and which, it appears, are elevated three hundred feet above the level of the sea. There is a communication on this subject at p. 170, Vol. III. of the Magazine of Natural History, from the Rev. Mr. Gilbertson, who had collected these shells as early as 1829. Mr. R. C. Taylor also has two notes following the same communication. The country appears to be covered with a marl, and, according to the observation of Mr. Murchison, the sands, marls, and gravels, have no deposit superincumbent to them, save some blocks of Cumbrian origin, and which alone may be referred to what is called a diluvian origin. These shells are the *Buccinum undatum*, *Purpura lapillus*, *Triton macula*, *Murex erinaceus*, *Fusus bamffius*, and *Turritella terebra*, of Fleming. *Turbo littorius*, and *terebra*, *Cardium echinatum*, *Mactra solida*, *Dentalium striatum*, &c. &c. and Mr. R. C. Taylor has remarked, that their appearance is fresher, and more like recent marine shells found on the beach, than even those of the *Suffolk Crag*, which has hitherto been considered the most recent deposit. Many of them were embedded in, and filled with marl, as if it had always been their natural bed.

Mr. Murchison having made York one of the points of a very extensive geological excursion, had just examined the north-western coast of Lancashire. His account of this interesting district was listened to with great interest. The inference he drew, was, that the beds, containing these *quasi* recent shells, do not belong to the class called by some geologists *diluvial*, although the deposits have an analogous appearance, but that they have been raised from the bottom of the sea, to their present elevation, almost within historical times; at any rate, subsequent to the appearance of the same marine mollusca, which now inhabit the Irish channel. This is a branch of geology in which Mr. Murchison is pre-eminently skilled, and his opinions on the subject are entitled to great consideration. These conclusions will probably be found applicable to other parts of the coast, and perhaps to many parts of Yorkshire. We are of opinion that Mr. Phillips, when he publishes another edition of his excellent work, will find it expedient to modify his *diluvial* opinions. Facts of a like nature have been observed in Sicily by Mr. Lyell, and recently by Dr. Turnbull Christie. This gentleman has observed upon the flanks of Mount Grifone,—an elevated mountain of dolomitic limestone,—the following subdivision of the deposit, which once would have been called *diluvial*. We use the descending order.

Blocks of limestone.
Bone breccia, with cave bones.
Pebbles and sands, with existing shells.
Upper sub-appenine, with many existing shells.

The inference set up is, that the bone breccia has been washed down anciently into the sea, and that all the beds have subsequently been raised. To these facts we would add, that in many parts of this country, the same circumstances, no doubt, occur along the Atlantic border. In Alabama, gravel beds of a similar character, are found near fort Clairborne, now about seventy miles from the sea, and elevated, we suppose, about sixty feet from its level. We shall hereafter return to this branch of American geology.

Dr. Daubeny next brought up the interesting subject of hot springs, their connexion with volcanic action, the occurrence of azote in them, and the method of detecting it. Some of Dr. Daubeny's opinions were controverted: it was urged, that however satisfactorily particular phenomena might seem to be constructed from one cause, yet that different causes produce in our laboratories the same phenomena, which might be the case in the great laboratory of nature. This subject engaged both geologists and chemists in an animated conversation.—The members of the association were entertained this day, by his Grace the Archbishop, in the most cordial and hospitable manner, at the ancient archiepiscopal palace of Bishopthorpe. In the evening, the party returned to the Institution, where Mr. Potter communicated an account of the analogy of electricity in the Torricellian vacuum, to the aurora borealis. Dr. Warwick exhibited the method of Professor Moll, for making a temporary magnet of soft iron, by magnetic action. Dr. Daubeny exhibited a sphere of wire gauze, which, when dipped in water, filled; and on being lifted out, retained the fluid. When shaken, the water flowed from the pores. The phenomenon was explained by the principle of capillary attraction.

On Saturday, a valuable memoir was read by Mr. Dalton, on "*The Specific gravity of the Human Body.*" This is to appear in the Manchester Transactions. Mr. Dalton supposes the pores of the body to be filled with air, which, together with the air in the lungs, sustains us against the pressure of the atmosphere, leaving the solid parts free to use their functions. Mr. Scoresby related some facts connected with oceanic pressure on wounded whales: they sometimes descend a mile, but return exhausted, and blowing out blood, the pressure forcing a portion of it out of the vessels into the lungs. Mr. Allan, of Edinburgh, described a large aquamarine, brought from Brazil by Don Pedro. Mr. Robison explained, aided by his drawings, a contrivance for expelling elastic fluids from his fine linseed oil barometer. Dr. Brewster exhibited alum and rock salt prisms, excelling the finest glass prisms. This adaptation of cheap substances to such a purpose, produced some explanation as to Dr. Brewster's views of the heating rays of Herschell, supposed to be most numerous in the dark part of the spectrum, where he found the temperature highest. Dr. Brewster is of opinion, that there are no rays of heat unaccompanied by light.—Colouring matters also were treated upon. It was argued, that where a mixture of bodies has changed the colour of both or either, it is not that the one has penetrated into the other, so as to impart its colour to it, but that the union of the two has taken place in such a manner, as to produce an arrangement of the particles, which causes the light to be reflected in a particular way.—Mr. Forbes then read an elaborate paper, on the horary oscillations of the barometer. The morning closed by a communication from Sir James South to Dr. Brewster; he had lately observed one of the satellites of Jupiter, which were generally supposed to disappear, when within the disc of the planet, to appear as a black spot on its surface. He was desirous of having this anomaly accounted for.

In the evening, Dr. Daubeny explained some experiments of the Rev. Mr. Taylor, of York, with a view to increase the intensity of gas light, without increasing the consumption of gas. The Rev. Mr. V. Harcourt also explained the principle of a new lamp, invented by him, for the purpose of economising light, by the use of cheaper oils. An able memoir by Brewster, was then read, "*On a New Analysis of Solar Light.*" The last paper read, was a translation of a memoir, by Professor Gazzeri, of Florence, "On a method of rendering visible the traces of erased writing." This consisted mainly in the application of heat. Dr. Brewster mentioned, that the legends of worn out coins and medals, when placed on hot iron, would evolve in like manner. He had been much surprised, at first reading on such a medal, in letters in flame, the legend, "*Benedictum sit nomen Dei.*"

Lord Morpeth now addressed the meeting, and moved thanks to Dr. Brewster; when the unbounded applause had subsided which his eloquent speech produced,

Mr. Murchison, on the part of Dr. Brewster and his other scientific friends, begged leave to return thanks for the high honour done to the contributors of scientific memoirs, and for the kind assistance and valuable aid which had been received from the residents of York and the neighbourhood, in the promotion of the objects of this meeting. He explained the motives which first induced the original promoters of the meeting to select the city of York for their first assembly. To this city, as the cradle of the association, they should ever look back with gratitude; and whether they met hereafter on the banks of the Isis, the Cam, or the Forth; to this spot, and to this beautiful building, they would still fondly revert, and hail with delight the period at which, in their gyration, they should return to this the point of their first attraction. Mr. Murchison concluded by warmly eulogizing the kind reception and hospitality which the strangers had experienced from the Archbishop, and from all classes of the inhabitants of the city and neighbourhood. He concluded, amidst loud applause, with a motion of thanks, as follows:—" That the cultivators of science here assembled, do return their most grateful thanks to His Grace the Archbishop of York, the Patron, and to the officers and members of the Yorkshire Philosophical Society, for the very liberal manner in which, by the use of their Halls and Museum, and by their obliging and unwearied efforts to provide every accommodation and comfort to the visitors, they have so essentially contributed to the success and prosperity of this association."

The motion was seconded by Dr. Brewster. Mr. Dalton also rose to express his entire concurrence in Mr. Murchison's observations.

The Rev. W. V. Harcourt said, it was quite unnecessary, from the feelings which he knew to pervade the breasts of all, both scientific strangers and residents, to put to the vote of the meeting either of the proposals so eloquently brought forward. In the long period of its existence, the ancient city of York had never greater reason to be proud than of the genius and talent it contained within its walls at this moment, and of the honour it had obtained of being the birth-place of an Association destined (he firmly believed) greatly to enlarge the boundaries of science. After speaking with much depth of feeling of the grateful recollections which this meeting would furnish, of the valued friendships which it had been the occasion of forming, and of the pleasing anticipation of future meetings, when the infant association should be more matured and adequate to its lofty aims, Mr. Harcourt concluded by declaring the meeting adjourned to Oxford.

Tea and coffee were then served to the visitors, and the company separated, highly delighted with the intellectual and social treat which they had enjoyed throughout the week.—*York Courant.*

The nature of this association will be more fully understood by reference to Dr. Brewster's Number for Jan. 1832, to which we refer our readers; we shall, however, publish the preface to the first report of the association, which has subsequently appeared. We take it from the Philosophical Magazine, for March, 1832, page 225.

In giving to the public a Report of the Proceedings of the British Association for the Advancement of Science, it has been considered an important object to add to the account of the past meeting a distinct view of what is to be expected from the next, and to announce the result of the applications which have been made to individuals, requesting them, in the name of the Association, to undertake the reports and researches recommended by its committees in different branches of science.

The success of these applications will appear from the following statement.

Reports.—1. The Rev. George Peacock has undertaken to present to the next meeting, a report on the recent progress of Mathematical Analysis, in reference particularly to the differential and integral calculus.

2. Professor Airy has undertaken a report on the state and progress of Astronomical Science, in reference particularly to Physical Astronomy.

3. J. W. Lubbock, Esq. has consented to furnish such information respecting the data and desiderata for calculating the time and height of high-water as he may be able to offer.

4. James D. Forbes, Esq. has undertaken to present a report on the present state of Meteorological Science.

5. Dr. Brewster has undertaken a report on the progress of Optical Science.

6. The Rev. Robert Willis has undertaken a report on the state of our knowledge concerning the Phenomena of Sound, in reference especially to the additions recently made to it.

7. The Rev. Professor Powell has undertaken a similar report respecting the Phenomena of Heat.

8. The Rev. Professor Cumming has undertaken a report on the recent progress of Chemical Science, especially in foreign countries.

10. The Rev. Professor Whewell has undertaken a report on the state and progress of Mineralogical Science.

11. Robert Stevenson, Esq. has undertaken the report recommended by the Geological and Geographical Committee, on the waste and extension of the land on the east coast of Britain, and on the question of the permanence of the relative level of the sea and land.

12. Professor Lindley has undertaken to give an account of the principal questions recently settled, or still agitated, in the Philosophy of Botany.

Researches.—There is reason to hope that the earnest wish expressed by the Mathematical and Physical Committee, that a register of the thermometer, during every hour of the day and night, should be kept at some station in the south of England, will be realized at Plymouth under the superintendence of Mr. Harvey, with the enlightened concurrence of those who have the power of enabling him to render this public service to science.

The law of the decrease of temperature with increasing elevations in the atmosphere, will be illustrated by a continuation of experiments with balloons by the Earl of Minto.

The secretaries of the Yorkshire Philosophical Society have commenced the observations recommended, on the comparative quantities of rain falling on the top of York Minster and near its base; and the society has formed a Meteorological Committee, by whose labours other researches, which have been recommended in that branch of science, may be expected to be advanced.

The observations on the intensity of Terrestrial Magnetism, proposed by the Mathematical and Physical committee, have been undertaken by Dr. Traill; and the Royal Society of Edinburgh have lent for his use their Standard Needle, constructed under the superintendence of Professor Hansteen.

A summary of the observations which Mr. Henwood is making on the electro-magnetic condition of metalliferous veins will be presented to the meeting; and it is probable that the suggestion of the committee may be followed, in regard to the extension of these experiments to veins which traverse horizontal and dissimilar strata.

There is reason to expect that the objects contemplated by the Chemical Committee, in recommending a revision of some of the primary data of chemistry, will derive light from the labours of Dr. Prout and Professor Turner, in addition to those of the eminent philosopher from whom the recommendations originated.

Professor Daubeny and Mr. Johnston have undertaken the analytical researches respectively entrusted to them; and specimens of iron in different stages of its manufacture have been transmitted to the latter gentleman from the principal iron works in Yorkshire.

In Geology, the inquiry respecting parallelism in the lines of disturbance of the British strata will receive, it is hoped, the joint consideration of the Rev. Wm. Conybeare and the Rev. Professor Sedgwick.

In Botany, the comprehensive inquiry proposed by the committee will be illustrated by contributions which Professor Henslow proposes to add to the Flora Cantabrigiensis, and by a systematic catalogue of the native plants of the county of York, which the sub-curator of the Yorkshire Philosophical Society is preparing for the press.

Lastly, in Zoological research, for which no provision was made at the late meeting, the officers of the Association have received from Dr. Knox the promise of a memoir on the natural history of the Salmon.

We cannot conclude this paper, without expressing our unqualified admiration, not only of the motives which have induced so many eminent men to establish this truly scientific association, but of the manner in which they have proceeded to execute their intentions. There was, at first, some jealousy and some opposition, but we hear little of either at present. As far as we are informed, nearly all the leading men of science, at the universities of Oxford and Cambridge, have enrolled their names in the list of members. We suppose that by this time, the most distinguished men in the metropolis, will have followed their example. We understand that several who did not assist at the York meeting, including that eminent chemist, Prout, have already sent in their adhesion. In June next, the association convenes at Oxford. There never was such an assemblage of men convened in so magnificent a city before. We shall endeavour to give our readers a faithful account of what it is our misfortune, not to be able to be a personal spectator of.

Thus will this great association be annually employed, visiting the principal cities of Great Britain, in, to use the eloquent language of Mr. Johnston,*

> Gathering into its stores the genius and information of every district, awakening men, wherever it bends its footsteps, to the dignity and importance of science, and scattering into every corner, as it passes through the land, some new seeds of valuable discovery, and which, duly fostered, may ripen into a harvest of resources hitherto not known, and therefore undeveloped,—an institution, which, limited to no science, can comprehend, within its ample bounds, the votaries of every branch of knowledge, ready each, and willing to eliminate, by the conjoint researches of all, those complicated mysteries of nature which the most ardent philosophers are ever meeting within their single and isolated investigations, and which even the united efforts of all the cultivators of any one department could never have revealed.

There has been a great deal said about the march of intellect, which has almost become a bye-word, because of the misdirection which some have sought to give to those powers of reasoning which all men, more or less, possess. This will always be the case, where the knowledge of words, rather than that of things, receives an intellectual consideration, due only to that kind of knowledge, which is inseparable from a sound judgment. Amidst all the extravagances of this *siecle de mouvement*—we use the term on account of the appropriateness of the language, and not from an inclination to write French for English readers—we see an ultimate regenerating principle for society, in the increasing inclination for the study of nature. All her phenomena are produced by invariable laws, and such are the plastic powers of the human mind, that the habit of considering the relations of physical things, is gradually adopted by us, for the consideration of moral things; and as we find out that we cannot imitate nature, but by the application of her unchanging ways, so neither can we follow up the moral laws of the Author of nature, but by the aid of his immutable principles of truth and justice. We think that the love and study of nature, will eventually subdue

* Brewster, Jan. 1832, p. 1.

the disposition among men, to be estranged from her. If men are ever intended to be just to each other, the consummation of that great purpose will be produced in this way. Our gratitude then, is pre-eminently due to men who devote their highest powers to this lofty end.

This sentiment appears to be growing up in Great Britain. The propriety of representing, in a reformed parliament, the *intelligence*, as well as the property and *ignorance* of the country, is a subject which has received some discussion there; and it is said that the ministers have even admitted the *necessity* of it. We do not see why the presidents of a few learned societies, might not, ex officio, have seats in parliament, with the privilege of speaking, if not of voting. We feel quite sure that the president of the Geological Society of London, would be more useful there, representing the saurians of the lias, than Mr. Hunt, representing the mammalia of Preston in Lancashire.

METEOROLOGICAL OBSERVATIONS.

Made at Wilmington, Delaware, by Henry Gibbons, M. D.

Summary for February, 1832.

	Therm.	*Barom.*		
			Proportion of clear weather,	*days* 9
Average at sun-rise,	30°.14	*in.* 29.90	Proportion of cloudy,	20
Average at mid-day,	38°.45	29.86	Whole days clear,	5
Average at 11 o'clock,			Days on which snow and hail fell,	5
P. M.	32°.93	29.86	Days on which rain fell,	8
Monthly average,	34°.295	29.885	Depth of snow,	*in.* 4
Maximum, 19th,	62°.	24th, 30.38	Depth of rain,	5.10
Mimimum, 24th,	12°.	20th, 29.45	Quantity of water,	5.60
Range,	50°.	.93	Northerly winds prevailed,	*days* 12
Warmest day, 19th,	55°.		Easterly,	8
Coldest day, 24th,	15°		Southerly, (S. to W.)	9

No Auroras.—Clouds electrified, once.—Rains, frequent, though light; and several small snows.—Winds moderate, and rather changeable.—Two easterly storms, both attended with hail, sleet, and rain; also a partial one, with some snow, the wind changing in a short time to south. The weather of this month was very disagreeable, being a succession of transitions from warm to cold, with frequent rain and snow. The temperature was at no time cold enough to impede the navigation by forming ice. On three days only was the mercury so low as 20°, viz. on the 21st, 22d, and 24th.

Fig. 2

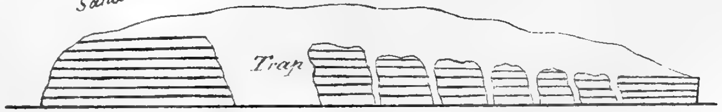


Fig. 3

Fig. 4

Fig. 5

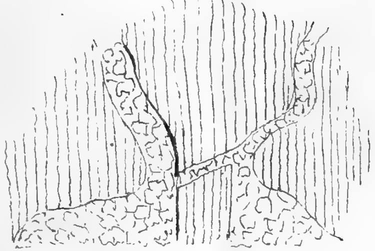


Fig. 6

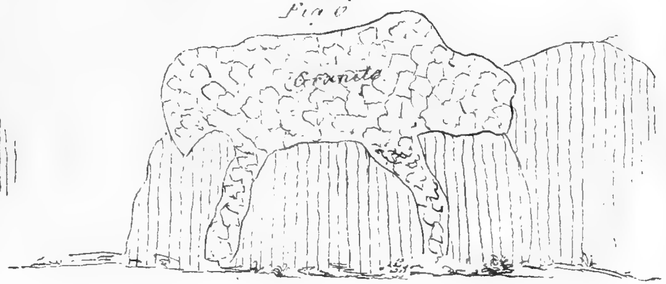


Fig. 7

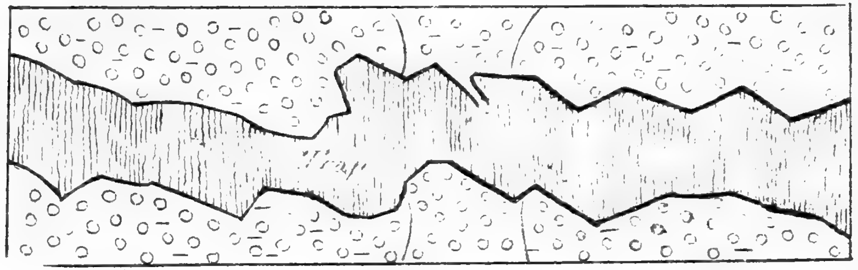


Fig. 8

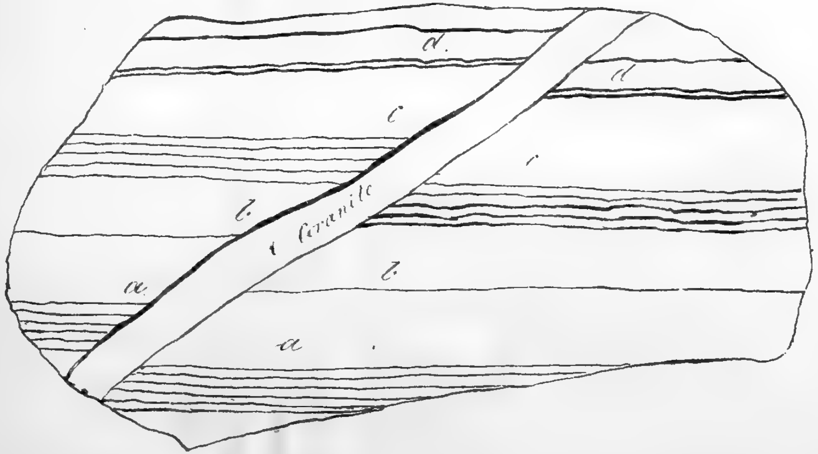


Fig. 9

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ON MINERAL AND METALLIC VEINS.

In fulfilment of the promise made in our March number, we proceed to the investigation of this very curious branch of geology. Our readers will soon perceive the importance of a knowledge of it, in a country possessing such vast metallic resources as North America, where indications of them are appearing in such various quarters, and at a period when the ideas entertained respecting their extent and origin are still undefined and obscure, except with those few persons who have made a particular study of the subject.

It is a very admirable proof of benevolent intentions on the part of the Creator, that iron, without the use of which man could scarcely have achieved his own civilization, is the most abundant of all the metals, and is found, more or less, in all the rocks. Copper and lead are sometimes abundantly found in the strata adjacent to the coal beds, [tabular view, page 388,] but the metals have their principal seat in the primary rocks. They are found disseminated either in extensive masses, or in veins which traverse mineral masses.

In our paper *on the Crust of the Earth*, page 289, we spoke of the expansive power by which it was continually agitated, the disturbed state of the lower stratified rocks, and the numerous displacements which constitute so many ancient geological periods. Such a power could not be in operation, without producing extensive fissures, of a character analogous to that we find presented by the numerous veins which traverse the lower parts of the crust of the earth. This has been the probable origin of all important veins, and it can lead to no injurious consequences, if, with the exception of a few cases of contraction and consequent separation of masses, we admit this origin. It would not be equally safe, if, considering veins to be ancient fissures, we were to come, with some geologists, to the conclusion, that all those containing metallic matter, have been filled by injection from below, when the fissures were produced. This would be to impede the progress of knowledge, since we can suppose other modes by which metallic substances can be produced in veins. If all veins had their origin from below, miners might form calculations upon penetrating to depths, the which, if they could be reached, would perhaps be delusive, whilst the effort would be ruinous. That many metallic deposits have come from below, is perhaps demonstrable; whilst it is equally demonstrable, that metals are formed by other processes, analogous to those upon which the formation of saline crystals depends. Mines which have been closed, on account of inundation, for two centuries, have, on re-opening, exhibited the curious spectacle of native silver coating the wooden supports which had been left there. If metals, then, grow, as it were, under our own eyes, we cannot limit the extent to which nature may be productive, when we reflect that the periods of time which preceded human knowledge are immeasurable, and during which, her processes were always in action. It is perhaps, then, more reasonable to suppose, that the mineral and metallic contents of veins and cavities have been brought into their places by the agency of more than one cause.

Veins may have either mineral or metallic matter, or both, in them. They are found vertical, inclined, horizontal; often running in parallel courses, as if they had a cotemporaneous origin, and intersecting each other in such various ways, as to leave no doubt, that many of the intersected ones have been formed prior to those by which they are intersected. It is upon this last fact an opinion has been founded, that metals are of different ages. The principal veins in the English mines run nearly east and west. This is especially the case with the tin veins, or lodes, in Cornwall, as well as the lodes containing copper. The veins which run nearly north and south, are not as metalliferous as the others, which are intersected by them. Many of these, called *flucan* in Cornwall, are filled with clay. Clay is sometimes found in the copper veins, and as other metallic veins which deviate from the E. and W. course, contain increasing quantities of clay, and the flucan veins which run N. and S. are filled with clay, an opinion has obtained with many, that tin and copper are older metals than the rest, and that tin, for these reasons, and on account of its being found in granite, is the oldest of all the metals. If this priority of age in metals were true, it would be a fair subject for adventure in countries where tin has not yet been found—and that is the case in the U. S.—to work through a bad copper mine in order to convert it into a good tin one. With our present information, we do not see any positive proofs of priority of age in metals, especially from their presence in particular formations. When a vein is continuous through primary and secondary rocks, it is evident that these last had been deposited before the vein had penetrated the first. It is true, tin has not been found in secondary rocks; it is found, however, in slate, and therefore the circumstance of its being found in granite is not to be adduced as a proof of its priority of age; for the cases of its limitation to the granite may be accounted for, by supposing that the power which produced the fissure, only operated upon the granite. If metallic veins, in their origin, are analogous to trap dykes, or veins, then we see no limitation to the extent of tin veins, but in the nature of the superincumbent power which produced them, and in the absence of secondary rocks, to be affected by it. In the case of the great Cleveland dyke, we find the trap penetrating even through the coal beds; but tin, we believe, has not yet been found in rocks actually subjacent to the secondary rocks. We think this a sufficient reason why tin is usually found limited to granite and slate.

Pleased as we always are at seeing a new direction given to inquiries of this nature, yet we have thought that superfluous pains have been taken by European writers, to turn opinions from the igneous origin of metallic veins. The ancient Wernerian notion, that minerals and metals settled into fissures, from aqueous solution, has no friends among enlightened geologists of the present day: how their contents got exclusively into fissures, at great distances from each other, having a very irregular inclination, sometimes extremely dilated, then contracted into a very small space, and afterwards dilated again, resembling a number of blown bladders, connected by a long wire; how they became alternately barren and productive, and why their contents are always found in these fissures, and never on the general surface, where, under such an origin we might have expected to find them, no man has yet ventured to say.

As to the theory of the igneous origin of the contents of many metallic veins, we see much to recommend in it, and we should have been surprised at the assertion of Mr. McCulloch, in his late work called a *System of Geology*,* that "the argument from the analogy of trap and granite veins is one of those superficial resemblances, consisting in words, rather than ideas, which it is painful to find in the writings of those who have been philosophers in other things," if we had not reason to suppose, from a rapid perusal we have now for the first time had an opportunity of giving that work, that the author was really and truly demented, *run a muck*, we may say, and at war with good sense, decency, and honesty, when he wrote it. We shall take an early opportunity of making good what we say.—That the contents of veins have been brought into their places by the agency of more than one cause, is very probable; but we know of no agency that recommends itself so plausibly as that of the igneous theory, for the origin of all compact metallic masses. We refer for striking instances of this, to the compact iron ore of Dannemora, in Sweden, which is one hundred and eighty feet thick, and to those extraordinary, and hitherto little known masses of crystalline iron, found in immense fissures, in the primary rocks of Franklin county, New York, and in some parts of New Jersey, all of which clearly indicate a subterranean and igneous origin. If masses of pure metallic iron can be thus produced from below, we know not why metals should not be brought, in like manner, into smaller fissures, or veins. Gold and silver are occasionally found in porphyry and sienite, which are volcanic rocks. Native copper is found in trap and porphyry. Lead and zinc have also been found in it. The elvan courses of Cornwall are porphyritic felspar, in which tin is diffused. It is true that earthy minerals are sometimes found associated with metallic masses having this origin; but infiltration takes place in all rocks, and especially in vesicular traps and amygdaloids. Those botroidal chalcedonies found in the copper lodes of Cornwall, are the produce of infiltration, from silicum in solution.

* Vol. I. p. 391.

Quartz also, in many instances; and we can witness the growth of calcareous spar as it gradually accretes from the roofs of calcareous caverns. We cannot imitate the forms, it is true, of many of the crystallized substances from mineral solutions; but it is because we are unable to conduct experiments which, perhaps, require thousands of ages of uninterrupted process.

It may be considered as giving weight to the igneous theory, that with few exceptions, the metals are found in the inferior rocks. In the immense deposits that lie above the coal beds we find, with the exception of ores of iron and a little copper slate, no segregation of metals into veins or masses resembling those in the inferior rocks. We find oxydes of iron in indurated masses, and in the state of bog ore, but these are clearly a rifaccimento from metals produced originally from the more ancient beds.

Perhaps, also, it is not true that all the metallic substances which have been brought into fissures from below, have arrived there in a molten state. Many of the substances found in them are capable of solution in hydrogen gas. Silver will deposit itself on substances suspended from the roofs of mines. Acicular crystals of lead are often found adhering to the walls of mines that have been closed a long time. The formation of saline matter on walls, and the spontaneous production of nitre on limestone, show that we are not yet acquainted with the principles upon which this branch of crystallization depends. We had occasion personally to observe, whilst on a visit to Mount St. Michael's in Cornwall, that on the sides of some masses of granite that had been separated from the rock for a great period of time, but which had evidently never been the wall of a fissure or vein, that amidst a profusion of small crystals of quartz, several hundreds of small white topazes were apparently forming. We were struck with the circumstance, and Sir John St. Aubyn kindly permitted us to bring some specimens away, together with any mineral substances we thought worthy our attention. The rocks there contain very curious minerals, but they are all contained, as the fine blue crystals of apatite are, in small veins. The topazes, on the contrary, were spread indiscriminately over the surface of immense fragments of granite, anciently separated from the mountain mass.

It would also appear as if some crystallized substances are the effect of a chemico-electric action between the wall, to which they are attached, and the atmosphere, which standing in the relation of galvanic plates, decompose and re-compound the gaseous bodies which surround them. When glass is interposed between the wall and the atmosphere, the production of salt soon ceases. We cannot say that salt is suspended in the atmosphere, for dry frosty weather is favourable to the quick production of nitre. When a wall is coated with paint, crystallization still forms upon the paint.

Amidst the curious phenomena which metalliferous and other veins present, is the fact that their contents are modified on entering a different rock. The walls of veins change also with the change of beds. At Welhope, the walls are sulphate of barytes in passing through the sandstone, but on entering the limestone, they change to carbonate of barytes in balls, with a radiated diverging structure. It has been observed also that when mineral beds of a different character are so shifted that their faces are opposed to each other, that part of the veins is impoverished. This could hardly be, under the Wernerian theory, and may be more plausibly attributed to electric action. Veins usually have a sheath or case diffeiing from the rocks they intersect. This mineral matter is sometimes mixed up with the metal contained in the vein; the sheath or case is called the walls of the vein, or gangue, or matrix. It is generally of a slaty structure, and in cases of igneous origin, may have been produced by cooling; the metal concentrating by affinity, and the slaty mineral remaining at the sides. At Castleton in Derbyshire, the vein of fluor spar, has a wall of cawk, or sulphate of barytes; the vein dilates into cavities, and again contracts into a small space, containing nothing but the cawk, which serves as a clue to the miner to conduct him to another repository of the fluor spar. Blende, a sulphuret of zinc, is occasionally abundant in Cornwall, in the upper part of veins that, lower down, become rich in copper. Tin also is found near the surface, with rich copper lying below. But in the mine of Cook's kitchen, after working first through tin, and then through copper to the depth of eleven hundred feet, tin is again found, and is still worked there to the depth of near thirteen hundred feet. The same vein at Dalcoath mine is sometimes contracted to six inches, and sometimes spread out to forty feet.

Trusting that we have said enough to draw the attention of our readers to this interesting branch of geology, we must refer them to scientific works for further details, having a great deal to suggest on the direction of veins, and their intersection and consequent shifting, as well as to illustrate them under these circumstances, as they present themselves to miners, by some figures.

As a system of veins maintaining a general parallelism, is often intersected by another set apparently belonging to another system, it is to be inferred that the veins thus intersected and divided, preceded those which intersect them, as to time. It is also to be observed, that mineral veins are all either vertical or highly inclined, and that their lowest portions are generally the thickest; it is true that some appear to be horizontal, a fact which appears opposed to the inference that their source is from below, and which has induced many, who perceived the impossibility of their being produced by aqueous deposits, to suppose that they were all the results of crystallization. Horizontal veins, however, have, in such numerous cases, been discovered to be mere ramifications of larger ones that are either vertical or highly inclined, that those whose horizontal direction cannot be traced to them, may nevertheless be referred for their origin to an inferior source; and there can be no reasonable doubt that it would be found to be so, if their roots could be laid bare, which in many cases can only be by deep excavations; and the deeper we go, the less we find of this horizontality.

We shall stop to illustrate this subject by referring our readers to fig. 1, of plate xiii. where there is a very instructive view of a system of trap veins intruding into sandstone, on the east coast of Trotternish in the Isle of Sky in Scotland. Trap, it is true, occurs in such vast masses, and forms occasionally rocky districts of such great extent, that it may be thought by some not to be a proper subject for the illustration of what are strictly mineral veins. The consideration of trap rocks, it is true, belongs to a different branch of the subject, but we consider that no truth is more universally acknowledged in geology, than that volcanic lavas, ancient traps, with other intrusive rocks, and many of the veins of which we are now treating, are all the result of the expansive power which is eternally striving in the central parts of the earth, and that the phenomena of mineral veins may be truly illustrated by trap veins.

In this interesting section of Trotternish, which is taken from

McCulloch's Western Islands, it will be observed, that the horizontal trap veins represent the handle and triple prongs of a fork; and that if all that part of the section to the left, from where the handle is joined to the prongs, had been disintegrated and worn away in the lapse of time, leaving the part to the right representing the prongs; or if the same part of the section had been so covered up with other mineral matter, as to defy examination, the part exposed would have constituted a very puzzling case of horizontal trap veins; but we can here trace the prongs to the handle, and the handle to a huge vertical dyke of trap that has its undoubted origin from below: there is also a smaller vertical shaft rising in the handle, and three ramifications which the handle appears to have given out.

Figure 2, plate xiii. is a section of Loch Eyshort, also in the Isle of Sky. Here the trap, for a great extent, like the palisadoes on the Hudson river, the rocks near New Haven, and those at the Passaic in New Jersey, spreads in extensive masses over the surface of the ground; and according to the old Wernerian opinions, was deposited from aqueous solutions. In this section, however, we have a satisfactory view of the origin of this trap, which every locality does not give; for we see the roots of the trap, and have no room left for doubt that its origin is from below. Fig. 3, plate xiii. is another instructive section, representing the intrusion of a vein. Here we perceive how the expansive force from below, has raised the strata on each side; and how the fissure or vein which divides the two masses, contains various fragments of them, embedded near its edges. These jets of trap which have been thrown up from below, have obtained the name of dykes in England, and are, in some instances, remarkable for their great extent, and for the number of beds which they intersect. The celebrated Cleveland Dyke, of which we have spoken at page 343, (see April No.) extends about a hundred miles in the northern counties of England. At Preston quarry on the Tees, it comes up through the new red sandstone; at a quarry at Langburgh it cuts through the Lias, and at Bolam quarry, it not only comes up through the coal measures, but overflows the surface, as is represented by fig. 4, plate xiii.

We have shown, at page 311, the perfect agreement between the mineral constituents of modern lava, trap, and greenstone, one of the primary rocks; with such a strong indication of their common origin, we need not be surprised at finding any of the primary rocks in the character of intrusive rocks, among those which lie above them in the geological series. Granite, frequently occurs intrusively. Masses of granite are often found intersected by veins of granite differing from them somewhat in their constituent parts. Gneiss and the slates lying above it are in like manner intersected by veins of granite. Figures 5 and 6, plate xiii. represent the granite traversing gneiss in the Vallée de Vallorsine in Switzerland. In various parts of the world streams of lava have been poured out from beneath the granite; the ancient volcanoes of Central France rest upon a granite plain sixteen hundred feet above the level of the river Allier, and their lavas, which have flowed since the valleys were formed into which they have run, pass into the state of compact basalt. Among other proofs of a common origin for all these intrusive rocks, whether lavas or traps, is that shown by Mr. McCulloch of a trap vein traversing granite, in the Isle of Arran, as described in fig. 7, plate xiii.

Where an evident displacement of rocks is observable, it generally occurs that some evidence of the cause is not very far off. In fig. 3, we see the strata displaced and raised, and infer that the displacement has been occasioned by an expansive subterranean force, of which the dividing trap vein is the evidence, the fissure in which it is contained being a sort of safety valve. At fig. 8, plate xiii. we have another instance of this subterranean force. The striped laminæ of the gneiss rock, and their continuation interrupted, that part lying to the left being raised above the part to the right. The fissure occasioned by this displacement, or shifting, is, in this instance, filled with a vein of granite. This occurs in Coll, one of the western islands. Fig 9, from Fudia, is still more instructive: the laminæ of the gneiss are here shifted as in fig. 8. A vein of granite which had intersected the gneiss, appears to have been in its turn shifted, by the subsequent intersection of a vein of quartz. On the other side of this mass of gneiss, another vein of granite intersects it, and is in its turn intersected by a vein of trap. From all these appearances, we may suppose that the veins of granite, and perhaps the trap vein, had penetrated the gneiss, perhaps before it had taken its indurated state, and that, at some epoch after every thing had become hard, the shifting took place, and the vein of quartz filled the fissure occasioned by it. It is by applying reasoning of this kind to veniferous rocks, that we come at length to apprehend clearly that there are many systems of veins, and that some are posterior to others.

This branch of geology may become of the greatest importance in mining operations, and practical miners have always, more or less, been guided by the indications belonging to it. All the valuable metals with which we are acquainted, are connected with rocks having veniferous systems: gold and silver may be said to be uniformly contained within veins, or enlarged masses which derive their origin from below. It will probably become the general opinion ere long, that metalliferous masses have the same origin; and although bog ore of iron, and many other deposits of iron ore, may be considered as oxides more or less indurated, and brought into their present places by aqueous deposit, yet they are oxides from masses which had a subterranean origin. There are many ancient ferruginous sand formations, which were once, no doubt, in the state of recent bog ore, just as many conglomerates were once in the state of gravel.

We intend to resume this subject when we give an account of the gold region in the southern states. The phenomena we have been treating of will be applicable to the appearances which miners there are now becoming familiar with.

ON THE MODUS OPERANDI OF PHOSPHORUS ON THE LIVING SYSTEM

By J. R. Coxe, M. D. Professor of Materia Medica and Pharmacy, in the University of Pennsylvania.

Dear Sir,—The perusal of an interesting paper in your Journal for March, by Dr. Harlan, of "Experiments with Phosphorus on a Cat," has induced me to offer you some observations respecting the modus operandi of phosphorus, on the living system; and which, should you deem them deserving of notice, are altogether at your disposal. They are, to a certain extent, the outlines of my lectures on this subject, which I have, for the last three or four years, delivered to my class. I think the total insufficiency of the explanations hitherto given of the action of this extraordinary substance, both as a remedial and as a noxious agent, has been a principal cause of its depreciation, by rendering practitioners fearful of its employment; when, if that action be fully comprehended, it will probably be found to be one of the most powerful and most prompt of all our stimulating remedies.

Without supposing the ideas I shall advance upon this subject are entirely correct, or even absolutely novel; I nevertheless consider them deserving of attention; since, if properly matured by the experience of others, they will unquestionably present to the hand of the physician, one of the most energetic remedies that has ever been employed.

I commence my remarks, by *denying in toto*, the poisonous properties that have been ascribed to phosphorus, by every writer on the subject, whether given on his own, or the authority of others. It is probably sufficiently known, that it has been chiefly administered as a powerful stimulant or tonic, by those physicians who have employed it, in certain chronic diseases; epilepsy, palsy, chorea, &c. and in various adynamic and ataxic fevers. The danger of its administration has been properly dwelt upon; and various supposed improved formulæ have been proposed, for its safer internal use; and yet, none of these circumstances appear to have led to a proper appreciation of its modus operandi, or of what is demanded, to render it safe and efficacious.

Not intending this as a medical communication, in its strict and proper acceptation, I shall say nothing of the diseases in which it has been recommended and employed: nor shall I meddle with its chemical history, further than is requisite to render intelligible and probable, that theory of its operation, which, to me, appears the only one capable of being sustained, both by argument and fact.

It is well known that phosphorus is considered as a simple body. To us, it is so, since it has never been decomposed. If this is so far correct, we have the analogy of almost every other so called simple body, of its being, like them, inactive and inoperative; until, by the chemical affinities existing between it and other agents, a change ensues in its character, which gives it a dangerous and destructive power, that it was not previously possessed of.

The co-operation of two other agents is essentially requisite to produce this change; neither, singly, is sufficient; nor even both united, unless favoured by existing circumstances. These agents are caloric and oxygen. Caloric alone, will fuse or melt the phosphorus, but effectuates no change of property: and oxygen, at a temperature less than 50°, scarcely evinces any disposition to combine with it. Thus, phosphorus may be melted *under water*, at about the 120th degree of Fahrenheit's thermometer, and in that state and situation may be safely handled, because the accession of oxygen is prevented; but should the hand that held it, be raised above the surface of the water, at that temperature, each one knows what would instantly ensue; a rapid and vivid combustion, together with the contemporaneous formation of phosphoric acid.

Here, then, we perceive the train of events that gives to phosphorus, both its remedial, and its noxious character. Chemical in its action altogether, it depends on the accession of combustion, to give it activity. This combustion is, however, of a twofold description; one slow and feeble, with but slight disengagement of caloric and light, and productive of phosph*orous* acid; the other is rapid, as above mentioned, and phosph*oric* acid is the result therefrom. In the former case, a lambent, phosphorescent flame, may be presumed to stimulate the living fibres, without destroying them. In the latter, whether on the surface of the body, or in the cavity of the stomach, a *burn* of no trifling character ensues; for it is augmented in its violence, by the affusion or infiltration of the acid formed. The extent of the lesion will depend, of course, on the amount of the respective agents in their combination; but it must, whether large or small, be greatly modified from its character of a common burn, by the presence of the powerful acid produced by the combustion; which cannot but give it a different character, from that produced by caloric alone. As the extent of injury will therefore depend greatly on the amount of phosphorus inflamed, and of acid produced thereby, so that amount must also depend on the temperature, and on the quantum of oxygen present. The animal temperature being that of 98°, may be presumed to be partially augmented, by the motion of the stomach; and if combustion once ensues, it must unavoidably continue until the oxygen is fully expended. But, however small the burn, can this exquisitely sensible organ be wounded in the slightest degree, without deeply feeling its influence, and extending that influence to every part, through the agency of its numerous nervous fibrillæ? And will not that be greatly augmented by the irritation of the acid formed? No poison, however, exists: every symptom, and the circumstances of the death ensuing, together with the *post mortem* appearances, all more obviously indicate the result of fire, than of any substance to which the appellation of poison can be strictly given.

If, then, when given as a medicine, how does it act? Unquestionably in a similar manner, although inferior in degree. The amount is small; the division of the phosphorus itself so minute, that it may, by its diffusion over the whole interior of the stomach, instead of being concentrated in one spot, be conceived of, as acting the part of a mild but extensive rubifacient, and thereby promoting that beneficial influence, that we might reasonably anticipate, from an appropriate and judicious administration. That it has occasionally proved fatal, even in small doses, cannot be denied: but without a full knowledge of existing circumstances, we must be unable to afford an explanation of the fact. If in a solid form, although small in amount, it might have ignited, and have produced all the effects resulting from a burn. Gastritis, and its results, increased by the acid formed, would probably be excited; whilst the more obvious effects of fire could only be appreciated, by a larger amount.

Let us advert now, to the case recorded by Dr. Harlan. Eleven grains were given to a cat at 10 A. M. of Tuesday, which seem to have caused but trifling uneasiness for several hours: nor did death ensue until Friday at one o'clock, or more than three days after its administration. The mucous coat of the stomach was generally inflamed, particularly about the great curvature, and pyloric portion, which displayed *numerous holes*, or abrasions, some of them much larger than the pieces of phosphorus swallowed. Two or three spots were sphacelated, the mucous coat near the pylorus softened in its structure, and this coat was also highly inflamed, and preternaturally softened throughout the duodenum; the same appearances extended the whole length of the intestinal canal. No remains of the phosphorus were found, the doctor supposing it to have been dissolved by the gastric juice; but which, I think, can scarcely have been the case, since Orfila found it to be insoluble in albumen, gelatine, milk, or bile, at the common ordinary temperature.

The above results, are the primary effects of the phosphorus on the stomach and intestines; the symptoms subsequently ensuing, were of a secondary character, arising out of the gastric and intestinal injury, and need not be pursued at present; since they are not to be anticipated from the prudent and judicious employment of the article, when administered as a remedy.

The experiments of Orfila, related in the first volume of his Toxicology, very nearly agree in their results, with those of the experiments described by Dr. Harlan. I shall notice but one or two of them, previously remarking, that Orfila appears to ascribe the injury of the stomach, rather to *the acid* formed, than to the preceding combustion: for he says, that "it gives rise to these symptoms, by combining with the oxygen of the air contained in the alimentary canal, and gives birth to phosphorous, and probably to phosphoric acid, *in such manner, that the corrosion depends upon the action of these acids;*" and that "whenever it is introduced in cylinders, phosphorous acid is constantly formed, *which corrodes the portions of the membranes with which it comes in contact;* and that hence, the inflammation ought to be greatest, where the greatest possible quantity of phosphorous acid is formed;" that is, in the stomach and superior intestines, where the greatest amount of oxygen exists.

That he should ascribe so much to the acid, surprises me; seeing, that when speaking of the action of phosphoric acid itself (p. 369) upon the animal economy, he tells us, that when a *few grains* of phosphoric acid, dissolved in a *very small quantity* of water, are injected into the veins, the blood becomes coagulated, and the animal dies in the course of one or two minutes; but that if the acid *be weakened,* it does not produce any inconvenience: and that introduced into the stomach, it destroys life at the end of a variable space of time, *according to its concentration and dose.* In the experiment connected with this, he accordingly gave to a small dog, *thirty grains* of phosphoric acid, in a drachm of water; which, after some considerable suffering, caused his death, but not until after twenty-three hours. On dissection, the mucous membrane of the stomach, and the interior of the duodenum, were found of *a deep red.* It does not, however, appear, that any evidence existed of *the destruction* of those coats, as he invariably found, on giving the phosphorus itself. Now, if thirty grains of acid produced results so slow, and comparatively trifling, it is unreasonable to suppose, that the amount of acid from one or two grains of phosphorus taken, could be productive of the fatal issue, sometimes following its administration.

In one of his experiments, he gave a small dog, one hundred and forty grains of phosphorus, divided into fourteen small cylinders; the animal having eaten nothing *for thirty hours.* He seems not to have suffered very greatly, and did not die until after twenty-one hours.

On dissection, the mucous membrane of the stomach was strongly inflamed, and covered with a stringy and flaky matter, easily detached. The muscular coat was of a bright red through a part of its extent. The mucous membrane of the duodenum, jejunum, and first half of the ileon, of a purple red colour, and covered by a thick fluid as black as ink. No phosphorus appeared in any of the parts above named; but the *lower half* of the ileon exhibited ten nodes at variable distances, containing ten cylinders of phosphorus of a reddish colour, and ninety-four grains in weight;—diffusing a tolerably copious smoke on opening the intestine: the mucous membrane corresponding to the places where they were found, *were much less red* than the parts already passed through. Three other nodes were found at the inferior portion of the colon, containing three small cylinders weighing twenty-six grains, and the muscular membrane here was still less red than of the ileon; the fourteenth cylinder was found in the rectum, weighing seven grains, and the internal coats were in a natural state. Thirteen grains then, of phosphorus, of one hundred and forty grains, had been removed, or disappeared, which is about the eleventh part; in which we find a curious coincidence with the experiment of Dr. Harlan. Of eleven grains, employed by him, the *whole* had disappeared, and inflammation extended even further than in the experiments of Orfila; we may reasonably suppose, therefore, that had more been given, at least two grains more might have disappeared; which being the amount that Orfila mentions as lost in his case, may possibly give us, pretty nearly, the quantum that, under common circumstances, might be converted into phosphorous, or phosphoric acid, by the oxygen it might meet with. Now, if this be the case, it would require but a little calculation to enable any one to *previously* decompose or drive out the atmospheric oxygen from the stomach and intestines; and then, thirteen or one hundred and thirty grains might be swallowed with impunity.

It is only the *first* step that is hazardous, *ce n'est que le premier pas qui coute.*

In another experiment of Orfila, he gave a middling sized dog one drachm of phosphorus, cut into eight pieces. He suffered but little, and did not die until the third day. He *had fed heartily two hours before* the phosphorus was administered. In this case, the mucous membrane of the stomach was of a *purple red* throughout; that of the duodenum and jejunum likewise *exceedingly red;* and but little alteration in the other intestines. The cylinders of phosphorus, reduced in bulk, were found in the colon and rectum. In this case we obviously perceive the influence of a full stomach in restraining the action of the phosphorus upon its coats, especially as administered in the massive state. This is confirmed by a subsequent observation of Orfila, who tells us, that frequently the phosphorus had not acted on the texture of the stomach *several hours* after its ingestion. I gave, says he, to an animal a *very great quantity* of food, and immediately after, two drachms of phosphorus, cut into twenty small cylinders. At the expiration of eight hours, he had suffered no inconvenience. I opened him, and found the phosphorus enveloped in the food, the texture of the stomach exhibiting *not the smallest trace* of injury.

Now, when much divided, it is more likely to come in contact with the stomach, and produce injury, if oxygen is present. Thus when he gave twenty-four grains dissolved (quere, if completely so) in three drachms of olive oil, to a small but strong dog, excessive suffering followed, even in one minute, and he died in horrible tortures in four hours and a half. The stomach was empty, *perforated with three holes* in its cardiac extremity. Two of them as broad as a shilling, the other ten lines in diameter: the mucous membrane that was not thus perforated, was reduced to a stringy pulp; and the muscular coat presented large ulcerations.

The tenor of all the observations, both of Dr. Harlan and of Orfila, is conclusive, I apprehend, in negativing the idea of phosphorus acting as a poison. And they equally prove its innoxious character, when oxygen is wanting to maintain its combustion, even at the temperature of nearly 100°. The safety of phosphoric acid is established (in proper amount) by the experiments of Orfila, as well as by its administration, *per se,* by many persons, remedially.—And hence, the disastrous, as well as beneficial influence of phosphorus, must, I imagine, be explained on principles very different from those that have been usually adopted.

Although Orfila has not remarked the influence of phosphorus on the urinary organs, yet it has been noticed by Dr. Harlan, and by other writers. It is probable, that as the kidneys are the common emunctory of saline matter from the system, that the phosphoric acid formed, is absorbed by the lacteals, and being conveyed into the blood, is immediately secreted and carried off with the urine, stimulating, by its presence, the kidneys to increased action, and thus giving rise to its greater discharge.

That Mr. Chaubert has any antidote to the *poisonous* influence of phosphorus, I cannot believe; because, I think I have sufficiently proved that it possesses no such character. If then, no mountebank slight of hand should actually deceive the senses, it would follow, that any measure adopted by him must be one that precludes the *co-existence* of those agencies in the stomach, to which I have adverted; and without which co-existence, phosphorus is altogether harmless. Let us then try to point out a few particulars, by which such co-operation may be prevented; perhaps others may suggest themselves to my readers.

1. By copiously filling the stomach with food, previously to swallowing the phosphorus, which is thereby enveloped; and, at the same time, but a very minute portion of any oxygen present can come in contact with it—the chances, therefore, of even the lowest degree of combustion taking place, are very trifling; the phosphorus passing on, and is discharged, without coming in contact with the parietes of the viscera.

2. By previously swallowing some *carbonat* of magnesia, or of potash, or soda; and *washing down* the phosphorus with *some weak acidulated* drink, as of sulphuric acid, or even acetic acid; which, coming in contact with the carbonat, produces an evolution of carbonic acid gas, in which phosphorus cannot burn. It may indeed happen, that in the slow or rapid combustion that might ensue, the evolution, or formation of the phosphorous, or phosphoric acid, would supply the place of the before-mentioned acids—and acting on the carbonat, equally evolve the carbonic acid gas, by which the combustion might be suspended, and further danger prevented:—the compound formed, subserving

the purpose of expediting the phosphorus and other contents through the alimentary canal.

3. Even largely filling the stomach with simple water must be adequate to prevent combustion; for any oxygen present would seek the higher part of the cavity of this viscus, whilst the phosphorus would as certainly fall to the lower part. By this simple measure alone, of largely drinking, Mr. Le Roy prevented the injury he would have otherwise probably received from three grains of phosphorus, which he took at once.

4. Phosphorus has the power of decomposing some metallic salts, as sulphat, or nitrat of copper, &c. and of causing a perfect precipitate of metallic copper to invest it, and hermetically seal it from the action of the air, if any should be present. If then, a weak solution of either of these salts, or perhaps of others, should be previously swallowed, and vomiting not produced thereby, the phosphorus would soon be invested with a sheathing of copper, altogether harmless to the stomach.

Now, whether any of these, or similar measures be adopted, they will all be found to act by simply restraining, or preventing the agencies of chemical affinity; but in no wise acting as antidotes, in the proper meaning of the word. It must be obvious to every one conversant with the laws of chemistry, that the danger of phosphorus on the animal economy, can alone be obviated by such measures as are capable of preventing those laws from taking place in the stomach.

The best mode of administering phosphorus, as a remedial agent, must then, apparently, be that in which all hazard of a vivid combustion might be prevented, and yet the stimulating agency of caloric be extensively diffused in a small compass. This seems best accomplished by the ethereal solution of phosphorus, of eight grains to the ounce, or one grain to the drachm. The dose of six to ten drops of this solution will thus convey into the stomach from the tenth to the sixth part of a grain of phosphorus; to every part of which the ether evaporating, conveys an infinitely small proportion of this active substance, which, like a diffusible stimulant, or *rubefacient*, is prompt in its effect, whilst it is free from danger. No actual combustion ensues; it rather resembles the genial warmth of a gentle flame; whilst the injurious effects of an absolute burn, accompanied necessarily with local destruction, is prevented; and the acid produced, whether phosphorous or phosphoric, is probably, under such circumstances, itself a beneficial tonic to the system in all such cases as it may be judged proper to employ it.

These views, if correct, may probably lead to the renewed employment of a remedy, which was at one time enthusiastically extolled, but soon fell into discredit. Its danger, under correct views of its action, can scarcely be dreaded; and, at all events, it seems proper to establish the real character it ought to maintain, which can only be effected by accurate and adequate experience. And should these views even be found erroneous, they may possibly lead to others more correct, and which must necessarily subserve the interests of science and of humanity.—I am, very respectfully, your obedient servant

John Redman Coxe.

OBSERVATIONS ON THE ANATOMY OF THE SLOTH;

(Bradypus *tridactylus,* Linn.) by R. Harlan, M. D.

I have been indebted to the Academy of Natural Sciences of Philadelphia, for the long desired opportunity of making a dissection of this most curious animal. The specimen was preserved in spirits, and was sent along with many other interesting quadrupeds, by Dr. Hering, from South America. The specimen is one of the common variety of the Bradypus tridactylus of Linneus, and proved to be pregnant with a fœtus, nearly matured. For the knowledge which we already possess of the anatomy of this animal, we are principally indebted to the observations of Daubenton and Cuvier;—my own dissection has resulted in the discovery of several additional facts, as well as the detection of some errors.

As regards the habits of this animal, in a state of nature, the accounts of travellers are at variance with each other, and the subject still remains obscured in fable. The Sloth has generally been described as one of the most miserable, helpless, and dejected of beings, the effect of a physical organization altogether extraordinary and imperfect. A recent English traveller, however, Mr. Waterton, who has observed these animals in a state of nature, represents them as sufficiently active in their proper element, *on trees*, and asserts that they pass from bough to bough, and from tree to tree, with a rapidity which soon enables them to lose themselves in the depths of the forests. However this may be, there can exist little doubt but that most of the errors in the description of their habits, and the false inferences drawn from what appears at first view a vicious organization, are to be attributed to the erroneous notions which prevail, relative to the true position of this animal in the scheme of nature, and the part which it was intended to perform.

Considered as a creature destined to pass nine tenths of its existence on the trees of the deep-foliaged and endless forests of the tropical climates, where it lives, breeds, moves, and has its being; we venture to assert, that no other animal is so perfectly adapted, by its peculiar organization, to such a mode of life. But, on the other hand, viewed as a quadruped, formed for progression on the ground, or on a flat surface, it must be confessed, that the construction of its osseous frame, presents us with an anomaly in nature unequalled; an enigma insusceptible of solution; a machine, monstrous in all its proportions, without apparent form, utility or intention. But of such an anomaly, the whole creation does not furnish us with a single example to interrupt that series of animated beings, where so much beauty and order of arrangement are displayed, from the " worm that revels in the dead man's socket," to the " lord of the lion heart and eagle eye." All are equally perfected, and wonderfully adapted to fulfil the purposes of their existence.

To commence with the skeleton of the individual before us, it is necessary to premise, that though it was nearly full grown, all the parts are not completely ossified; hence it may be inferred, that such portions as are completely solid in this subject, will always be found so in all adult individuals, and some other portions that are here cartilaginous, would have become ossified by age. Referring to Baron Cuvier's description of the several skeletons of the Sloth which he has examined, it will be perceived that the same species differed among themselves in several important particulars. One of his specimens possessed 16 ribs, of which 7 are false. Another, a younger subject, possessed 14 ribs, of which 5 are false: (vid. Ossem. Foss. vol. v. pt. I. p. 81.) Our specimen possesses 15 ribs, 6 of which are false. The Baron represents the *Ai* with 3 lumbar vertebra: ours possesses 4: the former has 11 caudal vertebra: the latter 10: the former 6 false vertebra of the sacrum: the latter 5.

These discrepancies will appear more evident, being placed in a tabular form. In the first column we have arranged Cuvier's adult specimen, in the second our own.

	Cuvier.	
Cervical vertebra	9	9
Dorsal	15	16
Lumbar	3	4
Sacral	6	5
Caudal	11	10
	45	43

The transverse processes of the first caudal vertebra, are elongated, and flattened or depressed, and are united to the os ischium by cartilaginous suture, which tends very much to enlarge the capacity of the pelvis, the outlet of which is disproportionably large: the posterior, or sacral region, presents a very broad, nearly flat, and solid surface, for the pregnant uterus to rest upon, as well as to accommodate the enormous rectum, in the usual position of the animal; that is, suspended from the lower surface of the limbs of trees, the back towards the earth: by this form of the pelvis, the cotyloid cavities, and consequently the thigh bones are widely separated, rendering an approximation of the knees difficult; an arrangement, which though exceedingly inconvenient to a quadruped walking on the ground, is, at the same time, an admirable structure for an animal always embracing a trunk, limb, or some foreign body, between his thighs. The ossa pubis are separated more than an inch, by an intervening cartilage in the present instance, which was ossified in Cuvier's specimen; whilst the sacro-ischiatic ligaments, uniting the sacrum to the ischium at the suture between the tuber ischii and transverse processes of the first caudal vertebra, are already ossified. The sternum is composed of nine distinct pieces; its nine cartilages are all ossified, and united to the true ribs and sternum by cartilaginous suture: the ninth cervical vertebra supported at the extremity of the transverse process, an osseous rudiment of a rib, to which it is joined by cartilage: the unusually long neck of this animal, was exceedingly flexible, particularly so in the anterior direction, forming very readily a complete circle, with the snout resting on the ninth vertebra. This long and flexible neck, bending in every direction, must offer considerable conveniences to an animal which feeds on the leaves of trees in its immediate vicinity, and would also enable the animal to direct his visual organs to any position, without changing that of its body.

But the most remarkable peculiarity in the skeleton of this species, and which alone distinguishes it from that of all others, and admirably adapts it for its characteristic mode of locomotion, is to be observed in the form, structure, and articulation of its posterior extremities. We have already alluded to the widely separated state of the thighs at the acetabulum, which enables it the more readily to embrace any foreign object; the knee-joint is large, strong, and flexible; the femur is long, stout, and depressed, with a considerable concavity on its inner edge; the bones of the legs are both convex externally, all admitting of the attachment of powerful muscles, and the joints, though supplied with firm ligaments, are unusually flexible. Baron Cuvier has already dwelt with great interest, on the very extraordinary and unique manner in which the foot is articulated with the tibia and fibula; the astragalus, in addition to the pulley-like surface, by which it moves on the end of the tibia, presents, on its exterior and upper surface, a deep conical pit, which receives a corresponding projecting bone of the inferior head of the fibula, admitting the greatest latitude of rotatory motion, together with the usual ginglymus motion of the ankle, at the same time rendering dislocation impossible; but the powerful lateral ligaments prevent lateral motion at this joint; this, however, is more than compensated, by the unusual degree of motion existing between the calcis and astragalus, or rather of the latter *on* the former bone; producing a rocking motion from side to side, two distinct transverse pulley-like surfaces on the inferior aspect of the astragalus, being received into two corresponding cavities in the upper surface of the calcis, and to render the joint more secure, the anterior articulating surface of the astragalus, presents a deep conical pit which receives a pyramidal process, projecting from the usual articulating surface of the cuboid bone: a complication of structure, attended with equally complicated motions, witnessed in no other quadruped, and utterly useless and inconvenient to an animal moving on a plane surface; yet admirably adapted to the habits of the Sloth, as it enables the animal, in any position of the body, to apply the soles of its feet to the sides, or even opposite surface of the limb or trunk of the tree, on which it is climbing; its long claws and powerful muscles harmonizing with this arrangement, enable this animal to remain thus suspended, for hours and days without fatigue, and even to sleep, in a position so awkward and painful to other animals.

The organs of mastication, the peculiar construction of the shoulder, with many other interesting details, have been already fully commented upon by Cuvier, in his "*Ossemens fossiles:*" in the present instance, the rudimentary clavicles and coraco-acromion pieces were cartilaginous. We have only further to remark, as entering into the composition of the knee joint, the existence of a large sesamoid bone at the exterior portion of the head of the fibula; and that, in two crania which we possess of this animal, all the canine teeth are worn on their *posterior* surfaces.

The size of this species has been variously estimated, at from 14 to 28 inches in length; the skeleton of our specimen is 22 inches in a straight line from the tip of the snout to the extremity of the tail.

The following represent the measurements in detail:—

	Inches.	*Tenths.*
Length of the Head,	2	6
Neck,	4	6
Body,	9	0
Sacrum,	2	4
Tail,	3	4
	22	00

Length of the arm 7 inches 2 tenths: length of the fore arm 6 inches: length of the hand, including the wrist, 5 inches: greatest circumference of the body 13 inches.

The crowns of the molars appear peculiarly adapted to the mastication of leaves. The *fœtus in utero* possessed the same number of teeth, similarly arranged, and with the exception of being more conical towards the crown, presented perfect miniatures of those of the adult animal; and from the state of their developement, no doubt can exist of the capacity of these animals to masticate from the period of their birth. The fœtus was clothed with a profusion of hair, marked in every respect like that of the adult; the eyes appeared to be perfectly developed: compared with other animals, the fœtus was unusually large; yet its protrusion is easily effected by means of the extremely large outlet of the pelvis, and the peculiar structure of the generative organs. The uterus is musculo-membranous, and contains two distinct lobulated placenta, one on either side of the fundus, receiving an equal number of branches from the umbilical vessels.

The reproductive organs of this animal are singularly anomalous. Vagina ab recto sejuncta est, ambo tamen uno ore aperiad untur, sphinctere communi circumdato; in ipso cujus introitu, inferiorem spiraculi partem apparent nymphæ bene patefactæ, et clitoris triangularis foliaceaque. Circiter mensuram unciæ intra vaginam, meatus urinarius se aperit. Inter vaginam et os sacrum latum, rectum ingens positum est, impletum induratis fæcibus, similibus excrementis ovis.

The Sloths, then, have been erroneously represented as possessing a cloaca like that of birds, inasmuch as there does not occur any mixture of the contents of the bladder and rectum, as is the case in true cloacæ. The vagina and rectum, or cloaca, are distinct from each other; there being no large intestines, properly so called, the rectum performs the functions of the coecum. Although the animal is strictly phytivorous, the bowels resemble those of the carnivora, being small and short; the inferior portions are somewhat succulated, like the colon; but the fæces do not assume their characteristic form, until they have reached the rectum. The stomach consists of a large paunch, in no way furnished with compartments like that of the ruminantia, as is asserted by Buffon, who also errs in attributing ruminating faculties to these animals; but this organ presents a structure differing from that of any other animal with which we are familiar, being furnished with numerous long, conical cul-de-sacs, some of which are divided longitudinally into two compartments; these, in the present instance, were filled with masticated leaves, of a pulpy consistence. The liver is small, without a gall bladder, or any unusual enlargements of the ductus communis. The kidneys are rather small and conglobate: the urinary bladder is very large. The heart was very small, and contracted by the spirits, as were all the blood vessels. The account given by Mr. Carlisle, of the peculiar distribution of the humeral and femoral arteries in these animals, (vid. Philos. Trans. Lond. 1800,) had excited our curiosity, and prepared us for disappointment; for after the most careful examination of the arteries, we were unable to detect any resemblance to this *rete mirabile* structure, which was thought to explain the cause of the tardigrade movements of the Sloths; after considerable difficulty in distinguishing the nerves from the arteries, (the action of the spirits had rendered them similar in appearance,) we only succeeded in detecting and passing probes into the cavities of the humeral profundal, and the radial, ulnar, and interosseal branches at the elbow; but as the present specimen had been preserved in spirits, and Mr. Carlisle injected the arteries of his specimen, we are not authorized to question the observations of so accurate an observer, from the results of a single dissection. We wish, however, to direct the attention of comparative anatomists who may possess an opportunity, to a re-examination of this arterial arrangement.

It will be apparent, from what we have said, that the term Tardigrade, derived from the extreme slowness of this animal, does not express its principal character; that the peculiar organization of the Bradypus, and its prodigiously compressed and crooked nails, cause its locomotion upon the surface of the ground, to be very slow, is true; but if one animal existing under this negative condition, is to be called Tardigrade, we conceive that all animals under like restraint, and not belonging to the Edentata, may, with equal propriety, be put among the Tardigrades.

The mud-fish of the genus Hydrargira of Lacepede, are often, by the retreat of the tide, left on the shore. These animals have the faculty of springing up and changing their place; they will thus advance over a considerable space, until they gain the water, which is their proper element. In like manner, the Bradypus, by an imperfect motion when on the surface, gains the trees where it lives, feeds, and sleeps. It rarely leaves the tree it is on until it has stripped it of every leaf, so painful is the effort to change its situation, by dragging itself on its elbows from one tree to another when they stand far apart. The nails of this animal, when at rest, are always bent towards the palm of the hand; and it is thus it sleeps, grasping the branches, and suspended with its back towards the ground. We think the term Pendentia would be even more appropriate than Tardigrade, for these mammalia.

ANCIENT VITRIFIED BEACON STATIONS.

To the Editor of the Monthly American Journal of Geology.

Sir,—Your readers, perhaps, are aware that there are in Scotland certain stations of an irregularly round or elliptical form, in somewhat elevated situations, surrounded by one or more stone walls, or ramparts, rudely put together, and without any regular masonry. These walls are constructed of fragments of primary rocks, granite, gneiss, mica-slate, and other feltspathic rocks. About half a century ago, these stations attracted a great deal of attention, from its being observed that the greater number of them had these walls partially, or altogether vitrified, or slagged together into a coherent mass, evidently by the action of fire. Many theories were brought forward to account for this unusual appearance. By some, the vitrification of these walls was attributed to volcanic agency, and the area which they surrounded was considered as a crater. Mr. Pennant, the naturalist, and other eminent persons, maintained this opinion. This, however, gave way to another, brought forward by Mr. Williams, a mineral surveyor, in 1777, who supposed them to have been ancient forts, or defences, and that the vitrification of the walls had been artificially produced, by laying the mineral materials upon beds of fuel, and firing it. Dr. Maculloch defended this theory in the Transactions of the Geological Society of London. In 1787, lord Woodhouselee proposed a new theory, in the Transactions of the Royal Soiciety of Edinburgh. He supposed these stations to have had a superstructure of wood built upon these walls, and that the vitrification was produced by the destruction of the timber by fire.

A more reasonable supposition than any of these was subsequently brought forward in that valuable work, the Statistical account of Scotland, a work of which too much cannot be said in praise, or of its public spirited and venerable projector, Sir John Sinclair, Bart. This was the opinion, that the vitrification of these walls was owing to the action of beacon fires, and that these stations were not ancient forts, but beacon sites, "generally situated on lofty insulated hills, in such a chain of mutual connection as to allow telegraphic communications to be conveyed from one station to another, at a considerable distance." The fused state of some of these walls had brought them within the province of geology at one time; but it is now perfectly clear that the consideration of these stations belongs purely to archæology, and any person who still entertains doubts on that subject, has only to read Dr. Hibbert's papers, contained in the October number for 1831, of Dr. Brewster's Journal; especially the letter to Dr. Brewster, entitled, "Notice of the discovery of very extensive vitrified remains at Elsness, in the Island of Sanday, Orkney," to be entirely convinced of this fact. This notice of a very interesting subject will be concluded by citing the following passages from the letter alluded to.

"Such is the general history of the vitrified cairns of Orkney, which may serve to set at rest, I trust for ever, two questions which have been agitated for more than half a century. The first is,—To what uses or observances is the effect of vitrification attributable? While the second is,—To what people is the effect attributable? In a tone of confidence, therefore, we are now entitled to reply,—That vitrification was merely incidental to the fires which were kindled upon beacon stations; and that the people who, in every country which they occupied or colonized, organized systems of beacon stations, were of Scandinavian origin."

The letter concludes with the following summary.

"*First:* That the vitrified sites of Orkney not being characterized, as in Scotland, by the presence of stone ramparts, but simply by small cairns, upon which the fuel for beacon fires had been placed, incontestibly show, that a beacon station was not of necessity a place of strength or defence.

"*Secondly:* That such of the ancient *Duns,* or strengths of Scotland proper, in which vitrification is found to be an occasional occurrence, belong to the oldest fortified sites in the country, and are referable to some of its oldest inhabitants, probably to the Picts, who are supposed to be of German origin.

"*Thirdly:* That these ancient Duns, not originally vitrified, indicate, by their construction and extent, that they were used by a people who had already passed from the hunting to the pastoral state; as they evidently comprehend in their design, the protection of cattle, with that of human defence.

"*Fourthly:* That from the tenth to the fourteenth century, a considerable part of Scotland was overrun by the Scandinavians, under the various names of Northmen and Danes, who reciprocally became themselves liable to invasions from other piratical tribes of the same northern origin as themselves, and were therefore induced to institute systems of beacon fires, in imitation of those with which they had been familiar in Norway.

"*Fifthly:* That as in most instances the ancient fortresses or duns of the oldest historical period of Scotland, were continued to be used as the gathering places of clans or tribes, the same were most conveniently selected as the sites of beacon fires; the ramparts of loose stones, which characterize such fortified sites, serving the additional purpose of cairns on which such fuel was placed.

"And *sixthly:* That the intensity of fusion exhibited on the vitrified sites, is no less referable to the forest trees which, on such occurrences, extravagantly blazed, than to the incessant hostile invasions which caused beacon fires to be lighted. But while I state these, my *present* conclusions, (for it is possible I may yet make some little modification in them,) I would not renounce the idea, that other public occasions, as, for instance, the annual lighting up of the fire of the belting, might have assisted, though in a subordinate degree, towards producing the vitrified effects, which continue to be the astonishment of all who are conversant with their extent.

"But I must now conclude, as I have already exceeded the limits which I had at first assigned to it. The interest which continental geologists have begun to take in the varied effects of ignition which these vitrified sites display, has naturally made them curious regarding their mysterious history; which circumstance is the only apology I can offer for making your Journal, on this occasion, a medium of pure antiquarian inquiry. In some future number, I hope to render you acquainted with the mineralogical observations of M. Von Leonhard, on the specimens examined by him from the vitrified sites of Scotland." F.

RAFINESQUE'S ATLANTIC JOURNAL.

Enumeration and Account of some remarkable natural objects of the Cabinet of Professor Rafinesque, in Philadelphia; being Animals, Shells, Plants, and Fossils, collected by him in North America, between 1816 *and* 1831. *Philadelphia, November,* 1831.

Atlantic Journal, or Friend of Knowledge; a Cyclopedic Journal and Review of Universal Science and Knowledge; Historical, Natural, and Medical Arts and Sciences: Industry, Agriculture, Education, and every kind of useful Knowledge. With numerous figures. Editor, C. S. Rafinesque.

We had occasion, in our February number, to animadvert upon the injustice Professor Rafinesque had received, in relation to the bivalve shells of the river Ohio: we were led to this purely from a desire to strengthen the interests of natural science, by vindicating the claims of its votaries to fair dealing, and without any reference whatever to personal sympathies and antipathies. We again take up the pen in behalf of the interests of natural science, though we do not believe that upon the present occasion our remarks will divert Mr. Rafinesque as much as they will our general readers. In some branches of natural history, the active labours of this natural, historical, medical, and universal person, have been usefully applied, and have been praised; and if he had not been so paradoxical, and so off from the perpendicular in his writings, his authority, in matters of natural history, would have had some weight. We have observed with regret, for a long time past, that the European naturalists have not given that credit to the professor, which, from the necessity of the case, and from courtesy, they always extend to those of their brethren whose respectability and veracity is undoubted. We have observed that *nobis* out of the professor's mint was not current; but we never thought the magical letters *Raf.* would find their par value so soon.

The two productions, whose titles we have placed at the head of our remarks, satisfactorily explain why this is so. The most malignant enemy could not have injured the professor as much as they inevitably must do; nothing but a rash presumption of a general ignorance, that would dishonour us all, and of the public inability to discover the worthlessness of such a farrago as he has now let loose upon us, could have encouraged him to produce, what is entirely beneath the dignity of criticism. Nevertheless, the reputation of the country abroad, and the satisfaction of the lovers of sound learning at home, require our interference, and we think this a fit occasion to enter upon that part of the duties alluded to in our prospectus, "to put down impostures and puerilities as they arise."

Let us first examine the "Enumeration," &c. where, in his "Article 1, Fossil Remains of Quadrupeds," he has brought such strange names, strange things, and strange language together, that we are quite sure he has every thing to learn concerning geology and fossil remains.

And first, we have No. 1, *Mazama Salinaria*, of Rafinesque. A new genus, upon the authority of nothing but a piece of horn, five inches long, found in an old saline of the Indians, in Kentucky. The description concludes, "*it belongs to the latest geological age of fossil animals.*" The professor says it approximates to his genus Mazama, which yet exists in South America. What he means by the "latest geological age of fossil animals," we are utterly at a loss to comprehend under all these circumstances.

Next comes *Panallodon Tumularium* of Raf. which owes its existence to a jaw bone, six inches long, found in a *Solar tem-*

ple [*! ! !*] in Kentucky. He thinks this akin to mazama, which was somewhat similar to the antelopes, but having teeth, " more like some carnivorous animals, but no canine tooth," " *latest geological age, later than No.* 1, *period of the Mastodons.*" We were just told that *Mazama Salinaria* belonged to the " latest geological age," but panallodon it seems belongs to an age *later than the latest.* Whether the words " period of the mastodons" refer to the mazamaic or panallodontic period, we are left to guess. Hitherto we have been exceedingly puzzled to assign a geological period for the existence of the mastodon ; but it is now settled, that *the mastodontic period was contemporaneous with that of a bit of horn five inches long, or with carnivorous antelopes.* Here is a stride in the history of extinct fossil animals !

After this we have No. 3, *Taurus gigas*, of Rafinesque, a " beautiful and perfect tooth of a bull," which, a few lines afterwards, is stated, " must have belonged to a very large ox." This animal, we are told, was of the " age of the mastodons." Here is a bull genus, established upon the strength of what no doubt is a recent buffalo's tooth, with which the western country abounds. There is something worse than puerility in this. Rafinesque knew that the genus bos was established for the receipt of all kinds of bovine remains, and that Dr. Harlan's species of bos latifrons was universally received, and to which his bovine tooth, if properly fossil, should have been referred. Rafinesque, who has bitterly complained of others for trespassing upon his grounds, shows here the budding forth of the same talent in himself, to more exquisite proofs of which we shall by and by come.

Among the fishes we have No. 6, *Nephrosteon;* but we shall cite the description, as a specimen of the Professor's style.

" No. 6, Nephrosteon, Raf. Very singular fossil bone of a fish from the *diluvial* regions of Louisiana. *It must have been the head-plate of a huge fish twenty feet long or more*, but I know of none with similar shields. It is a fine perfect flat bone, yellowish white, solid, hard and heavy, rounded, with a reniform base, eight inches broad and six and a half long ; half an inch thick ; edge entire, thick ; surface above nearly smooth, with an areolar depression round the centre, which has several unequal chinks. Lower surface entirely covered with vermicular anastomosed elevations, forming irregular pits and prominences. *Is it the bony shield of the head of megasaurus ? or some other fossil reptile ?*"

Before we give Mr. Rafinesque an answer to his question, we must tell him that it is inexcusable in one, who pretends to write on geological matters, to commit so great a blunder as to call the alluvial soil of Louisiana "diluvial;" and that he has been unlucky in not sticking to his first guess, that the bone belonged to a huge fish; if he had had the slightest knowledge of comparative anatomy, he would have seen, at first inspection, that this bone formed no part of the head of any animal, but was simply, what we venture to assure him it is, the Ephyphysis of the vertebra of the existing spermaceti whale, and which is of very common occurrence in the *great whales' burying ground*, of Louisiana.

This nephrosteontic affair is a pretty good specimen of what the Professor can do in the way of geology and comparative anatomy. One of the most insignificant osseous parts of a whale, and which only belongs to it whilst very young, is hocussed into the representative of a new genus of extinct animals, which, in one line, "must have been the head plate of a huge fish," and in the next produces the interrogation, "is it the bony shield of the head of megasaurus, or some other huge fossil reptile?" A buffaloe's tooth sits in his scientific parliament for *Taurus gigas;* and as to Mazama Salinaria, and Panallodon Tumularium, their most conspicuous character is, that one of them belongs to a geological period "later than the latest," though by the context it is impossible to find out which of the two enjoys that inestimable advantage.

As to the *Atlantic Journal*, we despair of doing justice to its various merits; it is a perfect museum of curiosities, and those who desire cheap amusement—for it only costs twenty-five cents—cannot do better than purchase it. Lest, however, it should prove too great a mystification to those who may feel disposed to purchase it upon our recommendation, we must tell the truth—for we have read it—and fairly state, that it belongs to the days of Dr. Katterfelto of famous memory, rather than to the present times, as a few extracts we are about to give will show. These we take from the cover of the book, where there are no fewer than twenty advertisements. Having never heard of this Atlantic Journal, we were not a little surprised to see, that the first number had already acquired so valuable an advertising custom. Upon examining them, we found them all, without a single exception, drawn up by the Professor himself, and trumpeting forth his own praises and opinions, with as experienced and firm a blast as ever was in the service of the best patent blacking. Of this work the professor says in his introduction, "It will be of a strikingly novel character, and must be left to speak for itself; to deserve, by its own intrinsic value and merit, the patronage which it claims from all the friends of knowledge, education, and learning." We shall now treat the friends of knowledge, education, and learning, with the promised extracts.

"This Journal will be sent to several distinguished individuals."—"All those who shall keep it, will be put on the subscription list, and they are requested to pay the account to our agents, of which a list shall be given in our second number: unless they subscribe for the whole first volume, and remit us direct two dollars."

Hence we infer that the "distinguished individuals" who have been thus favoured, will be made to pay *one* dollar, unless they prefer the accommodating alternative of paying *two*.

One of his advertisements on the cover is addressed to "European readers," and announces that he has appointed *three* agents in London, and *four* in Paris: then comes an advertisement *for a paper-maker*, *one for a printer*, and *another for a publisher*. The following is a fine specimen of the encouragement he has to offer to them:—

"WANTED.—Two travelling agents to procure subscriptions, sell books, and collect money. None need apply but such as can give undoubted security. Apply at the office of the Atlantic Journal."

But the following advertisement settles for ever the genus to which Professor Rafinesque belongs:

"MEDICAL SPECIFIC FOR THE CONSUMPTION.—A safe and efficient remedy for this fatal disease, has been discovered by an *eminent* Botanist and Pulmist of Philadelphia, Professor of Medical Botany, &c. It has effected several wonderful cures, and already cured or relieved seven hundred persons from Boston to New Orleans. *It is a mild, fragrant and palatable remedy, purely vegetable*, which some patients become quite fond of; it is calculated for this disease only, but susceptible of many preparations and modifications to suit (and apply to) all the various cases. It is called the PULMEL; with it are prepared a Syrup for common use, and a Balsam for inhalation. A Pamphlet on the Pulmel is given gratis. A work called the *Pulmist*, or *Art to Cure the Consumption*, has been published as a guide. Dr. RAFINESQUE, the proprietor, practices exclusively as a Pulmist in diseases of the lungs, and is very successful. He sends ample consultations on specific cases to any part of the United States, and has thus cured many at a distance. Consultation alone $10, with the work and all the Pulmel needful for a complete cure $25, will be sent any where on demand, and a remittance."

Of the contents of this work, and of the pity they will excite in all, and indignation in many—pity, for himself, and indignation at this wanton attempt to disgrace the cause of knowledge, we shall merely say, that of zoology there is nothing which has not been published before. The geological portion shows an entire ignorance of even the outlines of the science. *The tabular view of the American generic languages, and original nations*, is drawn from that insane mass called *The Annals of Kentucky*. The article entitled *The Atlantic Nations of America*, is upon a par with it. He gives tables of words of different languages, to show their affinity, where not the slightest analogy between the words can be traced by any effort of philological refinement. It is enough to unsettle a weak mind to examine the crazy assertions he is constantly making, and which he puts forth with the greatest confidence.

The professor's "History of China before the Flood," is a morceau every way worthy of himself. His facts and reasonings are in perfect harmony with the figures and perspective on the old porcelain of the celestial empire, these last standing in the same relation to nature that the first do to history. We give the following inimitable extract from page 25 of the Atlantic Journal. From the four concluding words, we suspect it forms part of an edict which the Son of Heaven has addressed to the professor.

"The state of mankind before the flood of Ynti (or Noah, which agrees in time with the seventy computation) is represented as happy. China, called *Tien-hia* or Celestial Region, (universe) was ruled by benevolent monarchs, who took nothing and gave much; all the world submitted to their virtues and good laws. They wore no crown, but long hair; never made war and put no one to death. Harmony even reigned between men and animals; men lived on roots, fruits and cattle; they did not follow hunting, property was in common, and universal concord prevailed. They did not therefore deserve the punishment of total destruction by a flood.

"This interesting and important part of the early history of mankind, is not yet inserted in the would-be universal histories of the western Barbarians, as the Chinese call us. Our compilers for ages appear intent on destroying the little remnant of ancient historical knowledge as yet extant. *Let it be revived!*"

We think we can now perceive the reason why Mr. Rafinesque's authority as a naturalist has been hitherto considered so unsatisfactory. Those who accuse others of encroaching upon their rights, are especially bound to act with uprightness themselves. Mr. Rafinesque will admit, that if, upon a previous occasion, we were not slow to vindicate his claims to justice, we ought to be equally prompt in asserting the rights of men of known intelligence, and who are eminent for their disinterested labours in the cause of natural science.

At page 20 of the Atlantic Journal, is the following passage, in a letter which he states to have written to Baron Cuvier.

"I send you, as you request, the figure, description, and a specimen of my *Trinectes Scabra*, a new genus of fish near to *Achirus* found in the river Schuylkill; it has only three fins, dorsal, anal and caudal. Also the description and figure of a large and beautiful new cat-fish from the river Tennessee, discovered in 1823, *Pimelodus lutescens:* it was three feet long, excellent to eat, of an olivaceous yellow colour, belly white, jaws equal, eyes round, tail forked, first dorsal falciform, second dorsal nearly as large as the anal."

By what means Mr. Rafinesque was enabled to send the figure, description, and specimen of this fish to France, may be learnt from the communication to us, which appears below as a note.* It will be observed that he has not even mentioned the name of Dr. Harlan, to whom alone he was indebted for the knowledge of the existence of this fish. His conduct is of a piece with what we find at page 28, speaking of the caves in Kentucky:—

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* PHILADELPHIA, March 28, 1832.

Dear Sir,—In that strange production, the Atlantic Journal, edited by Mr. Rafinesque, he states that the *Megalonyx laqueatus*, described by me in March 1831, in the Journal of the Academy of Natural Sciences, was previously named by him *Aulaxodon speleum.* It is difficult to make such a man responsible for any thing he does. I feel it necessary, however, to explain what his conduct has been towards me in this, and in another instance, that the public may understand what is due to him.

When I was engaged in the examination of the fossil bones alluded to, and had already placed the species in Mr. Jefferson's genus megalonyx, Mr. Rafinesque called upon me, and asked a great many questions concerning their nature and locality: he acknowledged himself utterly ignorant of them, and was evidently unapprized of the characteristic difference between the genus megatherium and megalonyx. These bones were personally collected by the late Mr. Clifford; and when they were purchased from his collection, the labels, stating that fact, were attached to them. Yet Mr. R., without giving any authority for it, states they were found in another place.

During the summer of 1830, I obtained from Mr. Carr, proprietor of Bartram's botanic garden, several species of fresh water fishes, among which was a specimen of Flounder [Pleuronectes] never before noticed as an inhabitant of the Schuylkill. Mr. R. called upon me one day, and as he was generally supposed to have some knowledge of ichthyology, I showed it to him. He asked permission to take it home that he might examine it at leisure. Since that time I have never seen the specimen, nor been able to get any account of it from him, that I could rely on. It appears, however, at page 20 of the Atlantic Journal, that he sent it to Baron Cuvier previous to March, 1831, as a new genus *Trinectes Scabra*, without mentioning the fact to me, or mentioning my name in the communication. I was, as I yet am, disposed to think this fish a new species of the genus Achirus of Lacep. or of Soles, totally deprived of pectorals, but a new genus it certainly is not. Mr. Ranfinesque appears determined to gratify his appetite for notoriety by unusual means, and altogether inconsistent with the respect due to the property of others. It is a course that will bring its own punishment with it. I remain, dear sir, yours very sincerely, RICHARD HARLAN.

"The principal fossil bones found in them, and come to my knowledge, belonged to—

"1. The *Megatherium*, or an animal very near it.

"2. My Aulaxodon speleum, since called Megalonyx laqueatus, by Harlan."

Now, in relation to this, we state, that there never was any bone resembling that of a Megatherium found in those caves; and as to the Megalonyx, the genus was so named by that eminent lover of natural history, Thomas Jefferson. The new species, M. Laqueatus, was first published by Dr. Harlan in March, 1831;* the bones of this animal were shown by him to this *Doctor* Rafinesque, who had never seen them before; yet he who complains of being wronged by others, not only attempts to supplant the species of Harlan and the genus of Jefferson, but insinuates that the first-named of these two gentlemen had endeavoured to supplant him. We wish Mr. Rafinesque to understand, that when any *pseudo* scientific publication is published here, calculated to mislead at home, and to discredit the country abroad, we shall proceed to unbombast it as soon as our leisure permits. He may cry mercy, and plead past services; but it won't do. One of our objects in relation to the geology and natural history of this country, is to endeavour to clear up all the old crudities that have brought natural science into a fog here; and if it were only to spare ourselves future trouble, we must cut up by the roots all the new-born nonsense that threatens to darken the subject still further.

Henceforward, we trust, Mr., or *Doctor*, or Professor Rafinesque—who it seems must be doing—when he finds *queer things*, such as *Mazamas*, *Panallodons*, and *Nephrosteons*, which he does not know what to make of, will do what men of sense do, show them to those who do; and not publish them—without figures too, in language that no naturalist can understand, and which was only endured in the bygone days, when all were ignorant alike, and when it was the custom to hold *omne ignotum pro magnifico.*

* See Month. Am. Journal of Geology, Vol. 1, p. 45.

ACCOUNT OF OPERATIONS TO FIND WATER IN THE DESERT BETWEEN CAIRO AND SUEZ.

From the Journal of the Royal Geographical Society of London.

We have been favoured with an interesting account of some successful attempts, made with great energy and perseverance, by Mr. Samuel Briggs, of Alexandria, to find water in the Desert, between Suez and Cairo. This is not only an important discovery for the natives of the country, but will also prodigiously facilitate the intercourse with India by steam.

The first experiments were made in the valley of Kesche, where the workmen bored, in one instance, to the depth of one hundred and sixty feet, through a fine sandstone, mixed with clay, without finding any humidity; and in another place to the depth of fifty feet, principally through a rock composed of fragments of silex and jasper, where they met with a hard rock which broke the instruments, and the attempt was consequently relinquished on that spot. The operations were transferred to the valley of Candelli. Here water has been found in a clayey stratum, at the depth of only thirteen feet, where a well is already established, to which the Arabs come for their daily supply. Above the clay is a bed of calcareous sandstone, five feet thick, through which the water filters; and in the stratum of clay three lateral galleries have been ingeniously struck to the extent of twelve or fourteen feet, which not only serve to collect the water, but, together with a further continuation of the well, to the total depth of twenty-one feet, form a reservoir of one thousand two hundred cubic feet of water. The whole is to be lined with stone and mortar, which will render it a work of perfect art; and what is most important is, that the water being found so near the surface, neither the labour of camels nor of machinery will be required to draw it.

Two other wells have been commenced in the same valley, with the same prospect of success. It is believed that, as the spot is only an hour, or an hour and a half's journey from the great chain of mountains which stretches across the Desert from the Nile to the Red Sea, the waters have there their source.

This enterprise has been projected by, and carried into execution at, the sole expense of Mr. Briggs. He has in his employ an able mineralogist, Mr. Albert Gensberg (a Swiss, we believe,) who is still continuing his researches, and is confident of finding water, and establishing wells, at other parts of the route. The practical artificers are two Englishmen, named Hancock and Wood. The villages, where men and animals will not only be supplied with water, but with all other necessaries in their painful journeyings; and the names of the projector and executor, of this work will be remembered with gratitude by all future travellers in this hitherto sterile desert.

Above all, it is hoped that the enlightened ruler of Egypt will appreciate the merits of Mr. Briggs, whose success will facilitate the commerce and promote the prosperity of that country.

To the above may be also subjoined the following extract of a letter, dated, Alexandria, June 13, 1831, from Mr. Briggs himself, to the Earl of Munster, who has communicated it to the Royal Geographical Society:—

"My attempts to discover water in the Desert between Cairo and Suez have been crowned with success; and I hope all future travellers to and from India will feel the benefit of it, as well as the pilgrims to Mecca.

"I have had two English borers at work during a year and a half, at my expense; and *I mean to persevere till I have found water also on the other line of communication*, known to you, between Cosseir and Thebes, or Kenne.

"Ibrahim Pasha gives me every assistance in guards, tools, masons, &c., whenever sweet water is found; but the Hadgi know it is to the English they are indebted for this boon."

GEOLOGICAL SOCIETY OF PENNSYLVANIA.

Abstract of their proceedings, April 14th, 1832, Lieut. Col. Long in the chair—

A paper on the geology of the Alleghany Mountains, by R. C. Taylor, Esq. was read by Mr. Featherstonhaugh.*

Peter A. Browne, Esq. read a paper *on the rocks found in the vicinity of Philadelphia.*—These rocks are primary; no granite

* This paper, together with a section of the Moshannon Valley, were published in the last number of this Journal.

has been found, except in boulders and veins of other rocks. This rock is the general but not continuous Atlantic boundary of the United States. When Ashton street, in Philadelphia, was regulated, a boulder of granite, weighing several tons, was found in the gravel. The felspar was flesh-coloured, sp. gr. 2.727. Where it is found in veins, the felspar is white, and the sp. gr. 2.701. The river boulders vary in their constituents more than the inland ones. Mr. B. has found Porphyry with helyotrope among the first. The gneiss at Fairmount water-works contains white beryls, and schorl in granite veins, sp. gr. 2.620. The gneiss re-appears at the falls of Schuylkill, five miles from Philadelphia. The State Penitentiary, in Coates street, is built of this rock: it contains, in granite veins, green beryls, phosphate of lime, scapolite, &c. In some places the gneiss is entirely disintegrated, lying in extensive loose sandy beds. Mica slate is quarried near Lemon hill, and in Broad street; it is well displayed at the mill-dam upon old Fourth street, sp. gr. 2.038 to 2.712. This rock contains granite veins with white beryls, and hexagonal crystals of mica. The beryls, when first detached, are soft and friable, but become gradually harder. Near Bartram's garden, the mica slate is found in disintegrated and sandy beds. At Chesnut hill, the mica slate is nearly vertical. From Manayunk to the Plymouth dam, it becomes compact, and contains beryls, zeolite, cyanite, schorl, phosphate of lime, &c. The first hornblende rocks which appear near Philadelphia, are near Fairmount water-works; but further north, they may be traced from the Delaware to the west bank of the Schuylkill. They appear on the Delaware about a mile beyond the village of Frankford, at the forks of the Bristol and Bustleton turnpikes, and near Second street road. At Manayunk they pass into hornblende slate. Actinolite is found subordinate to this formation. Mr. B. succeeded in detaching a specimen of a very tough compact hornblende, on Second street road, near Frankford creek, and on examining it a few days afterwards, found the fractured surface spangled over with crystals of actynolite, similar to others he had observed on the exterior of the rock. At Streaper's hill, on the Ridge turnpike road, the hornblende rocks again appear. In a ravine at the side of the road, about 11 miles from Philadelphia, large boulders of hornblende are lying on clay slate; others are found on the surface further to the north-east. Proceeding up the Schuylkill from Manayunk, the mica slate, near the soap-stone quarries, gradually passes into talcose rocks, confusedly piled upon each other. Serpentine, steatite, talc, chlorite, and other mineral substances, are here subordinate to this formation. The steatite (soapstone) contains oxide of iron and tremolite. The chlorite slate contains octahedral iron.

A communication was read from a *Committee of the Cabinet of Science of Bradford County*, consisting of Messrs. Henry Wells, Ellis Lewis, Isaac Cooley, Bissel Chubbuk, and William Russell.

There is in Bradford county inexhaustible quantities of bituminous coal and iron. Indications of copper have also been discovered. Major Long, of that county, has detected gold and silver in particular rocks. The gold is found disseminated in a bed of hornstone. Limestone with marine shells is also found in this county: when prepared in the kiln, it is of a grey ash colour. A coarse-grained silicious sandstone is found on the waters of the Towanda creek, well adapted for mill-stones. The only coal-mines now open and worked in this county, are on the waters of the Towanda creek, a few miles south-west of the borough of Towanda. The coal is excellent, and is extensively used by the inhabitants in preference to wood. In the winter season, it is sent in sleds to Ithaca, Newtown, &c. The veins of coal are from three to seven feet thick, and are found a few feet from the surface. The coal-field is extensive, rests upon a general bed of sandstone, and the strata alternate with slate. The coal on the waters of Towanda is supposed to be part of a continuous deposit extending to the coal-mines of Blossburg in Tioga, and those of Lycoming in Lycoming county. The Towanda creek is navigable for the descent of rafts a considerable distance above the coal-mines, which are situated about twelve miles from the north branch of the Susquehanna river. Coal is also found in abundance about six miles from the borough of Towanda. Iron is found in the neighbourhood of the coal-mines, and in other parts of the county. No fossil coal plants have yet been found: it is supposed they are not so abundant in the bituminous coal-fields as they have hitherto been found to be in the non-bituminous ones. There are several salt springs in the county, and a salt manufacturing company is established in Susquehanna county, at a salt spring on the dividing line with Bradford county. No rock salt has been found, neither have any wells been yet dug in this last county for brine. At Rome, eight miles north-east of Towanda, is a fine mineral spring, impregnated with sulphur, iron, &c. Inflammable gas rises in large bubbles from the bottom. The medicinal properties of this spring have been found very efficacious in cutaneous diseases. No natural caves have as yet been discovered in this county, nor any osteological remains, except an elephant's tooth. An exploring expedition, for the purpose of making geological examinations of the most interesting parts of the county of Bradford, is now preparing; it is intended to communicate the results to the Geological Society of Pennsylvania.

A communication on the geology of Wayne county, Pennsylvania, accompanied with a map and section, from Jacob P. Davis, Esq. and dated Bethany, Pennsylvania, was read. The following is an extract from it:—

" The principal features of the county of Wayne are, a continuous upland, occupying by far the largest portion of surface, the long narrow valleys by which this upland is indented, and a few incidental eminences to which the distinction of mountains is applied. The general average elevation of the upland is estimated at about thirteen hundred feet above tide water.

" Moosic mountain, near the western line of the country, rises above the upland about six hundred feet; having a total elevation at Rix's Gap, on the route of the Rail road, of nineteen hundred and ten feet above tide water. The term "gap," as applied to the passes of this mountain, does not signify a cleft or opening; the top of the mountain being continuous: it merely signifies a convenient slope. Beyond the northern extremity of the Moosic rises Mount Arrarat, which is about the same height as the Moosic. Besides these there are a few eminences of but minor note.

" The upland, with its appurtenant valleys, appears to afford the most interesting variety, the features of which are particularly defined by the course of the waters. All the larger streams have their sources at or near the summit of the upland, increasing in their passage by the confluent springs and rivulets;

the upland affords a hollow for the waters which enlarges as the waters advance, until at length the acclivities gradually assume a mountain aspect. The greater part of these inequalities, however, present no serious obstacle to agricultural operations. The slopes are generally gradual, and with some exceptions near the larger streams, every part is susceptible of cultivation.

"Delaware river bounds the north-eastern side of the county. It receives from Wayne county, besides the Lackawaxen river, the waters of the northern end of the county, and much of the eastern waters. There is much alluvial bottom land along the margin of the river; the upland acclivity is lofty, bold, and sometimes precipitous. The greater part of the river shore in Manchester township, from the mouth of Great Equinunk creek, downwards, is bound by lofty perpendicular rock, from the water's edge, which effectually interrupts a direct land communication along the river for that distance.

"Lackawaxen river flows through the middle of the county, in a deep valley, which no where exceeds half a mile in breadth. It unites the waters of the greater part of the county, which it discharges into the Delaware river. The bottom of this valley is, for the most part, an alluvial flat of fertile quality. The principal branches of this river are, the Dyberry, which it receives from the north, flowing through a valley similar to the Lackawaxen valley; the west Branch, which is considered the principal branch of this river, flows through a similar valley, and unites its waters with the Dyberry, near Honesdale, forming together the true Lackawaxen river. The Middle creek enters the Lackawaxen near the south-eastern line of the county. It is a stream of considerable magnitude, but its channel is rocky and its course very rapid. The Wallenpaupac creek, on the county line, is a considerable branch of the Lackawaxen, and has much alluvial flat extending almost its whole length. It has a high cataract near its mouth. For the last fifteen miles the creek, after a previous rapid course, flows in a sinuous channel, with scarcely any sensible motion. Arrived at the head of the falls, the bed of the creek appears suddenly depressed, and forms a chasm, into which the water pours down a depth of near seventy feet, and then rushing along in a deep rocky channel, is precipitated over three successive cataracts within a distance of a mile and a half to the mouth of the creek; producing a total fall in that distance of a hundred and fifty-six feet. The width of the creek above the falls is eighty-three feet: the scite of the upper fall is improved by two saw mills and a grist mill, a short distance above which a wooden bridge connects the route of the Milford and Owego turnpike.

"Geological inquiries, in this county are restricted within a small space. The far greater part of the county is covered by its native forest, and has been but very little, if at all, regarded by geological science. The productions of the soil, where cultivated, yielding an ample remuneration to industry, no excavation has been made in search of minerals, and few for any other purposes. Our inquiries are therefore directed to the occasional uncovered rock, and the remains detached by their decomposition, and these, for the most part, only enable us to generalize a few facts.

"The geological formation of Wayne county is transition. Its stratified rocks consist of brown argillaceous slate, graywacke, graywacke slate, and an impure limestone. The Moosic mountain is composed of conglomerate or pudding stone, resting on graywacke, and containing beds of amygdaloid. An outlayer of conglomerate is also seen in Mount Pleasant, near Centreville, the upper surface of which just projects above the soil. A bed of clay slate occurs near the mouth of Cawley brook, in Dyberry township, interposed between strata of graywacke slate. This rock also occurs in beds on the western side of Moosic mountain, above Belmont coal mine.

The brown slate appears to be the transition clay slate, or argillite of geologists. It readily splits into thin plates, which exhibit glimmering scales, probably mica. Its colour is usually brown, by oxide of iron; it is, however, sometimes of a grayish colour. The clay slate is a variety of argillite. It is of a fine texture: its fracture is rather splintery than slaty, and exhibits a glossy lustre. Its colour is a smoke gray, or clay colour. It is used for whet-stones, for which it is very well adapted.

"The conglomerate is composed of silicious pebbles of various forms, but generally rounded, united by a cement. It is frequently employed for mill stones, and is said to be nearly equal in quality to the burr. It contains veins of sulphuret of iron, feldspar and quartz.

"The limestone is of a coarse texture, and uneven fracture, and sometimes slaty. It is fusible at a white heat into a black glass, which denotes the presence of much silicious matter.

"The strata of brown slate and graywacke slate most frequently alternate, and are of considerable thickness and extent, declining from the horizon at an angle of thirty degrees or more, and dipping generally towards the north-west. It is frequently the case that the several strata form successive ridges, facing the south-east, which seem to rise behind each other like steps to the summit of the upland. In such cases the strata are from ten to a hundred feet in thickness; principally of graywacke slate and brown slate, alternating with occasional small strata of graywacke and limestone.

"In the vicinity of the Belmont coal mine, on the western side of Moosic mountain, is found, an argillaceous oxide of iron, sometimes called clay iron stone, in nodules and masses of various forms, imbedded in shale. Some of the nodules exhibit only a shell filled with a dark bluish liquid, of the consistence of paint; or with a compact substance of the same colour, but always capable of being cut with a knife. A specimen of this ore yielded 33 per cent of metallic iron. This mine is not worked. The district is yet covered by its native forest. Sulphuret of iron is also found in the shale at this place.

"I am not acquainted with the existence of any other minerals in this county than such as I have noted. There can be no doubt, however, that many will be discovered when the country becomes more improved, and its forests cleared off. To such a conjecture the properties of the soil and the nature of the formation afford many indications. The anthracite region approaches the western side of the county, but does not extend into it. There are neither salt nor salt springs known in this county; the only mineral springs known are chalybeate, on the western slope of Moosic mountain, near Belmont mine, and near Big Beech pond, in the southern part of Damascus township."

Mr. Featherstonhaugh presented, on the part of Lieut. Col. Long, an original coloured sketch, showing the blue ridge, and the adjacent country, from the Susquehanna river to the Mississippi river.

METEOROLOGICAL OBSERVATIONS,

Made at Wilmington, Delaware, by Henry Gibbons, M. D.

Summary for March, 1832.

	Therm.	*Barom.*
Average at sun-rise,	34°.81	*in.* 29.87
Average at mid-day,	49°.42	29.83
Average at 11 o'clock, P. M.	38°.23	29.84
Monthly average,	42°.115	29.85
Maximum, 12th,	67°.	1st, 30.30
Minimum, 18th,	12°.	12th, 29.37
Range,	55°.	.93
Warmest day, 12th,	60°.55	
Coldest day, 18th,	18°	

Proportion of clear weather,	*days* 21
Proportion of cloudy,	10
Whole days clear,	14
Days on which snow fell,	1
Days on which rain fell,	7
Depth of snow,	*in.* 2
Depth of rain,	2.55
Quantity of water,	2.80
Northerly winds prevailed,	*days* 11
Easterly,	5
Southerly, (S. to W.)	15

An aurora, on the evening of the 27th, followed by easterly winds. Clouds electrified twice; a heavy thundergust on the 12th. Winds not very variable; but blustering and frequently high, supporting the character of March. Two transient, incomplete, easterly storms. The weather of this month was remarkable for its sudden transitions from warm to cold. The temperature of the thirteen first days was pleasant and uniform, averaging about 53° at noon. A severe thunderstorm took place on the 12th, which was not followed immediately by much decrease of temperature. But a N. W. wind set in the next day, and the thermometer fell from 57° (at 2 p. m.) to 35° (at 11 p. m.). The next morning it stood at 20°. During this and the eight successive days, the mean temperature at noon was $39\frac{1}{2}$°. A change still more remarkable took place on the 17th, when the mercury fell from 47°, to 17°, between the hours of 2 and 11 p. m., during a violent snow-storm from N. West. On the morning of the 18th, it was at 12°, a degree of cold extremely unusual at this late period. The weeping willow had put forth its leaves, and the blossoms of the Lombardy and Athenian poplar were out. The leaves of the one, and the blossoms of the other, were completely destroyed, and the buds of the willow were so effectually killed, that the tree continued without any trace of vegetation till after the middle of April, when it put forth a new set of buds. The fruit of the peach-tree was killed by the same frost, in the unexpanded bud, so that few, comparatively, of the blossoms, subsequently opened.

SCIENTIFIC AND GENERAL MEMORANDA.

Tyrian Purple Dye.—The shells from which the celebrated purple dye of the ancients was extracted, named by Pliny, the Murex and Buccinum, have given occasion to disputes among modern naturalists as to the species meant. M. Lesson, upon comparing the mollusca now found in the Mediterranean, with Pliny's description, is of opinion the Buccinum is the Ianthina. It is a pelagian shell, and extremely numerous. It sustains itself on the surface of the sea by air vesicles, which Pliny calls a glutinous wax; and as soon as it is taken out of the water, there escapes from it a very pure and very brilliant violet rose colour. Each shell contains an ounce of this in the dorsal vessel. By means of alkalies this colour is changed to green. The Ianthina abounds equally in the Atlantic as in the Mediterranean; and at certain seasons the beaches of St. Helena and Ascension are entirely covered with them. From experiments made with this colouring matter, it appears to be a valuable reactive, turning red when treated with acids, and blue with alkalies. Oxalate of ammonia gives a deep blue precipitate, and nitrate of silver a prttey ash blue for painting in water colours.

Mode in which the common Frog takes its food.—The Rev. Mr. Bree in a communication to the conductor of the Magazine of Natural History, states,—"The friend to whom I am indebted for having first called my attention to this amusing exhibition, was himself introduced to it by mere accident. He happened to be re-potting some green house plants, and meeting with a moderate sized worm among the roots of one them, he carelessly threw it aside into a damp corner near the green house. Almost immediately a frog issued from his lurking place hard by, commenced his attack upon the worm, and soon dispatched it. Another worm was thrown to him, which he treated in the same manner. But the amusing part of the business is to watch the manner in which the frog first notices his prey; and this I can compare to nothing so aptly as to what, indeed, it very much resembles, a pointer dog setting his game: he makes, in short, a dead set at it; oftentimes, too (if the relative position of the two animals so require it,) with a slight bend or inclination, more or less, of the forepart of the body to one side, just as we often see a pointer turn suddenly, when the game is one side of him, and has approached very near before he has perceived it. After a pause of some seconds or more, the frog makes a dart at the worm, endeavouring to seize it with his mouth; in this attempt he frequently fails more than once; and generally waits for a short interval, acting the pointer, as it were, between each attack. Having succeeded at last in getting the worm into his mouth, if it be a large one, he is unable to swallow it immediately and all at once; and the portion of the worm which yet remains unswallowed, and extends out of the mouth of its destroyer, of course wreaths about, and struggles with a tortuous motion. With much, but somewhat grotesque dexterity, the frog then employs his two fore feet, shoving, and bandying the worm, first with one, and then with the other, in order to keep it as nearly as may be in the centre of his mouth, till the whole is swallowed. Any of your readers who are fond of marking the actions and habits of animals are strongly recommended to try the experiment. They have only to find a frog, taking care not to alarm him more than need be, and throw down a worm near him, and they will be pretty sure to be gratified by the sight of what I have endeavoured, however imperfectly, to describe. I ought to add that, to be successful, the experiment should be made in the summer, say June or July; as I am informed, (but do not vouch for the fact,) that, except for a few months in the summer, the frog is wholly abstemious."

Bi-valve Mouse Traps.—A person at Plymouth, having placed some oysters in a cupboard, was surprised at finding, in the morning, a mouse caught by the tail, by the sudden collapsing of the shell. About forty years since, at Ashburton, at the house of Mrs. Allridge, known by the name of the New Inn, a dish of oysters was laid in the cellar; a large one soon expanded its Valves, and two mice bounced upon the "living luxury," and were at once crushed between the valves. The oyster, with the two mice dangling from its shell, was for a long time exhibited as a curiosity. Carew, in his history of Cornwall, tells of an oyster that closed on three mice. An appropriate instance is also epigrammatically recorded in the Greek anthology.

M. N. H.

A Geological Manual, by Henry T. De la Beche, F. R. S. F. G. S. &c. &c.—We have received the second edition, corrected and enlarged, of this very instructive work. The lists of organic remains have been corrected, and additions made to them, as well as to the body of the work.

On the Means by which certain Animals ascend the Vertical Surfaces of highly polished Bodies.—Mr. Blackwall has read a paper before the Linnæan Society of London, showing that insects effect their progress upon the vertical sides of smooth objects, by the agency of an *adhesive secretion,* emitted by the instruments they employ in climbing, and which proceeds from the fimbricated under surface of the dilated extremities of the toes.

Services rendered to Natural History, by E. W. A. Drummond Hay, Esq.—This gentleman, who is British resident consul at

Petrefacta Musei Bonensis, by Professor Goldfuss.—The third part of this beautiful work has just appeared, and is fully equal to the preceding ones. It contains the *stellerides, encrinites,* and *serpulites,* with some additional species of corals. It contains twenty-five splendid lithographs, and eighty pages of letter-press. The learned author has paid much attention to synonymes, and has done a great deal towards clearing up the confusion they have created.

Birds of Europe.—Mr. Gould, author of "*Illustrations in Ornithology, from the Himalay mountains,* is about to publish a new work on the birds of Europe, the first part to appear on the

1st of June, 1832; it is to be published quarterly until completed. Each quarterly number is to contain twenty plates, imperial folio; fifteen of which are to be descriptive of British birds, and five of birds of the European continent. Price to subscribers of each part, paid on delivery, three pounds sterling.

A Manual of the Land and Fresh-water Shells of the British Islands, with coloured Plates of every Species.—This is the title of a work lately published by Dr. Turton, author of the *Conchological Dictionary.* Collectors of land and fresh-water shells will receive great assistance from this beautiful and accurate volume, in the arrangement of their *shells.* It is to be regretted, however, that it tends to continue the delusion about these testaceous coverings, as if their beauty and scarcity were the main objects of the study; and not the structure, faculties, and habits of the animals that lived in them.

Discovery of a Reef in the Pacific.—A dangerous reef has been discovered in the Pacific ocean, among the Caroline Islands, the N. E. extremity of which is in latitude 7° 36′ N. and longitude 155° 18′ E. It was found to lie in a N. E. and S. W. direction, and is so extensive, that the whole of it could not be seen from the N. E. extremity. It is about fourteen miles in a W. S. W. direction from Island Bordelaise, discovered in 1826. The discovery is due to the ship Larkins, W. Campbell, master; and, as here given, is extracted from her log, bearing date 23d February, 1830.—*Jour. Royal Geo. Soc. of London*, 1830–31.