Fossils in the State of Virginia — A Classic of Science

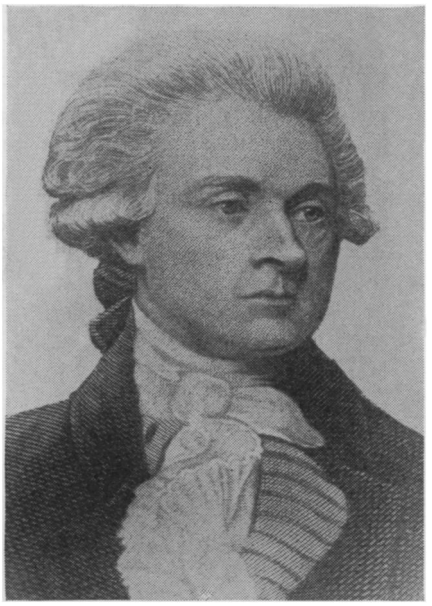
Paleontology

NOTES ON THE STATE OF VIRGINIA; written in the year 1781, *somewhat corrected and enlarged in the winter of* 1782, *for the use of a Foreigner of distinction, in answer to certain queries proposed by him respecting . . . [table of contents follows. By Thomas Jefferson. Paris?] MDCCLXXXII* (1782)

NEAR the eastern foot of the North mountain are immense bodies of *Schist,* containing impressions of shells of very different kinds from the first sources of the Kentucky, which bear no resemblance to any I have ever seen on the tide-waters. It is said that shells are found in the Andes, in South-America, fifteen thousand feet above the level of the ocean. This is considered by many, both of the learned and unlearned, as a proof of an universal deluge. To the many considerations opposing this opinion, the following may be added. The atmosphere, and all its contents, whether of water, air, or other matters, gravitate to the earth; that is to say, they have weight. Experience tells us, that the weight of all these together never exceeds that of a column of mercury of 31 inches in height, which is equal to one of rain water of 35 feet high. If the whole contents of the atmosphere then were water, instead of what they are, it would cover the globe but 35 feet deep; but as these waters, as they fell, would run into the seas, the superficial measure of which is to that of the dry parts of the globe, as two to one, the seas would be raised only 52½ feet above their present level, and of course would overflow the lands to that height only. In Virginia this would be a very small proportion even of the champaign country, the banks of our tide-waters being frequently, if if not generally of a greater height. Deluges beyond this extent then, as for instance, to the North mountain or to Kentucky, seem out of the laws of nature. But within it they may have taken place to a greater or less degree, in proportion to the combination of natural causes which may be supposed to have produced them. History renders probable some instances of a partial deluge in the country lying round the Mediterranean sea. It has been often supposed, and is not unlikely, that that sea was once a lake. While such, let us admit an extraordinary collection of the waters of the atmosphere from the other parts of the globe to have been discharged over that and the countries whose waters run into it. Or without supposing it a lake, admit such an extraordinary collection of the waters of the atmosphere, and an influx of waters from the Atlantic ocean, forced by long continued western winds. The lake, or that sea, may thus have been so raised as to overflow the low lands adjacent to it, as those of Egypt and Armenia, which, according to a tradition of the Egyptians and Hebrews, were overflowed about 2300 years before the Christian era; those of Attica, said to have been overflowed in the time of Ogyges, about five hundred years later; and those of Thessala, in the time of Deucalian, still 300 years posterior. But such deluges as these will not account for the shells found in the higher lands. A second opinion has been entertained, which is, that in times anterior to the records either of history or tradition, the bed of the ocean, the principal residence of the shelled tribe, has, by some great convulsion of nature been heaved to the heights at which we now find shells and other remains of marine animals. The favorers of this opinion do well to suppose the great events on which it rests to have taken place beyond all the eras of history; for within these, certainly none such are to be found; and we may venture to say further, that no fact has taken place, either in our own days, or in the thousands of years recorded in history, which proves the existence of any natural agents, within or without the bowels of the earth, or force sufficient to heave, to the height of 15,000 feet, such masses as the Andes. The difference between the power necessary to produce such an effect, and that which shuffled together the different parts of Calabria in our days, is so immense, that, from the existence of the latter we are not authorized to infer that of the former.

M. de Voltaire has suggested a third solution of this difficulty (Quest. Encycl. Coquilles). He cites an instance in Touraine, where, in the space of 80 years, a particular spot of earth had been twice metamorphosed into soft stone, which had become hard when employed in building. In this stone shells of various kinds were produced, discoverable at first only with the microscope, but afterwards growing with the stone. From this fact, I suppose, he would have us infer, that, besides the usual process for generating shells by the elaboration of earth and water in animal vessels, nature may have provided an equivalent operation, by passing the same materials through the pores of calcareous earths and stones: as we see calcareous dropstones generating every day by the percolation of water through limestone, and new marble forming in the quarries from which the old has been taken out; and it might be asked, whether it is more difficult for nature to shoot the calcareous juice into the form of a shell, than other juices into the forms of crystals, plants, animals, according to the construction of the vessels through which they pass? There is a wonder somewhere. Is it greatest on this branch of dilemma; on that which supposes the existence of a power, of which we have no evidence in any other case; or on the first, which requires us to believe the creation of a body of water and its subsequent annihilation? The establishment of the instance, cited by M. de Voltaire, of the growth of shells unattached to animal bodies, would have been that of his theory. But he has not established it. He has not even left it on ground so respectable as to have rendered it an object of enquiry to the literati of his own country. Abandoning this fact, therefore, the three hypotheses are equally unsatisfactory; and we must be contented to acknowledge, that this great phenomenon is as yet unsolved. Ignorance is preferable to error; and he is less remote from the truth who believes nothing, than he who believes what is wrong. . . .

OUR quadrupeds have been mostly described by Linnæus and Mons. de Buffon. Of these the Mammoth, or big buffalo, as called by the Indians, must certainly have been the largest. Their tradition is, that he was carniverous, and still exists in the northern parts of America. A delegation of warriors from the Delaware tribe having visited the governor of Virginia, during the revolution, on matters of business, after these had been discussed and settled in council, the governor asked them some questions relative to their country, and among others, what they knew or had heard of the animal whose bones were found at the Saltlicks on the Ohio. Their chief speaker immediately put himself into an attitude of oratory, and with a pomp suited to what he conceived the elevation of his subject, informed him that it was a tradition handed down from their fathers, "That in ancient times a herd of these tremendous animals came to the big-bone licks, and began an universal destruction of the bear, deer, elks, buffaloes, and other animals which had been created for the use of the Indians: that the Great Man above, looking down and seeing this, was so enraged, that he seized his lightning, descended on the earth, seated himself on a neighboring mountain, on a rock of which his seat and the print of his feet are still to be seen, and hurled his bolts among them till the whole were slaughtered, except the big bull, who presenting his forehead to the shafts, shook them off as they fell; but missing one at length, it wounded him in the side; whereon, springing round, he bounded over the Ohio, over the Wabash, the Illinois, and finally over the great lakes, where he is living at this day." It is well known that on the Ohio, and in many parts of America further north, tusks, grinders, and skeletons of unparalled magnitude, are found in great numbers, some lying on the surface of the earth, and some a little below it. A Mr. Stanley, taken prisoner by the Indians near the mouth of the Tanisee, relates, that, after being transferred through several tribes, from one to another, he was at length carried over the mountains west of the Missouri to a river which runs westwardly: that these bones abounded there; and that the natives described to him the animal to which they belonged as still existing in the northern parts of their country; from which description he judged it to be an elephant. Bones of the same kind have been lately found, some feet below the surface of the earth, in salines opened on the North Holston, a branch of the Tanisee, about the latitude of 36½° north. From the accounts published in Europe, I suppose it to be decided, that these are of the same kind with those found in Siberia. Instances are mentioned of like animal remains found in the more southern climates of both hemispheres; but they are either so loosely mentioned as to leave a doubt of the fact, so inaccurately described as not to authorize the classing them with the great northern bones, or so rare as to found a suspicion that they have been carried thither as curiosities from more northern regions. So



Thomas Jefferson at the age of 25

that on the whole there seem to be no certain vestiges of the existence of this animal further south than the salines last mentioned. It is remarkable that the tusks and skeletons have been ascribed by the naturalists of Europe to the elephant, while the grinders have been given to the hippopotamus, or river horse. Yet it is acknowledged, that the tusks and skeletons are much larger than those of the elephant, and the grinders many times greater than those of the hippopotamus, and essentially different in form.—Wherever these grinders are found, there also we find the tusks and skeleton; but no skeleton of the hippopotamus nor grinders of the elephant. It will not be said that the hippopotamus and the elephant came always to the same spot, the former to deposit his grinders, and the latter his tusks and skeleton. For what became of the parts not deposited there? We must agree then that these remains belong to each other, that they are of one and the same animal, that this was not a hippopotamus, because the grinders differ in their size as well as in the number and form of their points. That it was not an elephant, I think ascertained by proofs equally decisive. I will not avail myself of the authority of the celebrated[1] anatomist, who, from an examination of the form and structure of the tusks, has declared they were essentially different from those of the elephant: because another[2] anatomist, equally celebrated, has declared, on a like examination, that they are precisely the same. Between two such authorities I will suppose this circumstance equivocal. But, 1. The skeleton of the mammoth (for so the incognitum has been called) bespeaks an animal five or six times the cubit volume of the elephant, as Mons. de Buffon has admitted. 2. The grinders are five times as large, are square, and the grinding surface studded with four or five rows of blunt points: whereas those of the elephant are broad and thin, and their granding surface flat. 3. I have never heard an instance, and suppose there has been none, of the grinder of an elephant being found in America. 4. From the known temperature and constitution of the elephant, he could never have existed in those regions where the remains of the mammoth have been found.—The elephant is a native only of the torrid zone and its vicinities: if, with the assistance of warm apartments and warm clothing, he has been preserved in life in the temperate climates of Europe, it has only been for a small portion of what would have been his natural period, and no instance of his multiplication in them has ever been known. But no bones of the mammoth, as I have before observed, have been ever found further south than the salines of the Holston, and they have been found as far north as the Arctic circle. Those, therefore, who are of opinion that the elephant and mammoth are the same, must believe, 1. That the elephant known to us can exist and multiply in the frozen zone; or, 2. That an eternal fire may once have warmed those regions and since abandoned them, of which, however, the globe exhibits no unequivocal indications; or, 3. That the obliquity of the ecliptic, when these elephants lived, was so great as to include within the

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[1]Hunter. [2]D'Aubenton.

Many Occupations Cause Deafness

Health

IF a group of weavers tried to strike for better pay or shorter hours they would have a hard time holding a meeting, because so many would be unable to hear what their leader was trying to say.

This possible outcome of deafness as a result of a noisy job was brought to the attention of the Federation of Organizations for the Hard of Hearing by Dr. Frank G. Pedley, of the Montreal General Hospital.

A Scottish physician has found that 75 per cent. of boiler makers either could not hear at all at a public meeting, or could hear only with difficulty and Dr. Pedley's own experience with weavers is similar.

"Every one has heard of boilermaker's deafness, but there are many other occupations in which work is carried on amid a most frightful din, and in which the workers almost invariably lose their hearing," he stated.

Among occupations which are hard on the ears are: Spinning, carding and combing in the textile industry, chipping and stamping metals, stone cutting, tunnel construction, riveting, stoking aboard ship. Some jobs in aviation, testing of firearms, cement manufacture, and wood work were included.

The number of individuals exposed to undue noise runs into hundreds of thousands, Dr. Pedley estimated. Chronic occupational deafness usually creeps on insidiously until some one calls the victim's attention to it. This type of deafness is traced to a degeneration of the delicate receiving apparatus of the internal ear.

DEFECTIVE hearing can be inherited, Dr. Emil Amberg, of Detroit, emphasized in an address on marriage and deafness.

Citing types of inherited deafness, Dr. Amberg spoke of otosclerosis, a disease characterized by the formation of spongy bone in the labyrinth of the ear. Investigations indicate that this condition exists in certain persons who have an inborn tendency to it. Marriage between close relatives is likely to result in deafness among the children, if the parents had a record of deaf-mutism in the family.

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Fossils of Virginia—*Continued*

tropics all those regions in which the bones are found: the tropics being, as before observed, the natural limits of habitation for the elephant. But if it be admitted that this obliquity has really decreased, and we adopt the highest rate of decrease yet pretended, that is of one minute in a century, to transfer the northern tropic to the Arctic circle, would carry the existence of these supposed elephants 250,000 years back; a period far beyond our conception of the duration of animal bones left exposed to the open air, as these are in many instances. Besides, though these regions would then be supposed within the tropics, yet their winters would have been too severe for the sensibility of the elephant. They would have had too but one day and one night in the year, a circumstance to which we have no reason to suppose the nature of the elephant fitted. However, it has been demonstrated, that, if a variation of obliquity in the ecliptic takes place at all, it is vibratory, and never exceeds the limits of 9 degrees, which is not sufficient to bring these bones within the tropics. —One of these hypotheses, or some other equally voluntary and inadmissible to cautious philosophy, must be adopted to support the opinion that these are the bones of the elephant. For my own part, I find it easier to believe that an animal may have existed, resembling the elephant in his tusks, and general anatomy, while his nature was in other respects extremely different.

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Safe Vacations—*Continued*

A stretcher can be improvised from two poles and some coats. The poles are slipped through the sleeves of the coats which have been turned inside out. The flaps are then turned down and buttoned underneath.

In case you are alone with the injured person you can carry him in your arms for a short distance. For a longer distance it is best to use the fireman's lift and carry him on your back.

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NEW BOOKS

SOME APPLICATIONS OF ORGANIC CHEMISTRY TO BIOLOGY AND MEDICINE—George Barger—*McGraw-Hill* —186 p. $2.50. Six lectures given under the George Fisher Baker nonresident lectureship in chemistry at Cornell University by the professor of chemistry in relation to medicine at Edinburgh University. The subjects covered are hormones, vitamins, chemotherapy, chemical constitution and physiological action, and the blue adsorption compounds of iodine. The book is too technical to be read without considerable knowledge of chemistry, but scientists and students of biology, chemistry and medicine will enjoy these lectures by an eminent authority.

Biochemistry

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AN ALBUM OF OUR WILD FLOWERS; AN ALBUM OF OUR TREES—*S. Gabriel Sons and Co.* $2 each. These two books may be used to encourage young beginners in botany to found their own herbaria. Each consists of a number of sheets on which pressed specimens may be mounted, a sheet of gummed strips for holding them down, and several pages of pictures which will aid in identifications, printed in color on gummed paper which may be stuck to the herbarium sheets.

Botany

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THE LONDON NAVAL CONFERENCE: ITS BACKGROUND AND RESULTS—B. H. Williams—*Univ. of Pittsburgh.* 111 p., 75c. A series of twelve radio talks, published in an attractive paper-bound book. With the Battle of the Treaty now looming in the Senate, these essays are timely and will be useful as a review of the naval situation.

Politics

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FRUIT MARKETS IN EASTERN ASIA —B. H. Crocheron and W. J. Norton —*Univ. of California Printing Office.* 366 p. "Around the world each useful product flies," wrote Oliver Goldsmith many years ago. The author of "The Deserted Village" would doubtless have been amazed to learn that the appetite for fruit of Malays in the Dutch East Indies helps to keep villages in California and Palestine well populated. This and a thousand other like facts make this economic bulletin most interesting reading.

Economics

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