

SCIENCE

NEW YORK, APRIL 17, 1891.

EUROPE DURING AND AFTER THE ICE AGE.

TEN lectures under this title have been given by Professor James Geikie of the University of Edinburgh, beginning March 13 and ending April 10, as one of the courses of the Lowell Institute, Boston.

Beginning with descriptions of the physiography of Europe and of the present glaciers of the Alps, Professor Geikie afterward described successively the glacial deposits of the Alps and adjacent lower lands, of the British Isles, and of the Scandinavian Peninsula, northern Germany, Finland, and north-western and northern Russia. The accompanying map of Europe at the climax of the glacial period delineated the maximum area of the European ice-sheet nearly as it is mapped in this author's "Prehistoric Europe," but represented it as extending farther north-east, so as to cover the northern part of the Ural Mountains. A very perfect demonstration of the origin of the till or bowlder-clay by the agency of land-ice is supplied by this order of presentation, first considering the development of the till, moraines, and glacial striae, in the valleys and lowlands bordering the Alps, where glaciers still exist, being evidently the shrunken representatives of their formerly much greater extent during the glacial period or ice age. No theorist has ever claimed a marine origin for these glacial deposits. Thence Professor Geikie proceeds to the similar Scottish till, which in all its characteristics and in its distribution, scanty in the valleys of the mountains and highland districts, but spread thickly on the lowlands, is manifestly the exact analogue of the Swiss ground-moraine. Both, therefore, are attributable to land-ice. And the same argument includes likewise the similar but far more extensive deposits of till and fluvio-glacial detritus which thickly cover the low tracts of Sweden, Denmark, northern Germany, and a large part of Russia. During the final melting of the ice-sheets, much of the finest detritus which had been incorporated with their lower portion was borne far away by rivers, and deposited as loess in the valleys and on flat lands, or in some places in broad shallow lakes.

One interglacial epoch, and perhaps more than one, interrupted the severe cold of the ice age in Europe. For a long time, between two epochs of glaciation and accumulation of till, a mild interglacial climate permitted southern animals and plants to extend into Great Britain and northern Germany; and during this time the ice-sheets were doubtless wholly melted away, or were as much restricted as now, remnants of them lingering only in the Alps and on the mountainous plateau of Scandinavia.

After this mild and even warm interval, which was of long duration, the glaciers of the Alps again spread out to the lowlands, but not so far as before; and ice-sheets were again accumulated upon the British Isles, Scandinavia, Finland, and northern Germany, but they too were less extensive than in the earlier glacial epoch. The British ice-sheet during that earlier epoch had extended south to the Thames;

but the ice of the later epoch, according to Professor Geikie, though again wholly enveloping Scotland, reached into England only to Lincolnshire. The earlier British ice-sheet certainly, and the later one probably, were confluent with the ice which deployed from Scandinavia southward in a broad *mer de glace* over the area of the North Sea, bringing Norwegian bowlders to the shores of England. All of Scandinavia, excepting a small tract of southern Sweden, appears to have been covered by the ice-sheet of the latest glacial epoch, which also, as mapped by Professor Geikie, reached east over Lapland to the White Sea, and over Finland nearly to Lakes Onega and Ladoga, but did not cover the Gulfs of Finland and Riga. Toward the south and west, however, the "great Baltic glacier," a lobe of this latest ice-sheet of north-western Europe, filled the basin of the Baltic Sea and overflowed the low northern margin of Germany to Berlin, and the eastern half of Denmark. The extreme limits of the earliest European ice-sheet are not generally marked by terminal morainic accumulations, but rather by extensive stratified deposits of gravel and sand. On the other hand, the later glaciation is bounded in many places by prominent hilly and knolly terminal moraines, with abundant erratic blocks.

Since the ice age, there is evidence, in the fossil faunas and floras of marine deposits and peat bogs, that north-western Europe has experienced for some time a climate considerably warmer than that of the present day; and the speaker compared this with the formerly warmer waters of the Atlantic on the shores of New England and the eastern provinces of Canada, which allowed various species of southern mollusks in the post-glacial or recent epoch to extend northward to the Gulf of St. Lawrence, though now they have become mainly extinct north of Cape Cod, excepting a few colonies that survive in favorable localities. These climatic changes following the glacial period unite the whole quaternary era as characterized from its beginning to the present day by numerous alternations from severity to mildness of climate, and the reverse.

Inquiring what were the causes of the ice age, Professor Geikie pointed out its complex character, with two or more epochs of severe climate and ice accumulation, divided by recession of the ice and long-continued mild conditions; and he especially called attention to the Alpine glaciation and the ice-sheets of north-western Europe as simply the increased and greatly extended development of the glaciers that still are found in Switzerland and Scandinavia. A lowering of the mean temperature of Europe by twelve degrees might gradually restore the ice-sheets. The short estimates of the time (7,000 to 10,000 years) that has passed since the latest glaciation of the northern United States, given by N. H. Winchell, Andrews, Gilbert, and Wright, from their consideration of the recession of waterfalls and erosion of river-gorges, as stated in Wright's "Ice Age in North America," are pronounced by Professor Geikie unreliable; and he maintains the astro-nomic theory of his friend and colleague, the late Dr. James Croll, which accounts for glacial epochs by eccentricity of the earth's orbit, placing the close of the latest glaciation

It is evident that the structure of the sacrum at once shows the close affinity of this genus to *Agathaumas*. The description of the sacrum can be applied fully to the sacrum figured by Professor Marsh under the name of *Triceratops*. The description of the fore and hind limbs also agrees very much with that of *Triceratops*, and there is not the slightest doubt that *Monoclonius* belongs to the same family. *Monoclonius* and *Ceratops* are from the same locality, Cow Island, Montana; and the portions of the skull figured by Professor Cope (*American Naturalist*, August, 1889) leave no doubt whatever that *Monoclonius* is identical with *Ceratops*. The elements formerly considered by Professor Cope as episternum represent the parietals. I know and have examined the types of *Monoclonius* and *Ceratops*, and can state that the two forms are not generically distinct. In the April number of the *American Journal of Science* a restoration of *Triceratops* is given by Professor Marsh. I think there is no evidence that the animal had such a long tail as the restoration shows. The post-pubis, the presence of which I had predicted (*American Naturalist*, June, 1890), is not represented. In the February number of the *American Journal of Science* Professor Marsh makes the following remarks about the pubis: "One pubis recently discovered has a short, splint-like process, which may, perhaps, be a remnant of a post-pubic element, although it does not have the position of the post-pubic bone in other dinosaurs." Now, there cannot be the slightest doubt that this process is the same element as in the other *Iguanodontia*, and I do not see that it differs in position. The "splint-like process" is not complete behind, and I predict again that this process extended very much farther behind, just as in the allied *Iguanodontidæ*.

One of the characters now given by Professor Marsh to the horned saurians consists in the presence of a pineal foramen. This is evidently a mistake. The foramen described as a pineal foramen has nothing whatever to do, even if it really exists in all the skulls, with the true pineal foramen. This foramen is absent in all *Iguanodontia*, and it certainly would not make its appearance again in such a highly specialized animal as *Agathaumas*. I have nothing to add in regard to the teeth. I repeat, that they have not two true roots (compare the *American Naturalist*, June, 1890). The lumbar of the *Agathaumidæ* are not absent, as stated by Professor Marsh, but are simply co-ossified with the sacral vertebrae. The statement that the post-frontals meet in the middle line I take the liberty to doubt.

The *Agathaumidæ* (this is the only name which can be given to this group) represents a highly specialized family of the *Iguanodontia* (*Orthopoda*), the nearest allies of which are exhibited by the *Iguanodontidæ*.

The *Agathaumidæ* contain two forms which are well defined (I neglect here the horned saurians *Crataemus* of the Gosau formation, Austria, of which only fragments are known),—*Agathaumas* Cope, 1872 (*Bison* Marsh, 1887; *Triceratops* Marsh, 1889; *Sterrhophus* Marsh, 1891), and *Monoclonius* Cope, 1876 (*Ceratops* Marsh, 1888). *Polyona* Cope, I think, is also a synonyme of *Agathaumas*.

This result is different from that reached by Professor Marsh, who states in the February number of the *American Journal of Science*, 1891, "The generic names *Agathaumas*, *Crataemus*, *Monoclonius*, and one or two others, have been given to fragmentary fossils which may belong to this group; but these remains, so far as made known, appear quite distinct from those here described" (*Ceratops*, *Triceratops*). G. BAUR.

Clark University, Worcester, Mass., April 2.

The Shrike.

A PLEASANT article, chiefly concerning the shrike, or butcher-bird,—one of John Burroughs's bright articles,—calls to my mind some questions concerning the food of the shrike. Burroughs says that the shrike kills lizards, toads, birds, etc., by striking them on the head, then eats the brains only, and hangs up the carcass. What for?

Professor A. Newton, in "Encyclopædia Britannica," says the shrike hangs up its prey, or impales it, for greater convenience in tearing the carcass to pieces in order to devour it. I have seen a

shrike's nest *in situ*. Around it hung a beetle, a mouse, a small bird, and a big bumble-bee. All were within reach of the bird as she sat on her eggs. A dart forward of her head brought her beak upon any one of these victims. For what were they hung up? For traps, I venture to suggest.

The shrike, no doubt, strikes its prey on the thin skull-bone. Let us say that instinct teaches that here is the spot most vulnerable for a beak no larger than that of the shrike. The exposed brain presents a soft eatable morsel, and the shrike eats it *en passant*. Then it hangs up its booty, and straightway the decaying carcass attracts insects, blue-flies notably, and thereon the shrike feasts. I believe that the shrike is chiefly insectivorous; and its habit of hanging up plunder, making a kind of larder all about its nest, is to call there plenty of large flies, which can be safely picked off as the bird sits on her eggs. True, the shrike hangs up carcasses far from its nest; but to these carcasses it can return frequently for the flies they have attracted. No doubt the instinct which suggests converting the vicinage of the nest to a shamble will prompt the bird to hang up whatever is killed by it, in the place nearest at hand.

JULIA MCNAIR WRIGHT.

Fulton, Mo., April 7.

Iroquoian Etymologies.

In an article in *The American Anthropologist* (vol. i. No. 2) suggesting an Algonquian origin for the word "Iroquois," the writer had occasion to criticise a derivation given to this word by Mr. Horatio Hale, in his "Iroquois Book of Rites." This criticism is as follows:—

"Mr. Hale finds what he believes to be at least a possible origin in the indeterminate form of the Iroquois word *garokwa* ('pipe,' or 'string [error for "portion"] of tobacco'), *ierokwa* ('they who smoke,' briefly 'tobacco people'), the Iroquois being well known to have cultivated tobacco. With reference to this derivation, I am not aware that *garokwa* is used as a verb in any of the Iroquoian tongues. If not so used, it cannot, of course, have an indeterminate form, *ierokwa*; if this form existed, it would mean, not 'they who smoke,' but 'one smokes by which.'"

In the next issue of the quarterly named above, Mr. Hale tried, in "Indian Etymologies," to defend his erroneous derivation which had been called in question by the writer. Among other things equally remarkable, he says, "I have no desire to criticise it, but may be allowed to vindicate my own suggestion from the imputations of ignorance or carelessness, which his objections seem to imply. For this object it is not necessary to claim a profound knowledge of the Iroquois tongue, which is one of the most difficult of languages; but Mr. Hewitt, who has read my volume on the 'Iroquois Book of Rites,' might, perhaps, have reasonably given the author credit for a more careful study of the first principles of the language than he seems willing to suppose. With reference to my suggested derivation of the word from the verbal form *ierokwa* ('they who smoke,' reminding one of 'The Tobacco People,' which was a well-known designation of a Huron tribe), Mr. Hewitt remarks, 'I am not aware that *garokwa* is used as a verb in any of the Iroquoian tongues.' If he will refer to the volume just mentioned, he will find, on p. 116 (paragraph 2), the word in question used as a verb in this native composition. The form here employed is *denighroghkwaïen*."

If *denighroghkwaïen* were an instance of the stem of *garokwa* used as a verb, it would prove Mr. Hale's position and the justness of his remarks; but, unfortunately for Mr. Hale, it is not such an instance. This will be shown in the sequel.

Moreover, Mr. Hale's contention that a mere superficial knowledge of the tongue is sufficient preparation to enable one to analyze accurately its terms and sentences is inconsistent and self-contradictory: since, if it be true that the Iroquoian tongue is "one of the most difficult of languages," then, before putting forth any etymologic analysis of its vocables and sentences, it is not only necessary, but imperative, to have a knowledge of its grammatic and morphologic processes sufficiently "profound" to enable the student attempting an etymology to ascertain the several parts of speech, their flexions, and their positions in sentence-words, because such a knowledge will prevent him from mistaking the