

As to the invasion of fields occupied by professors of geology, there are in the files of the survey many letters to such professors urging them to work up the local geology and offering financial assistance and means of publication of their results. The case of the Fayetteville quadrangle is perhaps an apparent exception. It should be stated, however, that when the work was undertaken there Professor Purdue was practically unknown as a geologist and was, as a matter of fact, not sufficiently experienced to carry on independent work. Since his season with Adams he has been employed each summer and has submitted three folios for publication. It has been necessary, however, in connection with this work, to send more experienced men into the field with him, although he will receive the entire credit for the work.

It was not my intention to cast any reflection, even in a personal letter, upon Professor Purdue's work, the quality of which has been higher than that of most work done for the survey under similar conditions. When he was first entrusted with independent work, however, his field experience was less than is required for the regular members of the survey and his ability in this direction was not known to us. It is for this reason, and not because of any deficiency in the quality of his results that more experienced men have conferred or collaborated with him in the field. This course is, indeed, frequently necessary with regular members of the survey, as well as with per diem men. That Professor Purdue's work is regarded as good is sufficiently shown by the fact that an allotment for its continuance has been made every year since it was begun. A further point in his favor, and one highly appreciated, is that his results are submitted when promised.

CHAS. D. WALCOTT,
Director

SPECIAL ARTICLES

EVIDENCE OF MAN IN THE LOESS OF NEBRASKA

AFTER careful investigation the writer stands ready to announce his belief in the occurrence of human remains in the loess of this state, and for this primitive type he has proposed the name Nebraska loess man.¹

¹Nebraska Geological Survey, Vol. II., parts 5 and 6.

Such importance attaches to the discovery as to warrant a paper devoted to the geological facts connected therewith.

Physiographic Features.—North of Omaha for a number of miles the topographic features are bold and abrupt for a prairie country due to the proximity of the Missouri River, the relief being 150 to 200 feet.

On all sides landslides are in evidence and must be reckoned with in all field work. Early in October Mr. Robert F. Gilder, of Omaha, opened a mound on Long's hill facing the Missouri River, ten miles north of Omaha or three miles north of Florence, Douglass County, Nebraska. From Florence north to Long's hill there is a continuous section along the roadside for about three miles and from the base of Long's hill to the summit, on which Gilder's mound is situated, there is an unbroken section, hence the geology of the place is well exposed, and being simple is easily interpreted. The public highway, which is about forty feet above the river level, is just upon the top of the Carboniferous, the dark carbonaceous shales of which constitute a distinct geological feature. Upon the shales there rests an average of ten to twenty feet of glacial drift containing occasional Sioux quartzite and granitic boulders. Upon the drift comes 150 feet of bright buff loess such as is conspicuous in and around Omaha and Council Bluffs.

Long's hill stands 200 feet above the river level, and 150 feet above the valley out of which it rises. It is a hill of erosion, and no discoverable land slip has complicated its simple geology. On its summit is Gilder's mound, in the superficial layer of which were found mound-builder remains, and in the deeper layer eight skulls and many bones of a still more primitive type. The writer at once joined Mr. Gilder in a critical investigation of the place, continuing the work from time to time to December 2, 1906, with results leading to the conclusion that two of the skulls are mound builders', in all probability. These were found in the upper layer readily discernible as a mixture of black soil and light buff subsoil such as would result from digging and burying. This layer has a

thickness of two and one half feet. Below it was an undisturbed layer of unmistakable loess, and in it numberless fragments of human bones and an occasional animal bone, loess shells and stray angular pebbles.

In brief, the conclusion is that in the case of the upper bone layer there was burial, in the lower, deposition. Those in the loess doubtless antedate the hill itself while those in the upper layer are subsequent to it. That archaic burial could have taken place in loess without detection is altogether improbable. Of necessity there would result a mixture of black with light soil and a breaking up of the lithologic structure. Where these bones occur the loess structure and color is perfectly preserved and it contains characteristic vertical lime-tubes, concretions and shells precisely as is customary. Out of the evidence at hand the writer concludes that bones of this layer were strictly synchronous with the loess formation in which they were found, in substantiation of which comes the fragmental nature of all of the bones, their water-worn condition, their range of distribution, and disassociation of parts.

One would scarcely think of such conditions being possible in the case of human burial; besides it is improbable that a primitive people would dig graves to a depth of twelve feet. Should a people without tools and appliances perform such an improbable feat, would they bury water-worn fragments, would they scatter them so widely as not to exceed five or six pieces to the cubic yard? How could they replace the earth in the grave in such order and regularity that there would be perfect structure and gradation of color from soil to subsoil?

Methods of Exploration.—Early in November the writer recognized that the bones in the loess were apparently fossil, and great care was exercised in all subsequent work. On extending the cross trenches which Mr. Gilder had dug, human bones scattered, water-worn, fragmentary and unrelated were found in natural undisturbed loess at all levels down to six feet. The most interesting single bit found on this occasion was the left half of a frontal bone secured at a depth of four to five

feet. Later at a distance of five feet the other half was dug up, and the two parts fit together, completing an interesting low-browed frontal. A jaw, which was found in undisturbed loess at a depth of four feet, was that of a youth. The crowns of the teeth were scarcely worn, so old age can not be assigned as the reason for the absence of all teeth save molars Nos. 2 and 3 in the right ramus and No. 2 in the left. Just as the teeth of any water-soaked jaw drop out readily, so it seems to have been with this one. The inference is that they were lost in the process of deposition. A week later work was resumed, the writer being accompanied by Mr. Robert F. Gilder and Dr. George E. Condra, and the attempt was made to be severely critical and careful.

All surface material was carefully removed and three wide shafts were sunk on the northern, eastern, and southern points of the mound. Each shovelful of earth was scrutinized, all bone fragments carefully saved and recorded. In all some twenty bits were found, as follows: a fragment from the base of a skull, fragments of ribs, limb bones, scapula and sacrum; a clavicle, calcaneum, three complete vertebrae, two metapodes and a phalanx.

Some of the bits mentioned were but slivers, other bits were two or three inches long. Some were badly etched by water, others gnawed by rodents. As each fragment was unearthed a block of the matrix was kept and as far as possible each fragment was preserved in position in the block.

There were but twenty fragments in this lot, for while it is true that the shafts were sunk to a depth of eight feet, and while bone chips were found at all levels, they were widely scattered and few in number. Among the fragments may be mentioned five or six bits of skull, as many bits of rib, the angle of a jaw, metatarsal No. 3, and two phalanges, and with them bits of *Anadonta*, *Succinea avara*, and several angular pebbles. When work was resumed a few days later a circle thirty feet in diameter was described concentrically about the mound, which is about eighteen feet in diameter. The northeast quadrant of the circle was divided into sectors

of twenty-two and a half degrees and lettered. This quadrant as a whole was excavated to an average depth of six feet its periphery to an average depth of eight to nine feet, and a shaft was sunk to a depth of twelve feet on the north edge.

The writer was accompanied and aided by Dr. George E. Condra, Edwin Davis, Paul Butler, and as time would permit by Mr. Gilder. Systematic work was continued for three consecutive days. Fragments of human bones, scattered and unrelated, were found throughout the quadrant at all levels even to the depth of eleven and one half feet.

It was plainly demonstrated that the part without the circle of the mound was quite as rich in bone fragments as that within. The relation of the two sets of bones may be viewed as purely accidental. In but a single instance were several bones found together. Three ribs, fragments of limb bones, and an astragalus were in proximity. Probably two hundred fragments were exhumed on this occasion. It should be noted that no whole bones were found excepting a few phalanges. Instead they are bone-chips and splinters, with an occasional section from a limb bone, and many of the fragments are pitted or etched. Out of this set the following fragments seem of especial interest: half of a jaw with a solitary molar, the condyle, angle, and region of the symphysis being weathered off, fragmentary rami of two other unrelated jaws, the bony palate with the two back molars in place. By far the most interesting and instructive specimen found at this time was a skull completely disarticulate, broken, and scattered over a space five by five feet.

This was taken out in blocks, and no attempt will be made to remove the bits from their original position, the intention being to keep everything in such condition as to facilitate the detection of inaccuracies and errors.

Age of the Supposed Loess Man.—The present paper concerns itself simply with the announcement of human remains found in undisturbed loess. The chief point is the evidence that human remains have been found in the loess, and whether this is the very oldest or newest loess seems a secondary considera-

tion. The loess here is not leached of lime salts, but is actively effervescent at all levels, arguing for recency of deposition. All recognize the chronological diversity in the loess formation, and whether Long's hill is in the main loess body, as we believe it to be, or in a much more recent one does not materially affect the relation of the bones to some stage of glaciation, the precise glacial or interglacial age being as yet undetermined.

The loess in question rests on Kansan drift, and though as young as the later Wisconsin sheet or younger, it is nevertheless old.

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ASTRONOMICAL NOTES

THE UNITED STATES NAVAL OBSERVATORY

THE Naval Observatory is showing an activity in astronomical work and publication, which ought to go far toward creating a more favorable opinion of that institution than has sometimes prevailed in the past. Several volumes have recently appeared, containing observations of the sun, moon, planets and miscellaneous stars from 1900 to 1903, of the sun, moon, planets and comets from 1866 to 1891, and of standard stars and zodiacal stars from 1900 to 1902; also, reduction tables for transit circle observations and meteorological observations.

Several hundred pages and a large number of plates are also devoted to an elaborate study of the total solar eclipses of May 28, 1900, and May 17, 1901. The leading members of the astronomical department of the observatory are: Professors Skinner, Eichelberger and Littell and Assistant Astronomers Hill, Rice and Hammond, under the superintendency of Rear-Admiral Asa Walker, U.S.N. A large number of astronomers from other institutions assisted in the work of the eclipse expeditions.

THE SOLAR OBSERVATORY OF THE CARNEGIE INSTITUTE

THE solar observatory on Mount Wilson continues to surprise the astronomical public with its developments. A five- or six-foot mirror has perhaps appeared to most astronomers to mark the limit to practical construc-