

through the three-mile-high passes of the Himalayas, by horse and mule to Shigatse, a short distance from the sacred city of Lhasa. In Tibet the expedition will collect anthropological material for the American Mu-

seum and botanical specimens for the New York Botanical Garden. Out of respect for Buddhist tradition, which holds all living things sacred, no animals or other living creatures will be removed.

## DISCUSSION

### HUMAN REMAINS IN GRAVEL NEAR WEST UNION, MINN.

THE record of recent discoveries as reported in *SCIENCE* indicates that Minnesota is unusually rich in the remains of early man. A skeleton recently uncovered in West Union Township, Todd County, appears to belong to this group, although there are various uncertainties that need to be solved by further study.

A gravel pit on the land of Daniel W. Fraser (Lot 1, N E 1/4 Sec. 11 T. 127 N., R 35 W.) has been the source of gravel for the improvement of certain roads. The gravel is dug by hand and the ordinary procedure is to shovel from the base of a face 20 feet high. Once or twice a day the men go up on top, spade the loam from a strip 2 to 3 feet wide, throw it to one side and then cave down the bank. A considerable number of men with Ralph Smith as foreman, were employed, including Romaine Johnson, Ludwig Elven, Melvin Irwin, Earl Tompkins, Martin Brakken, Bob Iverson, and Teddy Randall. These men are agreed that the first unusual fact that attracted notice was a bone, afterwards identified by me as the tibia, that projected from the bank about 3 to 4 feet below the top. This bone lay in undisturbed gravel and fell or was pulled out and two smaller bones came with it. Later, on June 11, 1935, two men were on top, stripping and caving when the spade of Earl Tompkins struck bones and at the instant that he saw them, a large mass of gravel fell down the bank carrying the bones to the bottom of the pit. As this occurred at the end of the day the men quit work, and did not realize that a skeleton had been brought down until the next morning, June 12, when they picked the skull and bones out of the gravel. On that day I obtained the bones from the owner of the pit, and interviewed the men. The next day I took photographs of the site and on June 17 recovered from the waste pile two of the first bones seen. At various times I searched the road on which the gravel had been dumped and recovered small fragments of bone.

The gravel pit lies on a ridge which is part of the southern boundary wall of the flat-bottomed valley of Sauk River. The upper 7 feet of gravel in the pit consists of bedded fine and coarse gravel much iron-stained, which I call the West Union gravel. It rests unconformably on till at the south end of the pit and

on slightly deformed gray gravel at the north end where the skeleton was found. Similar gravel is exposed in a pit on the top of the next ridge 700 feet southwest, but elsewhere it has not been found. Geological alternatives are as follows: (1) Is this gravel part of a more wide-spread deposit of a stream or streams later than the lower till and gravel? (2) Is this gravel only a part of the till which has been exposed at this place by erosion?

Archeologically, it is unfortunate that conclusive evidence by trained observers is not available as to the disposition of the bones in the gravel. The men estimate the depth of the bones from 16 inches to 4 feet. They agree that the bones lay well below the loam which is a foot thick and that the well-stratified gravel appeared to them to be undisturbed.

If the West Union gravel is a stream deposit later than the till (Hypothesis 1 above) it is Postglacial in age and the skeleton may be contemporaneous with it. One would have to suppose that a man was killed or died on the banks of the stream and his body entombed by natural processes.

On the other hand if the West Union gravel is part of the moraine complex, a mere fragment of gravel caught up and embedded in till, it dates back to the Bemis stage of the Keewatin Ice-sheet ("New Gray Drift") or may even be of "Iowan" age ("Old Gray Drift"). The relatively modern type of the skull makes contemporaneity with such comparatively old deposits unlikely. One would have to suppose that the man was buried in the gravel and that the evidence of a grave passed unnoticed by the workmen.

Further studies of the geology are planned. The skeleton is to be referred to a competent physical anthropologist.

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THE RECTORY  
ST. ALEXIUS CHURCH  
WEST UNION, MINN.  
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### KILLARNEAN AND EARLIER GRANITE

PROFESSOR A. C. LAWSON has a note, "Is the Killarney granite different in age from the Algonian?" in *SCIENCE* for May 24. Lawson does not doubt that radioactive measurements are of geologic value, for as chairman of the Division of Geology and Geography of the National Research Council he himself organized

the committee to study them. But he calls for more evidence that the Killarnean, of which he doubts the Keweenaw age because it is cut by a swarm of Keweenaw dikes, is other than the Algoman.

At Killarney it is, I found (in an unpublished report of a trip I made with Ellsworth for the Canadian Survey before Lawson visited the region), associated with porphyries, as Lawson later pointed out. I did not find it at Killarney cut by diabase dikes. There are porphyrites north of it which I think are Keweenaw, but they do not seem to cut, but to conform in strike. I wish we could visit the region together. Even if it were cut by such dikes they would not show that it was not Keweenaw. I remember looking over some drill cores of the Onondago Copper Company in the Porcupine Mountain region (Hole 7 see 4-49-42 at 1,408 feet) close to Keweenaw Point and being surprised to find a basalt dike cutting the Keweenaw rocks. F. E. Wright and I found another intrusion in the Chippewa felsite which is the core.

The latest Keweenaw for which Urry has yet given age data is, I think, the north and south dike of the Horne mine (Noranda). This is the kind of dike to which Lawson refers. It is  $510 \pm 25$  million years old. On the other hand, a normal dike of the Gogebic range is 560. But this dike is cut and displaced by a sill and may, as L. M. Scofield, S. Royce and others suggest, be very late Huronian (Animikie, neo-Huronian). The ages of the flows of the mines of Keweenaw Point vary from 550 (Champion) to 520 (Atlantic) million years old. These dates cover at least two periods of wide-spread felsites and disturbances (not to mention the valuable suggestions of Broderick just made in "Economic Geology")—(1) Conglomerate 8 and the felsites of Mount Houghton and (2) Conglomerate 16 and the Chippewa felsite of Porcupine Mountain. But the Lake Shore traps are later with thousands of feet of strata separating and might be of the age of the Horne dike. In this letter I can not try to enter into the connections with the Duluth gabbro invasion and disturbances of late Keweenaw age studied by H. R. Aldrich and the Embarrass and the Presque Isle granites to which I referred (*American Journal of Science*, 1917, pages 42 to 48) nor the Republic (Lamey) and the Mellon (Richarz), more recently studied. Obviously there is time in the Keweenaw for various dates of granite intrusions. As Killarnean may have been included granites of substantially different ages which might yet all be Keweenaw.

But I agree with Lawson that these granites lap closely on the base of the Paleozoic, the top of the Upper Cambrian (the kolm), having been formed about 400 million years ago. Indeed I am inclined to

consider some Cambrian. Lawson has suggested<sup>1</sup> that the Algoman is some 218 million years earlier than the Keweenaw and Animikie, separated long enough for its profound peneplanation. Not to go beyond North America into Norway and Africa, there are such earlier granites. We may instance that represented by the Besner uranite, of which we have 3 or 4 lead ratios and an atomic weight, and the age is not far from 800 million years.

I imagine this and similar granites cutting only part of the Huronian would be Lawson's Algoman, for these are distinctly younger than another group of granites cutting the Grenville limestone, which are the original Laurentian granites represented by Wilberforce, Pied des Monts, Villeneuve, etc., about a thousand million years old. Out West there seem to be granites much older, Kewatin and pre-Kewatin, not yet distinctly recognized in Eastern Canada.

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### THE MELODIES OF VERSE

POETIC melodies tend, in good reading, to arrange themselves in patterns which coincide with the phrase or the line, and these patterns are often repetitive. Melody, furthermore, often emphasizes the poetic rhythm and the stanzaic structure, and prepares a sort of cadential effect for the end of a passage. These characteristics, often suspected, have been proved by phonophotographic researches into the nature of verse, which are being conducted this year under the auspices of the American Council of Learned Societies. The researches have revealed also a third characteristic: riming words tend to be pronounced on the same pitch.

The tendency of two riming words to be pronounced on the same pitch was noticed in an excellent reading by a distinguished American poet of a poem by Herrick. The mean frequencies of the riming words were as follows:

Word	Mean frequency, d.v.s.
eyes .....	235
skies .....	230
see .....	275
free .....	268
hair .....	250
air .....	248
wear .....	225
ear .....	232
stone .....	178
gone .....	172

This was all the more remarkable because the reader's pitch range for this poem was an octave and one half, and in one instance he had to jump seven tones in order to make his rimes correspond in pitch.

<sup>1</sup> *Bull. Geol. Soc. Am.*, 1934, p. 1069.