the fact that, in an analysis for water soluble salts, a high ratio of water to soil has been used. Under these conditions sodium zeolite will be hydrolyzed almost completely, and the alkalinity when calculated to the dry-soil basis may represent a relatively high percentage of sodium carbonate. The hydroxyl ions that are derived from the hydrolysis of sodium zeolite have heretofore been thought to be derived from the hydrolysis of sodium carbonate. When, in making an extract, the ratio of water to soil is gradually reduced, the percentage of hydroxyl ions is also reduced, until at a ratio that represents the optimum moisture content of the soil, few, if any, OH ions are found in the soil solution.

The titration curves for pH values of black alkali soils have been compared with curves made from solutions of known alkalis, and in this way the results of the soil investigation have been confirmed. This work, which has recently appeared as Technical Bulletin 13 of the Arizona Experiment Station, entitled "Sodium Hydroxide rather than Sodium Carbonate the Source of Alkalinity in Black Alkali Soils," by J. F. Breazeale and W. T. McGeorge, has an important bearing upon the reclamation of alkali lands by leaching, the application of gypsum and other correctives and to other practical soil problems.

P. S. BURGESS

UNIVERSITY OF ARIZONA

RESPIRATION OF INSECTS

IT has been known for a long time that insects breathe by means of openings called spiracles along both sides of the thorax and abdomen. These openings lead to tubes which branch and rebranch and thus spread to all parts of the body. The abdomen pulsates out and in during respiration.

In order to determine whether some of the spiracles were used for inhaling air and others for exhaling, the following experiments with large active grasshoppers were tried.

The first experiment consisted in placing the body of the grasshopper in a vertical position in a glass vessel. Water was then poured into the vessel until the abdomen was immersed in water and the head and thorax were out of water. The grasshopper was left in this position for twenty-four hours. At the end of that time it was taken out and appeared to be none the worse for its experience. During the course of the experiment I noticed that the abdomen continued to move in a normal manner and that air bubbles kept coming out of the abdomen.

The second experiment consisted in taking another grasshopper and reversing its position so that the head and thorax were under water and the abdomen only was out of water. The grasshopper was left in this position for twenty-four hours and during this time air bubbles came out around the thorax and rose to the surface of the water. When the grasshopper was liberated it seemed quite normal.

In the third experiment a grasshopper was placed in a vertical position in water with only the head out of water to see if air entered the body by any openings around the head. Air bubbles left the body and in ten minutes the grasshopper was limp and apparently lifeless.

CONCLUSIONS

These experiments would seem to prove that no special spiracles are used for inhaling and others used for exhaling, but rather that all are alike in this respect, as the abdomen expands air is taken in and as the body contracts the gases are exhaled.

The same thing is probably true of all insects.

D. A. MACKAY

OTTAWA COLLEGIATE INSTITUTE,
OTTAWA, CANADA

FOSSIL REMAINS IN THE LOESS OF EASTERN WASHINGTON

IN SCIENCE, page 477, November 12, 1926, announcement is made by O. W. Freeman of discovery of fossil bones of a mammoth (Elephas primigenius) in loessial deposits in the vicinity of Cheney, Washington.

This is of interest in connection with the study of the origin, distribution and age of the loessial soil-forming materials of eastern Washington, a subject which has been touched upon at intervals in the pages of this publication. It is particularly suggestive as indicating the age of accumulation of these great deposits from which the loessial soils of this region are derived, though widespread redistribution and modification of the soil materials have since taken and are still taking place.

The purpose of this comment is, however, to call attention to the fact that while reported fossils are rare, the writer, with Messrs. A. T. Strahorn and E. J. Carpenter, of the Bureau of Soils, found some large fossil bones embedded in loessial deposits exposed by a fresh highway cut in September, 1923. The remains were found about thirty miles northeast of Pasco on the Pasco-Kahlotus highway. They were partially removed during the following day under direction of Dr. Kirk Bryan, of the U. S. Geological Survey, and identified as a fossil elephant, and include thigh and pelvic bones, a number of ribs, vertebrae and the lower jaw. These fossil remains are now in the U. S. National Museum at Washington. The upper jaw and skull, however, which now appear essential to complete identification and restoration, were not recovered.

The bones were found on a hill slope bordering a small stream valley. They were embedded in fine-textured, uniform, very fine sandy and silty material of light brown color, without stratification, and entirely free from gravel or coarse gritty materials.

Accompanying the larger fossil bones were a number of jaws, skulls and small bones of small rodent or rodent-like animals, and there was some evidence in teeth marks on some of the rib bones that at least some of these smaller animals were of contemporary date.

A more accurate and exhaustive account of the fossil remains has recently been published by Dr. Bryan.[1]

MACY H. LAPHAM

BUREAU OF SOILS,
BERKELEY, CALIFORNIA

DEFEAT OF ANTI-EVOLUTION IN MINNESOTA

SINCE Minneapolis, Minnesota, is the home of the Reverend W. B. Riley, a leader in anti-evolution agitation and in attempts at legislation against the teaching of evolution in tax-supported schools in many states, a little more than ordinary interest may be felt by scientific men in the failure of the "Riley bill" before the Minnesota legislature that is now in session. This may be especially so because a letter by the Reverend Riley in a leading newspaper here now admits his defeat, but with so much apparent cheerfulness that a person who knows him well may be inclined to wonder as to just what he expected to accomplish by this bill and whether after all his defeat is not more in appearance than in reality.

It may be well for the evolutionists not to be deceived. The bill as it was presented to the legislature is any way more of a gesture or oratorical skirmish than an effectual attack on evolution teaching. Something more serious for Minnesota may lie behind it. In Minnesota, where the function of the university is defined in the constitution of the state, a mere legislative enactment very probably could in no way bind the university as to its educational policy. It is virtually a fourth department of the state and coordinate with the executive, the legislative and the judicial functions.

The State University has little if anything to fear from direct legislation against teaching any subject whatever in Minnesota. Again it is notable that the Riley bill does not aim broadly to forbid the teaching of evolution, but is specifically directed against the doctrine of the descent of man from animals, as if a particular department of the university is criticised. Against this bill, however, other universities of this state join with the State University in common. Both sides of the controversy thus make a great showing of political strength before the legislature.

Arguments used by either side are not such as are used *pro* and *con* in a scientific debate on the validity of natural science theories of evolution. No scientist as such appears against the bill nor for it. The battle is political when not theologic. Dogmatic assumption and deduction and even gross bigotry are met in kind largely. As a geologist, I could view the whole matter as in the clouds above me. I am spectator only.

Very obviously the Reverend Riley's opponents who do not know him intimately are deceived in him. From occasional contact with him for thirty years, it is not consistent for me to say that there is anything shallow about him. He doubtless has a very deep and serious purpose from which he may not be easily diverted. It may be a very pertinent matter to pause to consider just now as to whether any advantages are losing to the Riley attack.

To the best of my knowledge, the legislature and the governor do not commit themselves in the essential matter in laying aside this bill. Nothing is built up that hinders further agitation. The most sanguine of my friends predict only a lull of a year or two or even four, in Minnesota, whereas a few years ago any such attack at all would have been taken as highly improbable. Anti-evolution may be gaining in public respectability.

As a scientist, I am aware that something new is happening in this controversy about the teaching of evolution in Minnesota's schools. Attack by anti-evolutionists is not new here, however. Attack from the pulpit and otherwise by the Reverend Riley as against individual teachers of sciences began some 20 years ago. An effective method then is to back him off the board in defense of natural science theories of evolution by a plain show of visible evidence in their support. My personal experience is then that he can be a very reasonable and gentlemanly antagonist when faced in that way.

The new thing in the present instance, however, is not only his open attack on whole universities here, but further that the old effective method of meeting him can not be used by anybody. The controversy is gone beyond the field of the natural sciences, dogmatically into theology and politics on both sides. In all this controversy in Minnesota now the science professor is only an innocent bystander, in a sort of a no-man's-land. And, the end is not yet!

FREDERICK W. SARDESON

MINNEAPOLIS, MINN.

[1] U. S. Geol. Survey, Bull. 790–B, The "Palouse Soil" Problem with an account of Elephant Remains in Wind-Borne Soil on the Columbia Plateau of Washington.