DISCUSSION

EVIDENCE OF A LOWER LEVEL OF LAKE SUPERIOR

Early this fall a sample of peat was sent to the writer for pollen analysis. It had been dredged up from a depth of 54 feet below the surface of Lake Superior, about one and one half miles west of Sand Island, Bayfield County, Wisconsin. According to Professor J. A. Merrill, of the Superior State Teachers College, the deposit is in 40 feet of water and under 14 feet of lake sand, covers a considerable area, and is *in situ*. Another deposit is reported between Cat Island and North Twin Island, about 23 miles east northeast of Sand Island.

These two peat deposits would indicate a lake level at least 54 feet below the present level, which is not in accordance with our present ideas concerning the postglacial history of the region.[1] The unaltered state of the peat would strongly suggest that it was not of interglacial age, but postglacial, and probably associated with the Nipissing Stage of the Great Lakes.

Examination of the peat shows it to be remarkably well preserved. It is well stratified, and separates in layers when soaked in warm water. Several plant tissues are recognizable without special treatment of the peat. These are *Sphagnum,* leather leaf (*Chamaedaphne calyculata*) leaves, balsam fir (*Abies balsamea*) cone scales, and *Carex* achenes and rootstocks. The pollens in the peat are also well preserved, and are those of plants found in and near a typical northern peat bog. Spruce pollen is the most abundant form, and *Sphagnum* spores are second in abundance. Pollens of birch, heaths, sedge, willow, and several composites have been observed, but only tentatively identified. Numerous dark-colored spores of fungi also have been found. Besides many unknown pollens and spores, there occur a few fragmentary parts of small insects.

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THE STRUCTURE OF SOME INDUSTRIAL DIAMONDS

The catalog of a large European dealer in diamonds used for industrial purposes contains the interesting information as to the relative structure and hardness of several different forms in which carbon is found in nature. Diamonds for industrial uses are classified into *carbons* (carbonado, black Brazilian diamonds), *ballas,*[1] and *boarts* (borts), which they describe as follows:

Boarts are more or less transparent crystals, of bright appearance occurring in the most varied shapes, and sometimes in twin and multiple crystal formation—Brazilian boarts rank first in point of hardness, followed in approximate order of merit by Australian, South West African and Cape.

Carbons (or carbonados) differ essentially from boarts in their structure. They are often described as amorphous diamonds, but really consist of microscopically small dark octahedrons, and are, consequently, a porous cluster of minute diamond crystals, fine to close-grained. The fracture of a good carbon should resemble the structure of fine steel. Not being built up in countless thin layers, they are much less fragile than boarts and unlike the latter, can be used until entirely consumed. The intense hardness of carbons is extraordinary, and considerably exceeds that of boarts.

Ballas are comparatively rare, and are found in South Africa and Brazil. They are non-porous, mostly roundish in shape, and consist of innumerable, well-formed, minute crystals grouped in concentric formation around a nucleus. On account of their structure, they have no defined cleavage planes, and are, invariably, of extraordinary hardness. Strictly speaking, they are not harder than the best carbons, but tougher on account of their structure. Round white diamonds are often wrongly described as ballas, but these are merely boarts of round shape, which being easily cleaved, can in no wise be used in place of ballas.

Brazilian ballas is used to test the hardness of carbons. When the two are rubbed together, a white mark indicates that the carbon is harder, while a dark-brown mark indicates the carbon is harder. Where both stones are of equal hardness, *no* mark results on either.

These facts seemed to indicate that, as is the case with steels, the hardness is greatly influenced by grain size.[2] The American representatives of the dealers kindly loaned me a small ballas and two pieces of carbon, one very hard, the other softer. About two years ago Professor George L. Clark was good enough to take x-ray spectrograms of the three specimens. The results indicate that the ballas was composed of a great number of small crystals, the softer carbon of smaller and more numerous crystals, while in the harder carbon many of the crystals were approximately of colloidal dimensions, the rings of the x-ray spectrogram being continuous, with many small spots.

[1] Frank Leverett, "Moraines and Shore Lines of the Lake Superior Region." U. S. Geol. Sur. Prof. Paper 154–A (1929).

[1] The word "ballas" has not been found in any dictionary consulted, but seems to be a modified form of the Portugese *balas* meaning *bullets.* The Spanish and Portugese word *bola* means ball, whence is derived the Argentine *bolas* used much as our lasso. Through the Latin *ballista,* the word goes back to the Greek βαλλειν, meaning to throw. Palla is an Old German form, and the golden balls of the house of Medici, now used by pawn-brokers, were known as *pallé,* which was the rallying cry of the Medicis.

[2] Samples of ballas and carbon were exhibited before the American Institute of Mining and Metallurgical Engineers in the course of a discussion. See *Trans.,* Vol. C, 29 (1929).

In J. W. Mellor's monumental book, Vol. V, p. 720 (1924), it is stated: "Boart and carbonado are usually regarded as forms intermediate between diamond and graphite." But the photographs indicate that the crystalline form throughout is that of diamond, the differences in hardness being primarily consequent on variations in the structure and particle size of the aggregates.

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BACTERIAL STEM-ROT DISEASE OF HYBRID SEEDLING CANES

IN October, 1930, a bacterial stem-rot disease of hybrid seedlings canes appeared sporadically in the cane culture of the College of Agriculture at Los Baños, Laguna, Philippine Islands. Later the same disease was observed on hybrid canes in the sugar cane plantation of the Calamba Sugar State at Canlubang, Laguna, and in the sugar cane plantation of the Pampanga Sugar Development Company at Del Carmen, Pampanga. Affected plants show pale yellow color on the foliage followed by wilting of the entire plant. When weather conditions favor, the tops of the diseased plants fall over as a result of the rotting of the tender tissues of the shoot.

Microscopic examination of diseased plants showed the presence of abundant motile bacteria between the cells in the young stages and within the cells in advanced stages. The vascular tissues are apparently free from the bacterial invasion.

The bacterium has been isolated and grown in pure culture. Inoculation of healthy plants with the pure culture of the bacterium reproduced the disease. The organism is of the genus *Bacillus* Cohn., since peritrichiate flagella are demonstrated by proper staining methods. The causal bacterium is a cylindrical rod with more or less rounded ends. The cells occur singly or in pairs, occasionally in chains, and in clumps in 24 to 48-hour-old culture. Films prepared from the juice of infected canes and stained with aniline gentian violet gave measurements of the cells from 0.95 to 2.2 by 0.5 to 0.7 μ. Spores are not formed. Thin capsules are formed in three-day-old nutrient agar slants. The cells are motile by means of peritrichic flagella numbering from four to several. No involution forms were observed in one-month-old fluid cultures. The bacterium is gram negative and non-acid fast. No such species of bacteria has been reported heretofore as the cause of a stem rot of sugar cane. A more detailed description of the disease and the bacillus is in preparation.

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THE FOUCAULT EXPERIMENT

IN connection with certain studies related to the relativity theory it has occurred to the writer that it might be interesting to repeat the famous Foucault pendulum experiment on a large scale, over a long period of time of perhaps a year or more, and under carefully prepared conditions.

To do so would, of course, require a suitable place and the solution of a number of problems associated with its construction, continuing its motion without affecting its direction, precision of measurement, and others which occur with contemplation. With a pendulum length of 100 feet, for example, rotational motion with a period of more than 2,000 years should be easily detectable over a length of time of a year.

This experiment, if thus carefully performed might reveal or disprove some very intriguing speculative possibilities. It is rather fruitless to outline them but it would seem that a plane of motion for the pendulum perpendicular to the direction of the sun at the earth's perihelion would be a good place to start.

The writer is seriously considering undertaking the task and would be much interested to see opinion, criticism, or suggestion.

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SCIENTIFIC BOOKS

A History of Applied Entomology (Somewhat Anecdotal). By L. O. HOWARD. Smithsonian Miscellaneous Collections, vol. 84. Washington: Nov. 29, 1930. 564 pp., 51 plates (portraits).

> For the fly, the fly, the fly is on the turmit,
> And it's all me eye, for we to try
> To get fly off the turmit.—*Old Oxfordshire Ballad.*

> The intelligence of the human race, *if brought to bear*, will conquer the insect menace.—*L. O. Howard*, 1930.

IT is probably no exaggeration to say that many thousands of people, at the present time, owe their lives to the work of the entomologists. The greatly increased population of nearly all civilized countries could not be supported without a correspondingly increased food supply, and this we owe in large part to those who have taught us how to defend ourselves against the attacks of insects. Thus, to give a concrete example, there is no orange-grower in California who doubts that his crop would be entirely ruined, were it left to the insects which prey upon it. Within a few years, at most, he would have to go out of busi-