At present we may conclude that the specifically protective effect of blood serum is due not to the combination or inorganic constituents but to the proteid constituents of the blood. This may perhaps explain the fact that different blood sera may differ in their beneficial effect. We even found that the blood sera of diseased, anemic *Limuli* may become as ineffective or as injurious as sea-water. Whether the action of microorganisms enters as a factor in the case of blood sera of anemic *Limuli* remains still to be determined.

LEO LOEB

A PRELIMINARY NOTE ON SOIL ACIDITY

WHATEVER may be the cause and nature of soil acidity, apparently part of this acidity is due to some of the materials which constitute the soil itself. This gives rise to the question as to whether the minerals from which the soils are derived are acid; and if not, what changes occur in these minerals to make them acid and what factors cause these changes. Therefore in some work on soil acidity that has recently been done in this laboratory, the problem was attacked along a line somewhat different from that usually followed. Instead of working with acid soils entirely, neutral and basic soils were also chosen and the one factor which probably, more than any other, has to do with the natural changes produced in the soil forming minerals—namely, water leaching through the soil—was investigated. After working with a few soils, it seemed advisable to experiment with the more abundant minerals which constitute certain types of soils, and with a few of their decomposition products.

Such materials as the following were taken for the experiments: soils, rocks, miscellaneous gravel, pure minerals such as quartz, hornblende, microcline and garnet, and some of the decomposition products of the above mentioned minerals and rocks such as silicic acid, kaolin, silica, etc. Nearly all of the rocks, gravel and pure minerals were found to be either neutral or slightly basic. The materials were leached with water containing carbon dioxide, and analyses were made to determine what changes had occurred, both in the samples and in the percolated water.

The results from this work show that of all the samples that were leached, no matter whether the original material was basic or acid, the resulting material was acid; and that with the exception of the decomposition products such as silicic acid, kaolin, etc., nearly all of the samples became more acid. The fact should be emphasized here that all of the materials, with the exception of the soils themselves, were minerals or rocks which contained no organic matter. Hence the acidity was not due to organic matter.

From the above statements, the conclusion may be drawn that the compounds formed from some of the soil-forming minerals due to leaching, are an important factor in making soils acid.

Having shown then that some of the materials of which soils are composed, on being leached with water containing carbon dioxide, make soils acid, the next logical step in this research was to try to determine how these compounds give rise to this acidity.

This problem was attacked by determining the hydrogen ion concentration of neutral water extracts of the materials in question; and by determining the hydrogen ion concentration of similar extracts after different known quantities of standard calcium hydroxide had been added. A curve plotted from the results of these determinations should show (1) any excess of hydrogen ions in the solution; (2) the presence of any compound that is capable of taking up calcium hydroxide as a result of adsorption, by the formation of addition products, or by true chemical action; and (3) any excess of free hydroxyl ions. To illustrate, let the following figure represent the relation between the hydrogen ion concentration (expressed as P_h) in a solution and the amount of calcium hydroxide that has been added. Then line *ab* shows a decreasing excess of hydrogen ions in the solution; *bc* that the hydroxyl ions are being removed from the field of action as fast as they are added; and *cd*, an increasing excess of hydroxyl ions.

The curves plotted from the results of the determinations made on acid soils and on the decomposition products of the soil-forming minerals are similar to the one described above, while those made on neutral or alkaline soils are similar to lines *bc* and *cd* of that curve. This apparently indicates that there are some dissociated acids or acid salts present in the solutions of acid soils, and of the decomposition products; and that with all of the materials some of the calcium hydroxide is entirely removed from the field of action. These statements are interesting, especially when compared with the conclusions drawn in regard to soil acidity from results obtained by the freezing[1] point method. The conclusions by that method are contrary to the former of the above statements, but agree with the latter.

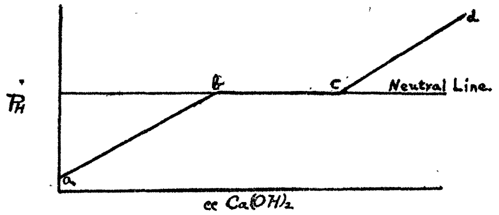

FIG. 1.

Some other interesting facts concerning these curves are that where they first reach the neutral line, they show a lime requirement as determined by the so-called Jones[2] method; and that where they leave the neutral line, they may indicate what Sharp[3] and Hoagland term "potential acidity" or what Bouyoucos[4] terms "maximum lime requirement." It is also interesting to note that the curves vary somewhat when bases other than calcium hydroxide are added to soils. Barium hydroxide gives rise to curves similar to calcium hydroxide, while sodium and ammonium hydroxides gives curves represented by lines *ab* and *cd* in the above figure.

This work is being continued with the hope that within a short time sufficient data will be obtained to warrant a more complete discussion of the subject.

O. B. WINTER

MICHIGAN AGRICULTURAL COLLEGE,
EXPERIMENT STATION

ALABAMA MEETING OF THE ASSOCIATION OF AMERICAN STATE GEOLOGISTS

ONE of the most successful and profitable annual field meetings of the Association of American State Geologists was held in Alabama, September 1 to 6, 1919, on invitation and under the able guidance of the state geologist, Dr. Eugene A. Smith. Headquarters were at the Tutwiler Hotel, Birmingham.

An instructive printed guide of 14 pages briefly summarizing the essential geologic features to be observed at each place visited in the state was prepared by Dr. Smith and associates. As originally planned, the program called for a division of the party into two sections (Highland and Coastal Plain), to be together only on the first and last days. This plan was later modified to exclude the Coastal Plain section, but was closely adhered to for the Highland section, which closed with a visit to the University of Alabama, so long and well known to geologists as the home of the distinguished host, Dr. Smith.

Much of the Highland region of the state, long known for its varied and complex geology, was covered by excursions, and many of the interesting features of physiography, structure, stratigraphy and economic geology, were reviewed. Among some of the more important localities visited were the famous Birmingham district, where opportunity was afforded for observing some of its more important geologic features, including visits to iron and coal mines, limestone quarries and industrial plants; the extensive productive graphite area between Lineville and Goodwater, the largest domestic producer of graphite; the marble quarries near Sylacauga; and Sheffield and Florence where are located the government nitrate plant and prospective water-power developments at Mussel Shoals on Tennessee River.

The geologists participating in a part or all of the excursions were: Eugene A. Smith and W. F. Prouty (Alabama), J. A. Bownocker (Ohio), G. F. Kay (Iowa), H. B. Kümmel (New Jersey), I. C. White (West Virginia), W. N. Logan (Indiana), S. W. McCallie and J. P. D. Hull (Georgia), W.

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[1] Mich. Agric. Col. Exp. Sta. Technical Bul., No. 27.

[2] *Jour. A. O. A. C.*, Vol. I., p. 43.

[3] *Jour. Agric. Research*, Vol. VII., p. 123.

[4] Mich. Agric. Col. Exp. Sta. Technical Bul. No. 27, p. 37.