teaching and research; for I am first and last a schoolmaster.

The war having ended more than a year ago, I thought I should like to go to the meeting of the American Association for the Advancement of Science at St. Louis, to meet my colleagues from the other universities and to talk over plans for the future. Now at the last the poor old decrepit U. S. Railroad Administration, which, I verily believe, has done more than any other single agency to increase the cost of living, decides that this association is not educational! Therefore, its members are not entitled to the reduced fare previously granted to those attending "meetings of religious, charitable, educational, fraternal, or military character." This, the equivalent of 2 cents per mile, which was full fare before the war, may be granted for truly educational gatherings, such as those of public kindergartners; but it is not for such as we are: we pay 3 cents per mile with a war tax added, or we help the railroads by staying at home.

Such is the judgment of a high official in that administration (Mr. Gerrit Fort, assistant director), who is doubtless provided with a salary adequate to support him and his family while he renders such decisions. Hear him: "The term 'educational' taken in its broad sense could be construed to cover a very large number of conventions. It was necessary, therefore, to restrict its definition, and this was done by confining it to those conventions having to do with elementary education, such as meetings of school-teachers."

This is the last straw!

SCHOOLMASTER

SPECIAL ARTICLES

THE PROTECTIVE INFLUENCE OF BLOOD SERUM ON THE EXPERIMENTAL CELL-FIBRIN TISSUE OF LIMULUS[1]

IN the preceding communication we showed that the solutions of different salts, which are constituents of blood serum or seawater, differ in their effect on the cellfibrin tissue and that the amount of regenerative outgrowth of the tissue is different in different solutions. If we cover a wound with 5/8 *m* NaCl healing may take place; a small piece of excised placed on a cover-glass and surrounded by a drop of NaCl solution may show a good outgrowth under the conditions of our experiment in which usually a small amount of blood serum was adherent to the piece. However, all of these solutions are inferior to the blood serum of *Limulus*. It was of interest to determine which constituent or combination of substances in the blood serum was responsible for the superiority of the serum, whether it was caused by the balancing action of salts or by another constituent.

Addition of calcium chloride in various quantities to the sodium chloride solution did not improve the latter and usually made it less favorable for the tissue. The addition of seawater in which the inorganic constituents are present in proportions similar to those found in blood serum, prevented an active outgrowth altogether. Inasmuch as it was possible that the alkalinity of the seawater was injurious to the tissue, we used seawater with a hydrogen ion concentration which corresponded to an approximately neutral solution. This did not improve the effect of seawater. The Van't Hoff solution mixture of salts was likewise much inferior to an isotonic NaCl solution. These results made it improbable that the beneficial effect of blood serum was due to inorganic constituents.

This conclusion was corroborated by the effect of the heating of blood serum. Heating the blood serum to 85° for a short time sufficient to coagulate a certain amount of its proteid destroyed the greater part of the beneficial effect of blood serum. Heating this filtered fraction still further to 100° for a short time, and thus producing an additional coagulation, made the blood serum as unfavorable as seawater; such heated and filtered blood serum had still the blue color of normal oxygenated *Limulus* blood. However, how far a proportionality exists between the intensity of heating and of loss of beneficial properties of the serum needs further investigation.

[1] From the Department of Comparative Pathology, Washington University School of Medicine, St. Louis, Mo.

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 seawater. 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.