and wiry" or "tall and flabby" (p. 381) in placing prospective workers. What we have to know is the limits of physical strength required for specific jobs. Similarly the question of heart efficiency as studied by Lowsley, Crampton and Schneider in this country would be of interest to the industrial physician. The omission of the nine figures illustrating the application of iodine and finger bandages (pp. 397–400) would provide ample space for such a discussion.

The maintenance of high production in any field of activity depends upon the health of the workers. Industrial hygiene need therefore make no appeal to the charity or humanity of industrial managers. It is primarily good business. Efficient, healthy, productive men and women have a social value whether their production is for service or for profits. Under any system of social organization industrial hygiene must therefore play a leading rôle in the future development of the world's industry.

REYNOLD A. SPAETH
SCHOOL OF HYGIENE AND PUBLIC HEALTH,
JOHNS HOPKINS UNIVERSITY

SPECIAL ARTICLES

SOIL ACIDITY THE RESULTANT OF CHEMICAL PHENOMENA

SALTS of strong acids with strong bases, of strong acids with weak bases, of weak acids with strong bases, of weak acids with weak bases, calcium hydroxide, the lowering of the freezing point, the catalysis of esters and the hydrogen electrode are all in use in one or another of the various methods advocated for the determination of "soil acidity." The results obtained by the different methods show that the condition of a soil at any time can be considered as its progress towards a constantly changing equilibrium according to the principles of Le Chatelier. It is to be remembered that those metallic elements occurring in ordinary soil stand at the top of the electromotive series of elements and that sodium and potassium compounds are all somewhat soluble; whereas, many calcium and magnesium compounds and most iron and aluminum compounds are very sparingly soluble in water.

The entirely different results obtained with different salts, and the large variations in soil acidity recently found by Conner when soils were kept at different moisture contents, make it certain that acid soils usually contain many soluble hydrolytic products which are controlled in amount by the quantity of alkaline earths and alkali metals present in the soil.

Carbon dioxide gas has long been known to cause many chemical changes in silicates and phosphates resulting in the increased solubilities of constituents making up these substances. The following results were obtained in recent investigations where soils in culture pots were treated with carbon dioxide. (The details of the different experiments will be published elsewhere.)

1. An "alkaline" sandy soil became acid in reaction in three months treatment with carbon dioxide gas.

2. The acidity of an acid brown silt loam was increased by treating the soil with carbon dioxide gas.

3. Liming this loam decreased its acidity but not as much as the original "lime requirement" determination (Veitch) indicated. One and one half times the total lime requirement did not neutralize the soil.

4. Where the soil was limed, limed and phosphated, and limed and treated with dried blood or sodium nitrate, carbon dioxide gas additions to the soil increased the soil acidity.

5. The specific conductivity of extracts obtained on treating the soils with conductivity water showed that the carbon dioxide gas had changed the constitution of the soil. The specific conductivity of the carbon dioxide treated soils was greater.

6. The acidity of the soils was lowered by extraction with conductivity water and the lowering was greater for those samples which had been subjected to the carbon dioxide treatments. A further evidence that the acidity was due to chemical changes in the soil was that the aluminum and iron in the normal potassium nitrate extracts was effected by the carbon dioxide treatments.

7. The volatile material determination was increased by carbon dioxide treatments, and since this increase could not be accounted for in the determination of total carbon, the carbon dioxide gas must have changed the water of constitution of some of the soil silicates.

8. The composition of the conductivity water extracts from the different soils varied as the fertilizer constituents added would theoretically replace substances known to be present in the soil.

9. The composition of the conductivity extracts from the carbon dioxide treated samples showed that the increased specific conductivity and acidities due to carbon dioxide treatment were associated with substances with low solubility and ionization constants present under conditions where hydrolysis readily took place.

The shifting of the acidity, the chemical changes in the soil and the soil extracts were in accordance with the solubilities of salts of metals high in the electromotive series and their tendencies to hydrolyze. The work leads to the conclusion that soil acidity is the resultant of hydrolytic mass action phenomena and thus the application of the exact amount of lime shown by any method can not be expected to give exact neutrality.

H. A. Noyes

Mellon Institute of Industrial Research,
University of Pittsburgh,
Pittsburgh, Pa.

THE AMERICAN MATHEMATICAL SOCIETY

The two hundred and sixteenth regular meeting of the American Mathematical Society was held at Columbia University, on Saturday, April 23, 1921, extending through the usual morning and afternoon sessions. The attendance included sixty-seven members. Twenty-four new members were elected, and eleven applications for membership in the society were received.

The council voted to accept the invitation received at the February meeeting to hold the next annual meeting of the society at Toronto in connection with the meetings of the American Association for the Advancement of Science.

The following papers were read at this meeting:

On the gyroscope: W. F. Osgood.

Seven points in space and the eighth associated point: H. S. White.

Most general composition of polynomials: L. E. Dickson.

Number of real roots by Descartes' rule of signs: L. E. Dickson.

The Einstein solar field: L. P. Eisenhart.

A special kind of ruled surface: J. K. Whittemore.

On the theorems of Green and Gauss: V. C. Poor.

Pressure distribution around a breech-block: J. E. Rowe.

The mathematical theory of proportional representation. Third paper: E. V. Huntington.

On the apportionment of representatives. Second paper: F. W. Owens.

On the geometry of motion in a curved space of n dimensions: Joseph Lipka.

Note on an irregular expansion problem: Dunham Jackson.

Hyperspherical goniometry, with applications to the theory of correlation for n variables: James McMahon.

On the location of the roots of polynomials: J. L. Walsh.

The kernel of the Stieltjes integral corresponding to a completely continuous transformation: C. A. Fischer.

On a simple class of deductive systems: E. L. Post.

Topics in the theory of divergent series: W. A. Hurwitz.

A new vector method in integral equations: Norbert Wiener and F. L. Hitchcock.

On a certain type of system of ∞^2 curves: Jesse Douglas.

Concerning Laguerre's inversion: Jesse Douglas.

Closed connected point sets which are disconnected by the omission of a finite number of points: J. R. Kline.

The sum of a series as the solution of a differential equation: I. J. Schwatt.

Method for the summation of a general case of a deranged series: I. J. Schwatt.

Higher derivatives of functions of functions: I. J. Schwatt.

A covariant of three circles: A. B. Coble.

R. G. D. Richardson,
Secretary