approximately 350 milligrams and constituted a treatment. The Lloyd's reagent holds the nicotine as long as the mixture is in an acid medium, liberating it when it becomes alkaline. The small intestine is slightly acid at its anterior end but becomes rapidly alkaline at about the point where the intestinal worms are present in the greatest numbers. Thus the nicotine is liberated at the desired point for the maximum effect on these worms. Rectal injections of nicotine sulfate (40 per cent. nicotine) diluted at the rate of 1 cc. to 200 cc. of distilled water and administered in 10 cc. injections remove approximately 85 per cent. of the cecum worms. Stronger concentrations are decidedly toxic, a 1 per cent. mixture administered in the same manner causing an immediate paresis and death in about ten minutes.

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TO DEMONSTRATE PROTEIN GRAINS

ONE of the most effective ways to demonstrate the presence of protein grains in the cellular tissue of a seed is by making a free-hand razor section of the meat of a Brazil nut. Place the section on a glass slide, and flood it several times with ether. If enough ether is used to cause it to flow over the edges of the slide the dissolved fat will collect on the under side of the slide where it is easily wiped off. After treating with ether flood with absolute alcohol; replace the alcohol with xylol and mount in xylol, or if a permanent mount is required mount in balsam. The Brazil nut is rich in its peculiar kind of protein, and by this method several of the grains may be seen in nearly every cell.

E. R. SPENCER

AMEBOID BODIES ASSOCIATED WITH HIPPEASTRUM MOSAIC

IN a recent publication[1] the writer described and pictured certain bodies in the cells of corn plants suffering from mosaic disease. Since the bodies are confined to diseased portions of the plant, it was suggested that they might be of etiological significance.

[1] Bul. Exp. Sta., H. S. P. A., 3: 44-58 (1921).

Those who are working on the mosaic disease problem will be interested to know that similar bodies have now been found in the light green portions of mosaic leaves of *Hippeástrum equéstre* Herb. This plant belongs in the Amaryllidaceae and is not closely related to corn. Its leaves which are thick and soft are well suited for cytological studies. The mosaic pattern shown by *Hippeástrum* is quite different from that of corn. The intracellular bodies associated with this disease will be described in detail in a future paper.

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SCIENTIFIC BOOKS

Laboratory Manual of Colloid Chemistry. HARRY N. HOLMES. John Wiley & Sons, Inc. XII + 127 pp.

THIS volume was written at the suggestion of the Colloid Committee of the National Research Council. Colloid chemistry is growing rapidly and this book is a welcome addition to the colloidal literature. There are 186 experiments, from which the student is expected to select the ones suited to his particular needs.

There are first of all methods of preparation and purification followed by illustrative examples of peptization and coagulation, of protective colloids and solvated colloids. The measurement of surface tension and viscosity are treated in brief chapters. In a chapter on adsorption several experiments are given on silica gel. The use of the ultra-microscope receives two pages. Experiments on hydrogen ion concentration and osmotic pressure and Donnan equilibrium are not included. Descriptive matter preliminary to the experiments makes the work easy reading and stimulates the use of the author's bibliography.

In classical chemistry we have used quantitative measurements to the greatest advantage, melting point, boiling point, solubility, percentage composition and molecular weight and they give the firmest sort of a foundation upon which to build a science. Colloid chemistry can hardly be called an exact science until it can offer similar quantitative measurements and

exact definitions. (Too much have we followed the good old practice, *"Wo ein Idee fehlt steckt man ein Wort hinein."*) We have a stupendous nomenclature, but do substances in the colloidal state have a measurable melting point (or something analogous to it)? We say that nitrocellulose is more soluble in acetone than in amyl acetate; but do colloids have a measurable solubility (or some analogous property)? Of what possible use is the measurement of the viscosity of a colloid if the viscosity is always a function of the particular shearing stress used and therefore not a definite property? When do colloidal solutions pass into true solutions? Gels are elastic, but how elastic? And what is a gel? Dr. Holmes quotes, page 43, with approval the interesting statement, "There is a definite connection between the boiling point, the viscosity and the heat of dilution of a solution of salt and its solvent power for cellulose." How is this solvent power measured, what is this connection and why does it exist? Several experiments in this manual are pretty without teaching much. In other cases the lesson is lost because chemists are in disagreement. It seems obvious to the reviewer that there is great need for more fundamental work on colloidal materials. And perhaps it is not too daring to hope that chemists will be found in agreement when the generalizations are sufficiently broad and far-reaching. Such work should serve not only as a basis for sound theory but offer simple quantitative experiments for instructional purposes of the highest pedagogical value.

EUGENE C. BINGHAM

SPECIAL ARTICLES

PHASE REVERSAL IN PROTOPLASM AND EMULSIONS

THE reversal of phases in oil emulsions by electrolytes was discovered by Clowes.[1] Clowes worked with olive oil emulsions in which the aqueous phase was a soap solution, the soap being added directly or formed through saponification of the oleic acid in the olive oil by an aqueous phase of NaOH. Clowes found that, when the salt of a bivalent cation ($CaCl_2$) is in excess in the aqueous phase, the emulsion is of the water-in-oil type, and when the hydroxide of the monovalent cation Na is in excess, the emulsion is of the oil-in-water type. Clowes came to some very interesting and far reaching conclusions on the basis of his experiments. It does not appear that he worked with emulsions in which the stabilizing agent is some colloid other than soap.

Clowes saw in the behavior of oil and water emulsions (in which soap is the emulsifier) an explanation of changes in protoplasmic permeability. It is now believed (by some biologists) that monovalent cations increase permeability of the plasma membrane, while bivalent cations decrease permeability. The hydroxide of the monovalent cation Na produces in an oil emulsion (with a soap stabilizer) a system in which the continuous phase is water. Such a system would be readily permeable to water soluble substances. Salts of bivalent cations, such as $CaCl_2$, produce an emulsion in which oil is the continuous phase. Such a system would be impermeable to water soluble substances.

On the basis of the similarity of the reactions of oil emulsions and of protoplasm to mono- and bivalent cations, Clowes has conceived of living protoplasm in contact with water as a system which is, within the protoplasmic mass, a dispersion of proteins, lipoids, etc., in water, and, at its surface, a system of the reverse type, in which water is dispersed in an external continuous fatty or lipoid phase. Clowes does not, however, regard the surface layer of protoplasm as a system in which the aqueous phase is wholly discontinuous, but rather as a system in which the continuous lipoid phase is permeated by water channels, *i.e.*, as an emulsion which is near the reversal point.

Clowes has assumed that the stabilizer active in the supposed protoplasmic emulsion is either soap or a substance which is like soap in its reaction to mono- and bivalent electrolytes. While soaps are present in protoplasm it does not seem likely that they are the emulsifier which determines the behavior of the supposed living emulsion when other possible emulsifiers such as proteins and lipoids are present in much greater quantities.

I had the pleasure of discussing phase reversal in emulsions with Mr. Hatschek, of London.

[1] Clowes, G. H. A., "Protoplasmic equilibrium," *Jour. Phys. Chem.*, 1916, xx, 407-451.