tween quiz sections was manifested, and the different sections came as units to boost their representatives. The students had had three or four weeks in which to prepare for the contest, and nearly all of them had been working hard for it. Our instructors are all agreed that the students participating derived great benefit from this match.

In addition to these benefits, the contest brought out the fact that our chemical nomenclature is not yet above reproach. A few instances of ambiguity might be cited: Sodium thiosulphate, $Na_2S_2O_3$, is sometimes named sodium hyposulphite and so labelled by a few manufacturers of chemicals. The latter name, however, is represented by the formula $Na_2S_2O_4$. Potassium fluosilicate and potassium silicofluoride are both used to represent the same substance. Potassium sulphocyanide and potassium thiocyanate are two names in use for KCNS. Then, again, we say hydronitric acid, or triazoic acid, or azoamide, when we mean a substance with the composition N_3H.

If these spelling bees were to be adopted by a considerable number of educational institutions it would doubtless tend to unify chemical nomenclature so that finally we should have one name only to represent a chemical compound having a definite composition. Spelling matches of this sort could also be profitably arranged between classes in organic chemistry, mineralogy and perhaps other departments of science. The contests appeal to students because they combine the elements of sport and competition. The benefits derived therefrom are incalculable, and we are now planning to make the chemical spelling match an annual event at the West Virginia University.

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SCIENTIFIC BOOKS

Proteins and the Theory of Colloidal Behavior. By DR. JACQUES LOEB, member of the Rockefeller Institute for Medical Research. New York: McGraw-Hill Book Co., 285 pp. 1922.

IN this volume the author has collected the results of his extensive investigations upon the properties of protein solutions and has attempted to found upon them a general theory of colloids. The book falls naturally into two sections. The main argument in the first half is that proteins are amphoteric electrolytes and that consequently, when hydrogen ion concentrations are duly measured and considered, proteins are found to combine with acids and alkalies according to the stoichiometrical laws of classical chemistry. This argument is illustrated and supported by numerous tables and diagrams. In the second part of the book the conclusion is established that all of the experimental results recorded can be logically explained upon the basis of Donnan's theory of membrane equilibria.

The far-reaching significance of the author's contentions may be summarized in the statement that, if justified, they dispose of colloid chemistry as a special branch of the science, with laws different from those of general chemistry. This does not, as is pointed out in the preface, detract from the importance of colloidal behavior for physiological and technical problems, but it completely changes the theoretical treatment of the subject.

A revolution in our current conceptions of colloidal solutions is hereby threatened, equal in importance to that brought about by van't Hoff and Arrhenius a generation ago in the field of crystalloidal solutions, and it seems probable, from certain reviews that have already appeared, that the battle between the new and the old points of view will be waged with equal bitterness. It is interesting to note in this connection that the veteran fighter Armstrong, now president of the Society of Chemical Industry in England, went out of his way in his recent Messel Memorial Lecture at Glasgow to refer to Loeb's "praiseworthy efforts to raise the character of the proteins from mere indeterminate lumps of jelly to a status of definite materials behaving in a simple and definite, orderly manner, if only put under comparable conditions." Since, however, he indulged in the course of the same address in his customary diatribes against the Scandinavian Ikon Arrhenius and his High Priest Ostwald, remarking that "hydrogen ion concentration is pure gibberish," his conversion to Loeb's theory is obviously incomplete. As he so appositely puts the case himself: "We all have partially permeable intellects."

At this stage, indeed, it is altogether premature to express an opinion as to the outcome of the struggle. What is certain is that Loeb has made, in this volume, a brilliant thrust which his adversaries will find it difficult to counter. There are many points of detail in his experimental work which will curdle the blood of any analytical chemist, yet it appears on close examination that the errors introduced are, after all, insufficient to affect the main issue. The opponents of Loeb's views, in any case, cannot restrict themselves to attacking the weak points of his presentation; he has already succeeded so far as to put them definitely on the defensive. To quote from his own preface: "Any rival theory (of colloidal behavior) which is intended to replace the Donnan theory must be able to accomplish at least as much as the Donnan theory, *i. e.*, it must give a quantitative, mathematical and rationalistic explanation of the curves expressing the influence of hydrogen ion concentration, valency of ions, and concentration of electrolytes on colloidal behavior; and it must explain these curves not for one property alone but for all the properties, electrical charges, osmotic pressure, swelling, viscosity, and stability of solution, since all these properties are affected by electrolytes in a similar way."

This quotation may be supplemented by another, from the final page of the book, indicating the importance of Loeb's work outside of chemistry. "If Donnan's theory of membrane equilibria furnishes the mathematical and quantitative basis for a theory of colloidal behavior of the proteins, as the writer believes it does, it may be predicted that this theory will become one of the foundations upon which modern physiology will have to rest."

Every so-called colloidal chemist will evidently be forced to read Loeb's book in self-defense. Those also who are only indirectly interested in colloidal phenomena cannot fail to find it stimulating.

James Kendall

SPECIAL ARTICLES

MOSAIC CROSS-INOCULATION AND INSECT TRANSMISSION STUDIES

Whether or not the plant disease known as mosaic is transmissible to plants of different orders, and the rôle of insects as agents in such transmission, are questions of fundamental importance. It is generally held that mosaic of the Cucurbitaceæ, Solanaceæ and Leguminaceæ are all quite specific and with few exceptions transmissible only to species within the same family. Certain mosaic diseases have been described indicating that even among species within the same family there may be two or more types of the disease. Allard[1] in 1916 described a specific mosaic disease on *Nicotiana viscosum* distinct from the mosaic disease of *Nicotiana tabacum.* Jagger[2-3] in 1917 and 1918 reports three specific mosaic diseases of the cucurbits. The tendency has thus been to divide mosaic into types which are distinct in their host range.

As opposed to the evidence indicating that there are a number of types of mosaic which are specific to a narrow host range, we have evidence showing that mosaic will cross to species belonging to other families and orders. Jagger[4] in 1918 published results of cross-inoculation studies where he succeeded in transferring mosaic from the Cucurbitaceæ to species of two other families of the Order Campanulales. Doolittle[5] has shown that mosaic of cucumber is transmissible to *Martynia louisiana,* a species belonging to the Order Polemoniales.

Cross-inoculation experiments by the writer have shown that the mosaic diseases of the Cucurbitaceæ, Solanaceæ and Leguminaceæ are inter-transmissible. Four petunia plants inoculated with mosaic from crookneck squash became infected while an equal number of checks remained healthy. The inoculations were made by inserting mosaic tissue into the stem with a sterile scalpel. An experiment in which juice from mosaic plants was inoculated hypo-

[1] *Journ. Agr. Research,* 7: 481-486, 1916.

[2] *Phytopathology,* 7: 61, 1917.

[3] *Phytopathology,* 8: 74-75, 1918.

[4] *Phytopathology,* 8: 32-33, 1918.

[5] *U. S. D. A. Bull.* 879, 1-69, 1920.