buzzing sound, which seems to have been simultaneous with the appearance of the light. This communication is prompted chiefly by a desire to learn if such sounds have been previously reported as being connected with meteoric falls. Several circumstances in the present case indicate that this sound was real, and not psychological. May it have been the indirect result of some form of electric energy? One observer seems to refer this sound to objects attached to the ground.

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AUSTIN, TEXAS,
October 22, 1917

ON THE COLLOID CHEMISTRY OF FEHLING'S TEST

TO THE EDITOR OF SCIENCE: Fischer and Hooker make the following statement in their article "On the Colloid Chemistry of Fehling's Test," page 507, SCIENCE:

> Formaldehyde reduces Fehling's solution not only to the ordinary cuprous oxide, but to the metallic copper. The copper comes down in colloid form, but as this happens, a second reaction ensues in which the metallic copper acts upon the formaldehyde and decomposes it with the liberation of hydrogen. The liberation of hydrogen continues for hours, until either all the formaldehyde has been decomposed or all the copper salt has been reduced.

In a study on the preparation of colloidal gold solutions by Dr. J. H. Black and myself (which is being reported by Dr. Black at the present meeting of the A. M. A. at New York), question arose regarding the probable explanation of the mechanism by which neutral sols are obtained although distinctly alkaline (to alizarine) sols should result from the proportions of reagents employed. I suggested the hypothesis that the colloidal gold acted as a catalytic agent to oxidize the free formaldehyde to formic acid, which latter reacted with the potassium carbonate responsible for the alkalinity.

It occurs to me therefore that it would be better to picture the colloidal copper functioning as a catalytic agent which oxidizes the HCHO in part, the remaining part serving to reduce the copper salt. The idea advanced by them that colloidal copper is produced is certainly reasonable; it is very difficult to understand how formaldehyde would liberate hydrogen.

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SCIENTIFIC BOOKS

The Fundamentals of Botany. By C. S. GAGER. Philadelphia, P. Blakiston's Sons & Co.

We are fortunate in the United States in having a number of excellent elementary botanical text-books, written from different points of view. Professor Coulter has furnished an admirable beginners' book conceived from the standpoint of the head of a botanical department in a large university, who is at the same time an educational expert. From the hands of Mr. Bergen, whose recent demise we all deplore, we have had a succession of well-approved texts, written by one thoroughly in touch with instruction in the secondary schools. Professor Ganong has put forward from time to time books which reflect the outlook of the teacher in college work. The present volume comes from one who is the director of one of the most important botanic gardens in the country and who has, at the same time, made it his business to get into touch with his community, primary and secondary schools as well as the general public, in the closest possible manner. There can be little doubt, particularly at the present juncture, when the general public under the spur of patriotism and necessity, has largely abandoned its usual attitude of indifference toward plants, that Dr. Gager's book will prove extremely useful.

The relation of the author to his subject is admirable, as is shown by the following citation (p. 192).

> . . . In fact, we may say that our ignorance of life-processes greatly exceeds our knowledge. Very much more remains to be ascertained than has already been found out; for example, what is protoplasm? Nobody really knows. We have analyzed the substance chemically, we have carefully examined and tried (but without complete

success) to describe its structure. We know it is more than merely a chemical compound. It is a historical substance. A watch, as such, is not. The metal and parts of which a watch is made, have, it is true, a past history; but the watch comes from the hands of its maker *de novo*, without any past history *as a watch*. But not so the plant cell. It has an ancestry *as a cell;* its protoplasm has what we may call a physiological memory of the past. It is what it is, not merely because of its present condition, but because its ancestral cells have had certain experiences. We can never understand a plant protoplast merely by studying it; we must know something of its genealogy and its past history.

It will be noted that although a physiologist in outlook, he has properly emphasized the historical and structural point of view so often and so deplorably neglected by the cultivators of disembodied plant physiology. The author obviously considers that living matter is to be studied *in vita* rather than *in vitro* (whether in glass models or merely in chemical glassware). By his broad outlook he has avoided the narrows which lead, on the one hand, into the ancient Scylla of systematic botany, or, on the other, into the more modern Charybdis of plant physiology.

The book is admirably printed on thin paper, so that its more than six hundred pages and well over four hundred illustrations make a conveniently thin and flexible volume, which is rendered still more useful by soft covers and rounded corners. The illustrations, whether original or borrowed, are for the most part good, and in some instances are of striking excellence. An adequate amount of space is given to the important themes of genetics and evolution, while the historical side is not neglected. Dr. Gager's work should be in the hands of every teacher of botanical science, and by its broadness and balance is admirably adapted for use in schools where the one-sided teaching of the facts of botany is by necessity and common sense excluded. The general text is accompanied by a laboratory guide, which is ingeniously contrived to avoid repetition and equally emphasizes structure and function.

E. C. JEFFREY

SPECIAL ARTICLES

WHY CHLOROFORM IS A MORE POWERFUL AND DANGEROUS ANESTHETIC THAN ETHER

ANY one accustomed to administering anesthetics has observed that the amount of chloroform necessary to produce deep narcosis is less than that of ether; also that the period between slight and deep anesthesia is shorter and the lethal dose smaller with chloroform than with ether. These differences in the effects of ether and chloroform led Hewitt to state in his book on "Anesthetics" that chloroform is seven or eight times more powerful as an anesthetic than ether. In chloroform poisoning it is known that many of the organs, particularly the liver, are very seriously injured, while it is more difficult, or impossible in many instances, to produce such injuries with ether.

It is now recognized that in both chloroform and ether anesthesia oxidation is decreased or rendered defective, as is indicated by the decreased oxygen intake and carbon dioxide output and the appearance of certain incompletely oxidized substances such as β-oxybutyric and diacetic acids, and acetone. The decreased oxidation in anesthesia with resulting acidosis is much more likely to occur and to a much greater extent with chloroform than with ether.

Using practically all the means by which it is known that oxidation can be increased in an animal, as, for example, by food, by increasing the amount of work, by fight, or by thyroid feeding, we have found that there is always an accompanying increase in catalase, an enzyme in the tissues which possesses the property of liberating oxygen from hydrogen peroxide. We have also decreased, or rendered defective, the oxidative processes in animals, as, for example, by decreasing the amount of work, by starvation, by phosphorus poisoning, or by extirpation of the pancreas, thus producing diabetes, and have found that there is always a corresponding decrease in catalase. From these results it was concluded that it is probable that catalase is the enzyme in the body principally responsible for oxidation.