tact. We are extending further this interesting method of determining the nature of hydrogen adsorbed on surfaces.

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THE ALLOMERIZATION OF CHLOROPHYLL

Sir:

When an alcoholic solution of chlorophyll is allowed to stand, a process known as allomerization takes place.[1] Allomerized chlorophyll *a* differs from the original material in that the product of hot alkaline hydrolysis is a mixture of unstable chlorins instead of the normal product chlorin *e*. The same unstable chlorins are obtained from unallomerized chlorophyll or the magnesium-free compounds (phaeophytin *a* or methyl phaeophorbide *a*) by saponification with alcoholic alkali at room temperature or below. It has recently been established[2] that the essential change in both allomerization and low temperature saponification ("phase test" hydrolysis) is the dehydrogenation of the grouping —CHOHCO— to —COCO—. The fate of the two hydrogen atoms was, however, uncertain. We have now been able to show by very simple experiments that the hydrogen atoms are removed by the oxygen of the air. If allomerization or "phase test" saponification is carried out in a modified Warburg apparatus,[3] the absorption of oxygen is easily measured. The amount absorbed corresponds to the removal of two hydrogen atoms with the formation of hydrogen peroxide.

The dehydrogenation of chlorophyll *a* or the magnesium-free compounds in the *a* or *b* series may also be brought about by the use of potassium molybdicyanide in acetone–pyridine solution. Two equivalents of reagent are required per mole. Dehydrogenated chlorophyll *a* thus prepared is identical with allomerized chlorophyll (the ultraviolet absorption spectrum is a satisfactory method of distinguishing the dehydro compound from the original material). After removal of the magnesium from allomerized chlorophyll or chlorophyll dehydrogenated with molybdicyanide, the absorption spectrum in the visible and the ultraviolet is identical in both cases and indistinguishable from that of methyl dehydrophaeophorbide. This latter substance we have prepared in quantity by the action of molybdicyanide on methyl phaeophorbide *a;* it yields the unstable chlorins on hot alkaline hydrolysis.

[1] Willstätter and Utzinger, *Ann.*, **382,** 129 (1911).
[2] Conant, Hyde, Moyer and Dietz, THIS JOURNAL, **53,** 359 (1931).
[3] Hyde and Scherp, *ibid.*, **52,** 3359 (1930).

From the facts given above, it is clear that allomerization is dehydrogenation brought about by the oxygen of the air. It is interesting that the dehydrogenation of a very easily oxidized group in chlorophyll is without pronounced effect on the color, although marked changes in color, as a rule, accompany the oxidation of a colored substance. The unusual behavior of chlorophyll in this respect is due to the fact that the chromophoric group is not the most easily oxidized group. A theory of photosynthesis has been recently suggested[4] which is based on the presence of this easily dehydrogenated group in chlorophyll.

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NEW BOOKS

Fundamentals of Chemistry. By CARL WILLIAM GRAY, CLAUDE W. SANDIFUR and HOWARD J. HANNA. Revised and enlarged edition. Houghton Mifflin Company, 2 Park St., Boston, Massachusetts, 1929. xiv + 650 pp. 201 figs. 13 × 19.5 cm. Price $1.80.

This book is a revised and enlarged edition of a high school text, first published in 1924.[1] The order of presentation of the subject matter, used in the first edition, remains one of the original features of the book. This unusual order is characterized in part by the introduction of metals in Chapter III, metallic oxides and ores in Chapter VI, and the introduction of carbon as the third element considered. A new chapter on the structure of matter has been introduced before the chapter on ionization, obviating one criticism of the first edition. These two chapters now constitute a good elementary presentation of the electron concept, which, however, is not afterward utilized even in discussing such topics as the periodic classification and storage batteries, and only a limited use is made of this concept in the chapter on oxidation and reduction which has been added in this edition.

Other new chapters are entitled "The Atmosphere," "Paints, Varnishes and Lacquers," and "Chemistry in Agriculture." These titles indicate that the method of treatment and the subject matter are those conventionally associated with courses for school students not in the college preparatory group. However, it cannot be said that the fundamental generalizations have suffered. The illustrative material and the order of treatment constitute the chief differences from the conventional text.

[4] Conant, Dietz and Kamerling, *Science*, **73**, 268 (1931).

[1] Reviewed in THIS JOURNAL, **47**, 592 (1925).