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CATALYTIC CHEMISTRY.

- (1) *Catalysis in Industrial Chemistry*. By Prof. G. G. Henderson. (Monographs on Industrial Chemistry.) Pp. x+202. (London: Longmans, Green, and Co., 1919.) Price 9s. net.
- (2) *Catalytic Hydrogenation and Reduction*. By Dr. E. B. Maxted. (Text-books of Chemical Research and Engineering.) Pp. viii+104. (London: J. and A. Churchill, 1919.) Price 4s. 6d. net.

BOOKS on analysis are legion. The ionic theory has helped the chemist to appreciate the anion and cation in electrolysis, but the term catalysis has only recently been deemed worthy of appearing on the title-page of a chemical text-book.

In the "Dictionary of Applied Chemistry," 1916 edition, issued by the same firm of publishers as that of Prof. Henderson's "Catalysis in Industrial Chemistry," there is no separate article on catalysis, the reader being referred to "Chemical Affinity" for the definition, whilst Dr. Maxted's "Catalytic Hydrogenation and Reduction" as a special branch of the wider subject received only indirect mention.

Both books are for the industrial reader, and show the rapid development of applied science without attempting to trace the growth of the fundamental idea from the early conceptions of Davy and Faraday, although Prof. Henderson has unearthed an early patent of Phillips in 1831 for the production of sulphuric anhydride from sulphur dioxide and oxygen through the catalytic action of platinum, which may be regarded as the precursor of the modern contact process as developed at Freiberg and by Squire and Messel in London. The Doberiner lamp of 1822 was an early industrial application of a metallic catalyst to hydrogen oxidation, and the stability of hydrogen peroxide in presence of acids, as shown by Thenard in 1818, is still a commercial illustration of negative catalysis which should be added to Prof. Henderson's review.

If a catalyst is simply an unalterable substance which modifies the velocity of the reaction, all solvents must be looked at catalytically, as pointed out by Ostwald, and Prof. Henderson gives us his first catalyst water both in heterogeneous solution, as in the inversion of cane-sugar, and in a homogeneous gaseous system, as shown by Dixon in sparking dry carbon monoxide and oxygen. The work of Sabatier and his pupils on the hydrogenation and reduction of organic compounds has activated within the last decade an industrial development of those catalytic processes which involve the use of free hydrogen, so that at the present time they are yielding results of considerable commercial value which are not confined to the soap industries. Although these are sufficiently summarised in two of Prof. Henderson's chapters, they are much more interestingly

elaborated in Dr. Maxted's little book of 104 pages.

Wieland's interesting work with oxygen-free palladium in order to differentiate between catalytic oxidation and dehydrogenation, as, for example, in the conversion of hydroquinone into quinone, is not referred to by Prof. Henderson, although its bearing on the function of water as a catalyst in carbon monoxide oxidation is important, and, as pointed out by Dr. Maxted, these results throw quite a new light on the necessity for, and rôle of, water in oxidation reactions generally.

The extended use of these hydrogenation processes has necessitated a consideration of the methods for manufacturing a suitable hydrogen free from poisons to benefit the equally important catalytic synthetic ammonia and nitric acid processes essential for the future explosive and fertiliser industries. It is remarkable that here, again, the interaction of water-gas and steam in presence of the right catalyst points the way to economic hydrogen production for these big catalytic industrial operations, so that, in the words of Berzelius, "it is proved that several simple and compound bodies, soluble and insoluble, have the property of exercising on other bodies an action very different from chemical affinity. I will call this force the catalytic force, and catalysis the decomposition of bodies by this force in the same way that one calls by the name analysis the decomposition of bodies by chemical affinity."

The two books are welcome additions to the literature of the subject. S. RIDEAL.

CALIFORNIAN GAME BIRDS.

The Game Birds of California. Contribution from the University of California Museum of Vertebrate Zoology. By Joseph Grinnell, H. C. Bryant, and T. I. Storer. (Semicentennial Publications of the University of California.) Pp. x+642+16 coloured plates. (Berkeley: University of California Press, 1918.) Price 6 dollars net.

THE game birds of all parts of North America are of special interest to residents on the other side of the Atlantic, since they, unlike so many of the Passerine forms of the country, are closely akin to those of Europe. Moreover, from our earliest years we have been attracted by a large number of the names. The Pilgrim Fathers used many picturesque expressions, and their descendants continue to do so. The "Heath Hen of Martha's Vineyard" makes us want to know who Martha was and all about her vineyard, while the "Prairie Chicken of the Foothills of the Rockies" might be the title of the villain of a melodrama. Thus we take up a book on Californian game birds with a predisposition in its favour.

In the present case the predisposition is thoroughly justified, but the work covers far more than what are most commonly known as