

of published research is so extensive. Each article is a model of clarity and conciseness, containing a wealth of up-to-date information, and is compiled by authors who have obviously a first-hand knowledge of their subjects.

Two articles—the physics of semiconductor materials, by E. Burstein and P. H. Egli (Crystal Branch, United States Naval Research Laboratory), and theory of electrical properties of germanium and silicon, by H. Brooks (Harvard University)—summarize our present knowledge of the nature and structure of semiconductors, including the recent substantial progress that has been made in the determination of the energy-level structure of the valence-type semiconductors. E. Rudberg in the early 1930's clearly demonstrated that when slow electrons impinge on solid surfaces there are characteristic values of energy losses that form a kind of line spectrum of the energy distribution, for which he coined the expression "characteristic energy losses". The last few years have seen rapid development in the observation and interpretation of these energy losses, and the article by L. Marton, L. B. Leder and H. Mendlowitz (United States National Bureau of Standards) describes the wealth of information acquired.

This is followed by an article on sputtering by ion bombardment, by G. K. Wehner (Wright Air Development Center), a phenomenon which is little understood owing to lack of reliable quantitative yield data. The report on electrical discharge in gases and modern electronics, by L. Goldstein (University of Illinois), is confined to a survey of work during the past ten years and deals with the fundamental processes occurring in the volume of low-pressure weakly ionized gases at ordinary temperatures, using the new experimental techniques involving high-frequency electromagnetic fields and microwave methods.

The two remaining articles deal with widely different branches of electronics—observational radio astronomy and analogue computers. The first summarizes the main results concerning the Sun, our galaxy and external galaxies, and the observational methods used for studying the universe at radio frequencies, together with the physical and astronomical significance of the radio observations. The second is concerned primarily with the advances during the past five years in analogue computation, though a short historical summary is given of computer developments since the Second World War. Various sections deal respectively with components; computer systems, the larger of which such as TRIDAC and TYPHOON were developed for the solution of problems in guided missiles; and a variety of uses to which analogue computers are now being put.

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## SCIENTIFIC BACKGROUND OF TANNING

The Chemistry of Tanning Processes

By K. H. Gustavson. Pp. ix+403. (New York: Academic Press, Inc.; London: Academic Books, Ltd., 1956.) 9 dollars.

FROM time immemorial animal skins have been transformed by the tanning process into the fibrous and biologically stable product, leather. Recent research in the chemistry of tanning materials,

proteins and the reaction between proteins, and substrates of small molecular weight, now permits the scientific investigation of tanning action, and a critical appraisal in book form of this progress should therefore prove opportune. This book by K. H. Gustavson deals with the chemistry of chromium salts and chromium tannage, the effect of neutral salts and complex-forming agents in chromium tanning, miscellaneous factors in chromium tanning, the nature of the chromium-collagen complex, vegetable tannage, the reaction of ligno-sulphonic acids and syntans (synthetic tanning agents) with collagen, aldehyde tanning, quinone and oil tannages, combination (chromium and vegetable) tannages, and some tanning reactions of biological and medical importance.

In the first half of the book, the author approaches chromium chemistry and tannage through the agency of electrometric titration, ion-exchange chromatography, ionophoresis and reaction kinetics. The results are interpreted in terms of the ionic and co-ordinate valencies of chromium, and of the functional groups and polypeptide backbone of collagen. Much of the research was initiated by Gustavson, who commands the reader's attention.

The review of vegetable tannins is, however, inadequate and out of date. Recent work (cf. Schmidt, O. T., and Mayer, W., *Angew. Chem.*, 68, 103; 1956) has restored order and interest to the untidy field of vegetable tannin chemistry. Of the ellagic acid-free hydrolysable tannins, the constitutions of chebulinic acid and hamamel-tannin have now been elucidated, and a tetrasaccharide formula has been proposed for sumach-gallotannin. Among the ellagitannins, the structures of brevifolin, chebulagic acid, corilagin, and dehydrodigallic and valonic acids have also been elucidated. Recent application of conformational analysis to catechin and its epimeride deserves mention.

A lack of appreciation of the chemistry of vegetable tannins, particularly of gallotannin and of the constituents of myrobalans, is reflected in the subsequent treatment of their tanning action. Further, conclusions drawn from adsorption experiments involving crude tannin extracts and hide-powder exceed in scope the nature of the experiment. Although the phrase "multipoint contact" is frequently employed, there is no reference to Fischer's (1894) provocative "Einfluss der Configuration auf die Wirkung der Enzyme" which initiated the spate of studies on enzyme substrate-inhibitor and agonist-antagonist relationships throughout the succeeding half-century. This approach to tanning action might have been advantageously developed within the context of vegetable tannage. It is surprising that no reference has been made to the application of reaction kinetics to vegetable tannage, despite its obvious importance, and its successful application to the analogous dyeing of wool. There is an excellent summary of synthetic tanning agents.

The book concludes with a stimulating account of biological reactions which possess a possible tanning implication. The biologists' discoveries require critical assessment, however, as their materials are often detected histochemically by staining-reagents. Much of this work awaits intensive investigation by the natural products' chemist. In spite of its limitations, the book is the work of an enthusiast. Its chief merit is that it brings within small compass the salient references in the literature of leather chemistry.

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