

## REVIEWS

**Photosynthesis and Related Processes.** By Eugene I. Robinowitch. Vol. I. (Interscience Publishers Inc., New York, N.Y.), 1945. Pp. 559. Price 8.50 dollars.

The author is a well-known worker in the field of Photochemistry and is now a member of the Solar Energy Research Project Committee of the Massachusetts Institute of Technology. A comprehensive treatise on Photosynthesis by an expert of his standing will remove a long-felt want. The present volume is divided into two parts.—I. The Chemistry of Photosynthesis and Related Processes and II. The Structure and Chemistry of the Photosynthetic Apparatus. In the treatment of the subject, much of the older work which are of doubtful value has been omitted but those that are of historical importance and enduring influence have been discussed in detail. All recent literature up to 1943 have been incorporated in this book with a critical insight, and the author has not hesitated to express his views on the merits and defects of the experimental technique, the conclusions, and hypotheses developed by research workers now investigating this fascinating but almost baffling problem. It is estimated that  $20 \times 10^{10}$  tons of carbon are annually fixed on earth by photosynthesis. Hence the importance of an accurate knowledge of the mechanism of this process is obvious. We are yet, however, far from the goal, i.e., fixation of carbon outside the living cell with the aid of solar radiation and plant pigments.

Observations made by Rubens and co-workers, using for photosynthesis, carbon dioxide and water containing radioactive carbon and heavy oxygen, have proved beyond doubt that the oxygen evolved in photosynthesis comes from water alone and that carbon dioxide is incorporated in the dark into a large molecule of the plant material probably forming a carboxyl group. Such definite conclusions are, however, rare. But, as the author says, "during the last twenty years, some important new avenues of approach to the study of photosynthesis have been opened. Mention may be made for example, of oxygen liberation by isolated chloroplasts; of the broader view of the chemistry of photosynthesis by the study of bacteria; of the discovery of the possibility of changing the chemical course of photosynthesis in certain algæ by substituting new substrates for carbon dioxide and water". The use of flashing light, new experimental procedures for rate measurements by sensitive physical methods, new knowledge of the structure of the photosynthetic apparatus, detailed chemical examination of the chloroplasts, extensive application of the methods of enzymology—chemistry—all these promise rapid progress in this field. The author has done well in emphasising these newer trends in the study of photosynthesis and has produced a book which

will be a standard work of reference for anyone interested in the subject.

The reviewer recalls with pleasure the interesting discussion he had with Professors Franck and Gaffron in Chicago a year ago on these new developments. The book bears the impress of the spell which these two path-finding investigators have also cast on the author.

J. C. GHOSH.

**Dynamic Meteorology.** By Jorgen Holmbe, George E. Forsythe and William Gustin, Department of Meteorology, University of California at Los Angeles. (John Wiley and Sons Inc., New York; Chapman and Hall, Ltd., London.) Price 4.50 dollars.

Here is a book which every student and professor of meteorology should welcome. It is an ideal and up-to-date text-book for the advanced student. Written in the traditions of the Norwegian School it reveals how thoroughly the weather forecaster was trained in the U.S.A. during the war. In this volume the authors deal with the major aspects of "Dynamic Meteorology". Naturally, topics like instrumental technique, descriptive aspects of synoptic meteorology, atmospheric turbulence and radiative phenomena are omitted. The treatment of the subjects actually dealt with is condensed and logical. By following an admirable system of cross-references repetitions are completely avoided. The book is self-contained and by the use of vector methods the theoretical treatment of atmospheric motion and circulation is handled with brevity and elegance.

The book is divided into twelve chapters. The first is devoted to dimensions and units. The next two deal with the thermodynamics of dry and moist air respectively. After discussing hydrostatic equilibrium in the earth's atmosphere and its stability (chapters 4 and 5) the authors proceed to discuss the problems of atmospheric circulation in the remaining seven chapters. In Chapter 10 the authors have included their discussion of the theory of cyclones which appeared in the *Journal of Meteorology* recently (1944).

The book deserves a place by the side of other recent treatises on meteorology like *Physical and Dynamical Meteorology*, by D. Brunt; *Weather Analysis and Forecasting*, by S. Petterson; and *Dynamic Meteorology*, by B. Haurwitz. The authors deserve to be congratulated for bringing out a volume which is sure to be a companion to every serious student of theoretical meteorology. We recommend it to all progressive Universities in India which have introduced or intend to introduce an advanced course in Meteorology for the M.Sc. degree,

L. A. R.

**The Organic Chemistry of Sulphur: Tetravalent Sulfur Compounds.** By Chester Merle Suter. (New York: John Wiley & Sons, Inc., London; London: Chapman & Hall, Ltd.), 1944. Pp. v + 858. \$10.00.

We now look to the U.S.A. for those comprehensive, if uncritical, reviews of literature, *Handbueher, Enzyklopadien*, once a product of German assiduity. The organic chemistry of sulfur has a copious but scattered literature, which has been very little collated, and a new volume on the subject cannot fail to be of interest.

The book under review deals, as its sub-title indicates, only with those "compounds which in a broad sense are derivatives of sulfuric acid". Its scope may be indicated by quoting the seven chapter headings: "I. Esters of Sulfuric Acid, II. Aliphatic Sulfonic Acids, III. The Preparation of Aromatic Sulfonic Acids, IV. The Properties and Reactions of Aromatic Sulfonic Acids, V. Derivatives of Aromatic Sulfonic Acids—1. Sulfonyl Halides, Esters and Anhydrides, VI. Derivatives of Aromatic Sulfonic Acids—2. Sulfonamides and Related Compounds, VII. Sulfones." This ground has been previously covered, less exhaustively, by J. Halberkann and F. Fretwurst in a monograph *Sulfonieren* (published in 1929 as a part of Abderhalden's *Handbuch der biologischen Arbeitsmethoden*—Abt. 1, Chemische Methoden, Teil 2, 2. Hälfte, heft 3, s. 1969-2104), a work not easy of access and to which no reference appears in the present volume. The bibliographies of the seven chapters are extensive. A small "test check" of references was possible, as the reviewer happened to have prepared some time ago a reasonably complete bibliography relating to Sulphonyl Halides, Esters and Anhydrides, and he is able to add nothing essential to the author's survey.

Due attention is paid to those products which have practical applications, though the treatment of sulphonated oils is brief and Burton and Robertson's book *Sulfonated Oils* (1939) is not mentioned. Chapter VI includes good accounts of saccharin, sulphohaloamides and sulphanylamine with a useful discussion of methods of estimation.

A more complete account of sulphones could hardly be found elsewhere and some curious recent observations are duly noted, including that of the occurrence of dimethylsulphone in cattle blood and adrenal glands (1940). The triboluminescence of sulphobenzide might have been mentioned; this appears to be a property of only one of the allotropic forms described by Bogert in 1936 and is worth investigation.

Only a few unimportant inaccuracies have been noticed, such as errors in proper names. The index—mostly to compounds mentioned in the text—is constructed on the *Chemical Abstracts* method; occasional inconsistencies occur, mesitylenesulphonyl chloride appearing also as trimethylbenzenesulphonyl chloride, p-anisidine-sulphonic acid as 5-amino-2-methoxybenzenesulphonic acid, whilst these duplications do not appear in other cases. These are, however, small points and the labour of the indexer must have been so considerable that the reviewer hesitates to suggest that German

assiduity would have proved a *Namen-vezeichniss* also!

In his short preface, the author disarmingly suggests that the preparation of a second volume to cover "the remainder of sulfur chemistry" will depend on "the interest of organic chemists in this type of monograph and other demands on the author's time". The interest of organic chemists need not be in doubt; the present volume must find its place in all adequate chemical reference libraries. The coming of peace may have removed the other obstacle by reducing alternative demands on the author's time. It may be suggested, however, that a single volume will hardly suffice to deal with the remainder of the subject on the scale of the present one; the heterocyclic compounds of sulphur will almost certainly find themselves relegated to a third volume.

In the meantime, we have Connor's useful survey of organic sulphur compounds in Volume II of the second edition of H. Gilman's *Organic Chemistry*, and we are promised an A.C.S. monograph by E. E. Reid. What is needed, besides the undoubtedly valuable work of the collator or compiler, is a critical account of the subject in relation to modern theories of organic chemistry, on the lines of Sidgwick's classic treatment of the organic compounds of nitrogen.

Wokingham,  
September 16, 1945.

REGINALD CHILD.

**Plants and Plant Sciences in Latin America.** Edited by Dr. Frans Verdoorn, Ph.D. (The *Chronica Botanica* Co., Waltham, Mass.; Messrs. Macmillan and Co., Ltd., Calcutta), 1945. Pp. xi + 384, with 83 plates and text-illustrations. Price \$6.00.

It is unnecessary to stress the need for greater international collaboration in the study of plant sciences. A constructive programme towards this end, however, had not been seriously thought of till now. As a help in this direction, the *Chronica Botanica* authorities have recently published an account of the vegetation and natural resources of Latin America together with a survey of the present condition and the future possibilities of a number of branches of plant sciences in that region, whose problems are not merely of local but of international importance.

Dr. Frans Verdoorn himself contributes an introductory essay entitled, "The Plant Scientist in the World's Turmoils", in which he has dwelt upon the importance of an international understanding of plant sciences and how best this can be done. The book contains contributions from nearly 100 authoritative writers, the contributions dealing with each politically delimited localities of Latin America. Most of the contributions are written up in English but about 18 are in other languages as Spanish, French and Portuguese. The entire book is divided into two parts. The first part contains primarily articles not previously published whereas the second part contains reprints of articles already published in the pages of *Chronica Botanica*.

The first part opens with the chapter, "Problems of Tropical American Agriculture",

After devoting the next three chapters for phytogeographic sketch, principal economic plants, and historical sketch, which are of general botanical interest, regional descriptions follow. About 25 politically delimited regions of Latin America have been treated by experts and each individual exposition is encyclopaedic. Further, there are about 23 titles dealing with botanical subjects of general interest concerning Latin America but on a regional basis. Of these, "Hevea Rubber Culture in Latin America; Problems and Procedures" by Dr. R. D. Rands, "Notes on Cinchona Culture" by Dr. W. Pennock, "Aims, Scope and Future of Research on Fibre Plants in Latin America" by Dr. B. B. Robinson, deserve careful study by every botanist. Of particular interest is the special supplement, "Plant Breeding, Genetics and Cytology in Latin America" by Dr. C. A. Krug. To an Indian botanist this is specially welcome, as he is also confronted with many pressing problems concerning the improvement of Coffee, Cinchona, Rubber, etc.

A large portion of the second part is again devoted to about 15 regional descriptions. Though many of the regions treated in this part overlap those in the first, information contained is by no means a repetition. A list of "Travel Books of Botanical Interest", "List of Collectors in the West Indies, Central America and South America" and the special supplement, "Plant Institutions, Stations, Museums, Gardens, Societies and Commissions in Central and South Americas" which is comprehensive and up to date has come as a very handy tool to every naturalist, collector or researcher, who is anxious to contact his co-workers.

The illustrations for the book have in many cases been selected from classical publications; and a careful study of some of them rouses curiosity in the reader as to the history of plant sciences. Of particular interest are the end-pages illustrating the vegetation of Latin America picturesquely. The size and get-up of the book conform to the familiar style of the *Chronica Botanica* series. While recording our sincere admiration for the work of the authorities, we would also express the hope that through their efforts similar compendiums dealing with the plants and plant sciences of other countries may soon become available to students of botany.

B. G. L. S.

**Fungicides and Their Action**—*Annales Cryptogamici et Phytopathologici*, Vol. II. By James G. Horsfall. (Messrs. Chronica Botanica Co., Waltham, Mass., U.S.A.), 1945. Pp. 239. Price \$5.00.

Yet another excellent publication has appeared in the new series of *Annales Cryptogamici et Phytopathologici*. Large number of books on Fungicides have been written in the past, but the present one is a departure from the normal in that it very ably combines fundamental knowledge with the applied aspect of the problem. Astounding progress has been made during this century in the field of fungicides, particularly on the organic side. In all these studies, intensive and extensive, statistical interpretation of experimental data ac-

ruing out of each experiment has put the subject on a sound and sure footing. What we needed at the present moment was a critical review of the position to-day as far as "Fungicides and their Action" were concerned. This task has been most admirably accomplished by Dr. Horsfall, who, for over fifteen years, has built up a sound school of "Plant Chemotherapy."

The chapters of laboratory assay; some problems of data assessment; principles of chemical protection; coverage of single and multiple surfaces; artificial immunization and chemotherapy; action of copper, sulphur; action of organic nitrogen compounds, etc., have been very well written. The reviewer was particularly attracted by the chapter on "Artificial immunization and chemotherapy". This chapter on chemotherapy is written, as in the case of other chapters, with up-to-date literature on the subject. The work in this line by the discovery of antidoting the toxin of Dutch elm disease by using diaminoazobenzene dihydrochloride, 8-hydroxy-quinoline sulphate and malachite green, has opened out a new avenue of research. Further, other promising chemicals in this line are mentioned, viz., urea, hydroquinone and many others where their basic nitrogen might have been responsible in part for the antidoting action. In this connection, ascorbic acid, a substance with strong reducing properties, was injected into egg-plants sick with the wilt fungus *Verticillium albo-atrum*. The wilted plants showed recovery. Perhaps, even more promising than the above examples is the work on inactivation *in vivo* of the virus disease known as X-disease of peach. This again was done by urea, calcium 8-hydroxyquinolate, etc. All this suggests that the instance quoted here of *in vivo* inactivation of plant virus is due to either oxidising or reducing of the toxin to an innocuous level.

The other chapter written very ably is the one on "Action of organic nitrogen compounds". It would be impracticable to go into the details of this chapter within the course of this review. On the whole, this well-got-up publication would attract considerable attention from both pathologists and organic chemists who work on this most fascinating field of fungicides and their action. The reviewer unreservedly recommends this volume to the researchers and students of botany or phytopathology who wish to have the latest and most trenchant views on the subject of fungicides.

T. S. SADASIVAN.

**A Changing Social Structure** (being a collection data submitted to *ad hoc* Committee appointed by the Conference of Trusts), 1945. By Sapur F. Desai, Joint-Secretary, Parsi Panchayat, Bombay. Pp. 59.

This brochure has been prepared from the information collected by Mr. Desai for submission to the *ad hoc* Committee appointed by the conference of charity trust to deliberate on different problems of the Parsis. It deals with such problems as health, nutrition, unemployment, education, housing and organisation of the Parsis who are one of the most important

communities in the Province of Bombay. Much of the brochure is naturally taken up with tables which in many cases cover statistics for the forty odd years of the present century. The author has no doubt presented the available data objectively, as far as possible and nowhere indulged in wide generalisation. The study of this privileged and gifted community can, however, hardly give an adequate idea of the problems facing the entire community. For example, the low birth-rate and death-rate noticeable among the Bombay Parsis in the last decade could hardly be taken as an index of the population trends even in Bombay city as a whole and conclusion based thereon. The entire data collected for the Parsi community can, however, be useful in determining the tendencies of the more advanced communities and in suggesting remedies for the more unhealthy trends. The social structure of the Parsi community has undergone gradual changes in the direction of progressive urbanisation with all that it involves. The tables prepared show how the numbers of unmarried persons have gone up four times during the last fifty years (1881-1931) while the number of married people has gone down by half during the last twenty years. In education, Mr. Desai notices the trend towards Science and Technical Courses while Agriculture, Law, Engineering, Medicine and Teaching seem to be losing charm for the Parsi boys. In regard to health and nutrition, the general standard of the Parsi community is much higher than other classes of population. The huge amounts spent by the Parsi community on charity in the shape of doles for the poor members of the community and in providing cheap accommodation for poor families in Bombay are unequalled by any other class of the population. The trustees of the Parsi Panchayat also run an unemployment bureau which is able to help most of the persons capable of being employed. On the whole Mr. Desai has given us good statistical information about the Parsi community although one would have wished him to have given a more extensive analysis of the

"changing social structure" and ways and means by which the undesirable tendencies could be checkmated.

**The Effect of Activity on the Latent Period of Muscular Contraction.** By Alexander Sandow. (Published in the *Annals of the New York Academy of Sciences*, Volume XLVI, Art. 3, pp. 153-154.)

The minute mechanical changes occurring during the latent period of muscular contraction have been recorded by a highly sensitive device consisting of a piezo-electric, cathode-ray oscillographic technique which, with great reliability, permits determining the activity induced latency time differences of the order of several 0.1 ms. and length differences of about 0.05  $\mu$ . The results obtained have been highly interesting. The effect of activity on the various variables occurring during the latent period has been obtained. These changes are correlated in some detail with activity induced pH changes, studied in other investigations. This correlation and several other implications of the data are shown to be confirmatory evidence for a previously advanced hypothesis that the latency relaxation is a mechanical sign of a tension-induction process involving mechano-chemical coupling of myosin and adenosine triphosphate in the form of an enzyme-substrate combination, during the existence of which the myosin is energised and activated for contraction.

I may here point out that in smooth muscle, it is quite common to see an initial relaxation preceding a contraction, when the muscle is stimulated with alternating current, potassium, adrenaline, nitrate, thiocyanate, etc., as published in my papers in the *Journal of Physiology* and the *Proceedings of the Indian Academy of Sciences*. This initial relaxation decreases with increase of pH, as in skeletal muscle, so that it appears that the two are related. I have postulated that it is due to release of calcium.

INDERJIT SINGH.

## CHROMOSOMES AND EVOLUTION\*

**S**YNTHESIS should follow analysis and nowhere is a synthesis more difficult than in Cytogenetics. To get the correct perspective the whole field has to be viewed from the evolutionary standpoint. Though chromosomes form the common "mechanical and physiological denominator" of plants and animals, evolution has proceeded in entirely different directions.

It is said that the majority of angiosperms could be traced to polyploid ancestors. Duplications of either individual chromosomes or of whole sets, thus appear to have played a major role in the evolution of new species in plants. Polyploidy is so rare in animals that it appears very doubtful whether they

have any role at all in speciation. "It was pointed out by Muller (1925) that in bisexual organisms polyploidy will inevitably upset the sex-chromosome mechanism, since it automatically abolishes heterogamety. Thus a tetraploid of an originally XY:XX form will have the composition XXYY:XXXX and nearly all the gametes of the originally heterogametic sex will be XY (due to the two X's and the two Y's forming separate bivalents at meiosis). So that even if a tetraploid male and female meet and pair they would stand no chance of starting a tetraploid race" (p. 181).

And again it is very doubtful whether the well-known type of genetic system of higher plants, allopolyploidy, exists in animals at all. All the metazoan polyploids appear to be autopolyploids. "The distinction between auto- and allopolyploidy is not, of course, an absolute one, and if a doubling of the chromosome number followed on crossing between the two

\* *Animal Cytology and Evolution* By M. J. D. White. (Cambridge University Press), 1945, Pp. 375 + viii. price 36 s<sup>h</sup>. Net.