

minerals and of carbon specimens. The genesis of the elements and their cosmic abundance is also discussed.

Each chapter is followed by a large selection of problems. Many new ones appear in the present edition. From my own experience, over the past 5 years in teaching a course using the original edition I can say that the problems adequately cover the material. Only through the solution and the study of them can the student get the maximum benefit from the book.

The Appendix contains the following tables: useful physical constants and conversion factors, relativistic relations, thermal neutron cross sections, reaction cross sections for 14-Mev. neutrons, thick target yields for some nuclear reactions, some measured nuclear spins, and a table of nuclides that includes the latest information up to January, 1955.

There is more subject matter here than can be presented in a one semester three-hour lecture course. This was true of the first edition and with the approximately 50% increase in material in the present book, the instructor will have considerable latitude in the selection of topics.

The course could be taught with a light treatment of nuclear theory for those intending to use tracers in research. On the other hand, the text will be useful if the emphasis is to be more on the reactions of nuclei, the properties of the resulting species and the fundamentals of nuclear theory.

This book satisfies a very definite need and is in my opinion the best in the field.

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BENJAMIN P. BURTT

Proceedings of the International Conference of Theoretical Physics, Kyoto and Tokyo, September, 1953. Edited by I. IMAI. Science Council of Japan, Ueno Park, Tokyo, 1954. xxviii + 942 pp. 21 × 28 cm. The price of the publication has been revised to U.S. \$10.00 or equivalent, postage \$1.00 extra (by surface mail). UNESCO Book Coupons will be accepted.

This comprehensive report of the proceedings of the first purely scientific international conference to be held in Japan has been very carefully prepared in that both the more formal papers and the quite informal discussions have been submitted to the participants for approval before publication. This necessarily means that much of the material has appeared elsewhere in more complete form, or has been superseded by more recent experimental or theoretical work. But the discussions and interchanges between the leading theoretical physicists of the world retain the utmost interest for student and research worker alike, containing as they do both the excitement of fresh discovery and the floundering in the face of unsolved puzzles which are rarely reflected in more formal scientific papers. Since the topics discussed range from field theory and elementary particle physics to solid state and low temperature problems, almost anyone interested in theoretical physics can profit by the look behind the scenes given in this volume, and gain an insight into the present state of the field that is hard to come by in other ways.

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H. P. NOYES

Traité de Chimie Organique. Vol. XXIII. Edited by VICTOR GRIGNARD, Membre de l'Institut Prix Nobel, G. Dupont, Directeur de l'École Normale Supérieure, and R. LOCQUIN, Correspondant de l'Institut, Professeur à la Faculté des Sciences de Lyon. Masson et Cie, Éditeurs, 120 Boulevard Saint-Germain, Paris VI, France. 1954. xvi + 360 pp. 17.5 × 25.5 cm. Price, Broché 8.000 Fr., Cartonné toile 8.600 Fr.

This is the final volume of the twenty-three that comprise the Treatise of Organic Chemistry begun in 1935 under the direction of Victor Grignard. It is largely devoted to a 360-page index of the complete work, but includes a short (86-page) concluding section on heterocyclic compounds. This material, on quinoxalines and purines, was originally planned as a part of Tome XX, but was postponed, for various reasons, until the present volume. Nearly sixty of the eighty-six

pages deal with the purines, the remainder being devoted to condensed pyrimidine systems of other kinds. The presentation is succinct, the abundant references to the original literature serving to document the often allusive discussion in the text. The treatment, though terse, is thorough, and a great deal of information is contained in what has clearly been a carefully edited treatise.

The index has been assembled with care and with a view to endowing it with more than ordinary usefulness. The system upon which it is based is described in detail in an introductory section. The unique features of the index are largely supplementary and serve to increase the usefulness and flexibility of an index that is in the main conventional. Cross-references between systematic and trivial or commercial names are frequent, and each entry gives, so far as possible, an indication of the nature of the material to be found in the text.

The Treatise is a rich source of information for organic chemists and will undoubtedly find extensive use. At the time of its inception it had no counterpart in the chemical literature; and although in recent years there has begun to appear the "Chemistry of Carbon Compounds," comparable in many ways with this Treatise, the two works will complement each other.

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T. A. GEISSMAN

The Foreseeable Future. By SIR GEORGE THOMSON, F.R.S., S.C.D., Nobel Laureate, Master of Corpus Christi College, Cambridge. 1955. 166 pp. Price \$2.50; Cambridge University Press, Cambridge, England. 1955.

"For I dipt into the future, far as human eye could see,
Saw the vision of the world and all the wonder that would be..."

These ringing lines of Tennyson keep coming to mind as the tale of this prescient little book majestically unfolds.

Sir George bases his predictions of scientific and technological advance for the reasonably near future on the purposefully conservative assumption that no new *basic* scientific principles will be discovered during this period. He lists the seven fundamental principles which underlie modern science as follows: Einstein's postulate that no material object or signal can travel faster than the velocity of light; the conservation of mass plus energy through the Einstein equation; the impossibility of creating an electric charge without making an equal one of opposite sign somewhere else; the impossibility of creating a magnetic pole without making an equal one of opposite sign somewhere in the same body; the Heisenberg uncertainty principle; the Pauli exclusion principle; and the second law of thermodynamics. It is fascinating to note that this list contains no axiom which may be described as purely biological. Is biology exempt except as it must conform to the laws of physics and chemistry stated above? Sir George thinks this is hardly likely, but feels the purely biological laws are as yet undiscovered.

The author goes on to discuss the scientific and technological developments that are highly probable, in many cases practically inevitable, being contained within these basic principles as the seed contains the future plant.

In the case of sources of energy, fission energy from uranium and thorium assure abundant energy for centuries even when fossil fuels are exhausted. If fusion energy can be controlled, as it probably will be, energy will be cheap and inexhaustible. Solar energy will also be harnessed for special uses and may possibly be another cheap and abundant source.

So far as materials are concerned, new methods of terrestrial mining and recovery from the sea will develop to keep pace with avaricious demand. Materials such as metals, glass and plastics will be made much stronger, approaching their theoretical strengths which are at least ten times their presently attained strengths. Elements that are now used only seldom will find special and very important uses, as was the case with germanium for transistors.

For terrestrial transport and communication the major problems of the present and future are not technological but sociological: nuisances such as parking, the rush hour and avoidable accidents. For non-terrestrial travel we may

expect space flights within our solar system in the foreseeable future.

In the future part of our animal fodder, if not our own food, may be harvested from crops of algae and yeast or made in chemical factories. Some of the food factories will use entirely chemical processes, others may use bacteria or other simple organisms to effect certain stages of the processes. New animals will be domesticated; perhaps it will be easier and cheaper to train monkeys to pick fruit crops rather than devise and construct fruit harvesting machines!

In medicine the chief problem of the future will not be how to attain old age but how to make old age pleasant, pain-free and desirable. It even seems possible that human beings can eventually be made immortal save for violent accident—a situation envisaged by George Bernard Shaw in "Man and Superman." The author fails to mention the giant strides being recently made in the control of mental disease; surely the health of the mind and the soul is equally important as the health of the body.

Sir George feels that minor and local control of weather might be effected but is not sanguine about far reaching climate control. At least man of the future will still be able to talk about the weather.

Many more aspects of the future are charmingly discussed: plant and animal genetics and controlled mutations, calculating machines, education, leisure and adventure, population growth, to name but a few.

What a harvest of abundance is being prepared for the average man and his children through the workings of the rational mind and the operation of the scientific method! It seems to me that a book of this kind, free from all political bias, can do much to establish communication and rapport between all the peoples of the earth. Surely, everybody's stake in the future is so large that we might hope that were it widely understood we might eventually beat our swords into plowshares (for museum purposes) and our super bombs into atomic fuel.

"Till the war-drum throbbed no longer and the battle flags were furled

In the Parliament of man, the Federation of the world."

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ARTHUR TOBOLSKY

Annual Review of Physical Chemistry. Volume 6. By G. K. ROLLEFSON, Editor, University of California, and R. E. POWELL, Associate Editor, University of California. Annual Reviews, Inc., Stanford, California. 1955. ix + 515 pp. 16 × 23 cm. Price, \$7.00 (U.S.A.); \$7.50 (elsewhere).

The sixth volume of this series constitutes another valuable tool for the busy scientist who wishes to keep himself abreast of developments in these areas which are so important to both chemistry and physics. It contains 21 chapters, prepared by a group of thirty-one authors and treating the following subjects: Thermochemistry and the Thermodynamic Properties of Substances, Cryogenics, Heterogeneous Equilibria and Phase Diagrams, Solutions of Electrolytes, Solutions of Nonelectrolytes, The Solid State: Diffusion in Metals and Alloys, Radiation Chemistry and Hot Atom Chemistry, The Quantum Theory of Valence, Electronic Spectroscopy, Vibration-Rotation Spectroscopy, Metal Chelate Compounds, Experimental Molecular Structure and Crystallography, Kinetics and Reactions in Solution, Kinetics of Reactions in Gases, Surface Chemistry and Contact Catalysis, Electrode Processes and the Electrical Double Layer, Polymerization Kinetics and Polymer Properties, Colloid Chemistry Exclusive of High Polymers, Isotopes, Nuclear and Paramagnetic Resonance, Statistical Mechanics.

Some of these subjects, Thermochemistry and Thermodynamic Properties of Substances, for instance, have been dealt with in each of the previous volumes of this series. In such cases the literature survey is limited primarily to the year 1954 and the coverage of the various sub-topics within the field is very broad and complete. On the other hand, in the chapter on Cryogenics, a subject which has been treated in only two of the six volumes of this series, the author has very wisely chosen to concentrate attention this year on two

areas, *viz.*, superconductivity and magnetic phenomena, and he covers their development over a decade or more. Both types of treatment are logical for the particular cases involved.

A stupendous amount of labor has clearly gone into the preparation of these reviews. Thus the bibliographies attached to these 21 chapters of the present volume contain 3918 references! The successful supervision and coordination of the work of the various authors attests to the skillful guidance of the editors, especially Gerhard Krohn Rollefson whose sudden death on November 15, 1955, has shocked his many friends.

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GEORGE S. PARKS

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April 10, 1956–May 10, 1956

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