they are very good indeed. In chapter 7 the authors discuss polycrystalline arrays, crystallite size and orientation, crystalline texture, precision measurement of lattice parameters, and internal stress determinations. In chapter 8 they treat the imperfect crystal, the small crystallite, and some of the methods and results of small angle x-ray scattering.

In general, the purposes of this volume, and of the series, have been well achieved. The reader will find a clear and always authoritative discussion of most of the areas in which x-rays are a useful tool for structural studies. Applications to physics and physical metallurgy have perhaps been emphasized a little compared to chemistry and biology. A minor annoyance is the too skimpy list of references. Frequently a new method or development is described, but without reference to the original, or even to a review article, where more complete details might be found.

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Inorganic Chemistry

Anorganische Chemie. vols. 2 and 3. István Náray-Szabó. Translated into German by András Beliczay. Akademiai Kiado, Budapest; Akademie Verlag, Berlin, 1963. vol. 2, 813 pp.; vol. 3, 669 pp. Illus.

In the second volume of this series [volume 1 was reviewed in *Science* **131**, 1214 (1960)] the author describes elements and compounds of the alkalies, alkaline earths, and aluminum and the transition metals of groups III through VII; actinides and lanthanides are also included.

The salts described include hydrides; halides; polyhalides; oxides, peroxides, and hydroxides; oxyhalides; sulfides and sulfur oxyacid salts; selenides and tellurides and the corresponding oxyacids; phosphides, arsenides, and their oxyacids; carbides, acetylides, carbonates, and combinations of carbon, nitrogen, and oxygen; compounds with silicon, germanium, lead, tin, and boron, with and without oxygen; and double and complex salts.

In the third volume information is given about copper, silver, gold, zinc, cadmium, mercury, gallium, indium, thallium, Group VIII, and the inert gases. The salts and compounds are treated in the same order as in the previous volumes. A review of the chemical properties of the elements and a short chapter on geochemistry and cosmochemistry conclude the volume.

Each group is introduced by a presentation of the electronic structure of the respective elements and their ionization and excitation potentials. This is followed by a concise discussion of valency, crystalline structure, melting points, ionic radii, the most characteristic chemical compounds, and the abundances of the elements.

In describing individual elements the author gives a short historical introduction followed by sections on the occurrence, nomenclature, and abundance of minerals, preparation of the element (on a laboratory and on a commercial scale), and their physical properties (with a tabulation of constants), chemical properties, and compounds. Application, world production, physiological activity, and analysis are also considered. This is followed by a description of chemical compounds for each group of elements, with a tabulation of physical constants.

The books represent a substantial amount of information presented in a manner that is clear, systematic, and uniform; thus they fulfill the purpose stated by the author. That the data are reasonably up to date is illustrated by the inclusion of information on krypton tetrafluoride, which was published in 1963.

Scientists and students who require a simple, concise reference source on inorganic substances should find these volumes particularly useful.

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Mathematical Physics

Mathematical Models in Physical Sciences. Proceedings of the conference held at Notre Dame, Indiana, April 1962. Stefan Drobot and Paul A. Viebrock, Eds. Prentice-Hall, Englewood Cliffs, N.J., 1963. x + 193 pp. Illus. $5.

In contrast with the atmosphere encountered at an increasing number of conferences, the atmosphere that held sway at the conference which gave birth to this slender volume must have been almost Victorian in its leisureliness. A small but generally distinguished group of speakers addressed a somewhat larger but almost equally distinguished audience on a remarkably broad range of subjects in mathematical physics; the speakers emphasized problems in classical physics and the mathematics of the models rather than their physical utility. Thus, there were two talks on the problem of the liquid-gas phase transition (by G. E. Uhlenbeck and Mark Kac; unfortunately the two addresses are represented only by abstracts in the volume); a short account by Harold Grad of his work on the mathematical foundations of the description of transport phenomena; and a very informative presentation by Norman J. Zabusky of his work on a model for the oscillations of a nonlinear string. The latter article is one of the few in the volume which is relatively self-contained. Zabusky gives an account of the previous (numerical) study of the model and of his own effort to understand analytically the basic phenomena yielded by the machine calculations.

Less readily placed in a category are papers by Martin D. Kruskal, Stan M. Ulam, and Jerzy Neyman. In a unique paper entitled "Asymptotology," Kruskal tries to summarize, in the form of principles, the techniques for obtaining the limiting behavior of systems of equations as some parameters decrease. Ulam summarizes all too briefly some computing machine investigations of nonlinear algebraic transformations and of nonlinear partial differential equations. Neyman recounts (in what is for this volume a relatively long article) his study, by means of the theory of probability, of the data produced by astronomers on the distribution of galaxies.

Of 11 technical presentations, only two were concerned with the quantum theory. F. J. Dyson summarized some of his own work and some of that carried out by others on a new version of statistical mechanics, which has important application to atomic and nuclear spectroscopy. My personal favorite is a beautiful article by Rudolf Haag on the mathematical foundations of the Barden-Cooper-Schrieffer model of superconductivity. The report concludes with an article on constraints in classical fields, written by the organizer of the conference, Stefan Drobot.

The volume contains a complete list of the conference participants, drawn from as wide a variety of fields as the speakers themselves. It is an amusing exercise for the reader to gauge the

active audience of any given lecture. The number is, in general, small. This most amusing and occasionally enlightening book contains generally useful introductions to the subjects mentioned.

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Origin of the Angiosperms

The Spores and Pollen of the Potomac Group of Maryland. Gilbert J. Brenner. Department of Geology, Mines, and Water Resources, Baltimore, Md., 1963. ix + 215 pp. Illus. Paper, $2.50; cloth, $3.50.

This volume represents the first comprehensive work on Lower Cretaceous spores and pollen published in the United States. Brenner describes all the pollen, spores, and algae (130 forms) that he found in the Potomac Group; the work is based on a study of 43 rock samples from three stratigraphic sections, two of them from bore holes and one from surface exposures.

The most significant finding in Brenner's publication concerns the time when flowering plants first evolved. Rocks of the Potomac Group in Maryland compose the classic American Lower Cretaceous section, in which the entrance of angiosperms in the fossil record is documented. In 1911 E. W. Berry had reported that, of the three rocks units of the Potomac Group, only the uppermost (the Patapsco Formation) contained unequivocal angiosperm fossils, and these appeared at the base of that unit and above. From the middle and lowest formations (the Arundel and the Patuxent), Berry recorded a few "thoroughly questionable angiosperms" associated with a rich flora of lower plants. Brenner's pollen evidence corroborates, in a convincing way, Berry's conclusions from fossil leaves. He found that undoubted (tricolpate) angiosperm pollen is present throughout the Patapsco Formation in three sections and is absent from the middle and lowest formations of the Potomac Group. In addition, Brenner found a few monosulcate pollen grains throughout the Potomac Group; monosulcate pollen is known to occur in living Angiospermae as well as in Gymnospermae.

Brenner summarizes the known leaf and pollen record of angiosperm occurrences in the Lower Cretaceous, and he concludes that the earliest unequivocal angiosperm leaves and pollen occur in strata of Albian age (late Early Cretaceous) in Portugal, northern Europe, and in the New World. This conclusion is interesting in the light of current theories that angiosperms had their origin during the Paleozoic. Those arguments would be more convincing if they were based on undoubted fossil evidence.

Happily, this volume takes careful account of existing valid names for fossil pollen and spores and follows the International Code of Botanical Nomenclature. (Sadly, not as much can be said for every American work on fossil pollen.)

In my opinion, the stratigraphic and taxonomic work is well done. A minor objection is Brenner's usage of the term *microflora* to mean an assemblage of pollen and spores. The term refers to either a small flora or entire microscopic plants; it should not be applied to the microscopic parts of vascular plants.

In summary, the volume is a significant contribution to the literature on pollen and spores in this country.

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History of Science

The History of Sciences in India. Proceedings of the symposium held at Calcutta, August 1961. P. Maheshwari, Ed. National Institute of Sciences of India, New Delhi, 1963. viii + 343 pp. Illus. Paper, R. 13.75.

The essays in this symposium are subdivided into four main sections: (i) Social and International Relations in the Development of Sciences (teaching, methodology, and the like in the history of sciences), (ii) Agriculture and Chemistry, (iii) Biology, Health, and Medicine, and (iv) Astronomy, Mathematics, and Earth Sciences. Most of the papers in the first section are of a general nature, but this is the only factor that binds them together, for they vary considerably in particular focus. N. K. Bose, for example, has written articles on the classification of soils and on the classification of temples; S. N. Sen has chosen the study of the transmission of scientific ideas between India and foreign countries in ancient and medieval times; V. R. Shastry discusses science in the Vedas; and A. Rahman, in addition to collaborating on other articles, has written on the theoretical aspects of the history of science. There are 12 papers in the first section.

Of the four papers in the second section, three are devoted to the history of agriculture in ancient India and the fourth, by B. V. Subbarayappa, to Indian atomism. The third section contains 12 papers that range from the need for the creation of medico-historical museums to essays on the history of botany in early India and discussions of various phases of the growth of medicine and pharmacy. Of the half dozen papers in the fourth section, four are devoted to the history of mathematics, including S. Chakrabarti's interesting comparative essay on the origins of the ideas of mathematical analysis (a discussion of Archimedes and Bhaskara). The two remaining essays are devoted to geography and aeronautics in ancient India.

In general, this volume represents the growing concern in India for an understanding of the history of science as part of its own national history. While the diversity of the collection testifies to the awareness of the problems involved in this undertaking, the irregular quality of the contributions highlights the limited nature of the solutions offered. The task is enormous, but it is under way, at least for the ancient and medieval periods. It can only be warmly encouraged.

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Conference Report

Advance in Mass Spectrometry. Proceedings of a conference held at Oxford in September 1961. R. M. Elliott, Ed. Pergamon, London; Macmillan, New York, 1963. xviii + 628 pp. Illus. $20.

This volume contains the proceedings (44 papers) of a conference on mass spectroscopy and some of its applications. Although the conference, which was attended by many authorities in the field, was sponsored by British and American mass spectroscopists, it can properly be called international, for authorities from other countries contributed many papers. The papers are distributed among five general sections: