

pages long and was just a portion of the volume on x-rays. The new volume, with indexes, has 663 pages!

The volume consists of monographs on "The Experimental Methods to Determine the Crystalline Structure by X-rays," by Gerard von Eller and André Guinier (Paris) (in French); "The Theoretical Principles of Structural Research by X-rays," by J. Bouman (Delft) (in English); "The Investigation of the Structure of Liquids and Amorphous Substances by Means of X-ray Diffraction," by Gerard Fournet of Paris (in French); "The Size of Particles and Lattice Defects," by W. W. Beeman, P. Kaesberg, and J. W. Anderegg (University of Wisconsin) and M. B. Webb (General Electric Research Laboratories) (in English); "Electron Interferences," by H. Raether (University of Hamburg) (in German); and "Neutron Diffraction and Interference," by R. Ringo (Argonne National Laboratory) (in English). The large amount of information on neutron diffraction now available did not exist at the time of publication of the second edition. The interferences from liquids and electron diffraction were briefly mentioned in two places; now each of these subjects forms the background for a detailed monograph.

The level of the book is entirely different from that of Ewald's. Whereas Ewald's book was written in such a way that it could be given to the beginning graduate student as an introduction to structural investigations with x-rays, the monographs in this volume are written for more advanced workers, and the bibliography takes into account only investigations of recent years. There are brief references, in the article by Bouman on theoretical principles of structural research by x-rays, to the elementary theory of diffraction, but otherwise most of the references deal with papers which have come out since the 1933 handbook appeared. This is quite justifiable in view of the fact that there is a large amount of material in the structure reports, which are now edited by the crystallographic societies.

One might feel that Bouman's article should really be the first one in the volume, for it lays the theoretical foundation, giving a detailed discussion of space groups, which is necessary for understanding of the experimental determinations that are discussed by Von Eller and Guinier.

The article by Von Eller and Guinier is quite complete; altogether, this volume is the only one in which all this information could be found, with the exception perhaps of Guinier's own book, *Theorie et technique de la radiocristallographie* (in French). The arrange-

ment in the present text is sufficiently different to make the reading stimulating even if one is familiar with the former volume. The standard methods of Fourier analysis are discussed, as is the method of x-rac used by Pepinsky. The latter method seems to have been treated too briefly, for it is so far superior to anything that is otherwise available. The detailed discussion of the phase problem, by Bouman, will be welcomed by all workers in the field, as will be the discussions that follow of the various methods which have been used to solve this problem.

The article by Fournet on the structure of liquids and amorphous substances is perhaps the most complete monograph on the subject in existence at the present time.

The article by Beeman, Kaesberg, Anderegg, and Webb is divided into two subsections, one on the effect of particle size and the other on lattice defects. The latter, in particular, will be of great interest at the present time, now that imperfections in crystals have been studied so widely and have been recognized to be of such importance in many fields of solid-state physics. The last few paragraphs of this chapter, on x-ray microscopy and microbeam experiments, will be of interest to the investigator who is concerned with thin layers. On combining this information with the information supplied by Raether in his chapter on electron diffraction, one gains a good insight into what can be done nowadays with a combination of various diffraction methods. Some of the figures in Raether's article, in particular, are very beautiful. The detailed discussion of applications to electrolytically polished metal surfaces and to the structure of mechanically polished surfaces will be of great interest not only to the physicist but also to the engineer, and so will be the chapter on thin layers and their structure. This monograph closes with a brief description of the diffraction of electron waves, which have become more useful in recent years. The complete discussion of all the problems which are involved in neutron diffraction, now that reactors are becoming widely used all over the world, is of great importance. The advantages and disadvantages of the methods are discussed in detail; the discussion covers not only simple diffraction theory but also the various techniques which have to be used for interpretation and the experimental techniques which are necessary to get monochromatic neutron beams, as well as good detectors.

This is a very valuable book and will be indispensable not only to the physicist and physical chemist but also to the biologist who wants to learn more about the

structure of materials. If I have one criticism, it is that there is, unfortunately, no really good index; the present one does not do justice to the amount of material which is actually available in the volume itself.

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Economic Backwardness and Economic Growth. Studies in the theory of economic development. Harvey Leibenstein. Wiley, New York; Chapman & Hall, London, 1957. xiv + 295 pp. Illus. \$6.75.

This book employs the tools of traditional economic theory to produce an abstract analysis of economic backwardness and economic growth. The central thesis consists of two parts: (i) Economic backwardness involves a condition of quasi-stable equilibrium such that any small growth in per capita income sets up forces, such as population growth, which operate to reduce per capita income and reverse the initial growth. (ii) In order to achieve sustained growth, the initial impetus to growth must exceed some critical magnitude necessary to overcome the reversing effect of the income-reducing forces.

This thesis involves much more than the obvious statement that, in order to raise per capita income, production must outrun population growth. On the one hand, the possible forces operating to reverse growth include not only population increase stimulated by higher incomes but also overconsumption, the exhaustion of particular limited resources, and institutional rigidities. On the other hand, these forces are of a limited magnitude, so that an initial growth above some critical rate will not be reversed but will tend to lead to further growth.

Possible patterns of quasi-stable equilibrium are examined analytically and used to explain some of the known characteristics of less-developed countries. The minimum effort necessary for sustained growth is considered analytically, and abstract models for growth are developed. Finally, an analysis is made of rates of population growth, of investment, and of appropriate investment policies.

The central theme of the book presents a promising hypothesis to be tested, and the detailed analysis constitutes useful pioneering in a field that is underdeveloped. At the same time, the analysis is likely to leave the reader with a sense of unreality. There is no evidence that the author has had any actual experience with underdeveloped countries. The application of market analysis to countries

such as India and Pakistan, where more than two-thirds of production is for communal use and lies outside the market; the neglect of the community development programs which are proving so successful in so many of the developing countries; the treatment of increased capital investment per capita as the determinant of per capita growth in income; the absence of any discussions of the role of development planning; and the exclusion of the balance-of-external-payments problem, which so seriously plagues most countries which are seeking more rapid development—all these aspects of Leibenstein's book indicate how partial the analysis is and how little it grapples with the real problems of economic growth, however successful it may be in diagnosing economic stagnation.

GARDINER C. MEANS
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A Frontal Section Anatomy of the Head and Neck. Otto F. Kampmeier, Arthur R. Cooper, Thomas S. Jones. University of Illinois Press, Urbana, 1957. xii + 25 plates. \$15.

The authors have prepared a clear, accurate, and well-labeled atlas showing the frontal-section anatomy of the head and neck. This should be a useful reference book for surgeons and others concerned with the detailed topographic anatomy of the regions dealt with. It shows the anatomy of the anterior faces of 20 frontal or coronal sections through the head and neck to the level of the cricoid cartilage and seventh cervical vertebra. The original sections, each about 1 cm thick and evenly spaced, were cut fairly symmetrically through a young adult negro specimen.

The plates are natural size. In their preparation, photographic enlargements of the sections were reworked and clarified by author-artist Tom Jones. Bones are colored with a yellow overtone, but other structures are uncolored. The various other anatomical structures—nerves, vessels, muscles, and so on—are clearly depicted, and the labeling is quite complete. Except for the temporal fascia, however, fascial planes of the head and neck were ignored. In addition to the 20 frontal sections, there are helpful reconstructions showing the front and side views of the skull, a midsagittal view, and lateral views of the arteries and veins.

The introductory pages include notes on the preparation of the sections and plates and historical notes on the section approach to anatomy, with special concern for frontal sections.

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Quelques Problèmes de Chimie Minérale. Rapports et discussions publiés par les Secrétaires du Conseil sous les auspices du Comité Scientifique de l'Institut. R. Stoops, Ed. Institut International de Chimie Solvay, Brussels, 1957. 544 pp. Illus. F. 590, paper; F. 675, cloth.

This book contains 12 papers dealing with problems in modern inorganic chemistry, presented at the 10th Congress of Chemistry held at the University of Brussels in 1956 under the auspices of the Scientific Committee of the Solvay International Institute of Chemistry. The value of the papers is enhanced by the inclusion of detailed discussion. Five of the papers are in French, and seven, in English. Much of the discussion is also in English. For those interested in the modern phases of inorganic chemistry, this published work should be extremely valuable.

The papers, presented by leading authorities from France, England, Denmark, the United States, and Sweden, deal with such subjects as the complex compounds of the transition metals; physical chemistry of some nonstoichiometric phases; nonstoichiometric organic compounds; absorption spectra of complexes with unfilled *d*-shells; application of the screening theory of chemical reactions involving nonmetallic solids; applications of the crystal-field theory to problems of transition-metal chemistry; problems of solid-state chemistry; and the influence of adsorbed gases on the reactivity and stability of surface crystalline lattices.

Included in the book are pertinent features about the institute, the composition of its administrative committee, a list of those who participated in the congress (which includes members of the scientific committee, the members who gave the papers, invited members, various secretaries, and invited auditors), the speech of the president of the institute, the banquet address of the president of the administrative committee, the speech of the president of the congress, and the closing speech.

RALEIGH GILCHRIST
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The Galactic Novae. Cecilia Payne-Gaposchkin. North-Holland, Amsterdam; Interscience, New York, 1957. 336 pp. Illus. \$8.50.

About four hundred years ago Tycho Brahe wrote, "all philosophers agree, and facts clearly prove it to be the case . . . that the heavens and the celestial bodies in the heavens are without increase or diminution, and that they undergo no

alteration, either in number or in size or in light or in any other respect" [quoted by J. B. Irwin, *Sky and Telescope* 16, 544 (1957)]. Yet, it was Tycho himself who, in 1572, observed in the constellation Cassiopeia one of the rare cataclysmic "alterations" in a star of our galaxy—a supernova explosion in which a previously unknown (and probably invisible) star suddenly blew off a large fraction of its mass with a velocity that must have been of the order of several thousand kilometers per second and that raised the apparent brightness of the star until it rivaled Venus and could be seen in full daylight. We have no knowledge of the brightness of the star before its outburst. But at the present time there is no star in the position of the supernova brighter than about the 18th magnitude. The decline from maximum brilliance to the present postnova stage must have corresponded to at least 22 stellar magnitudes, or a factor of almost one billion. There is, however, in the region of the supernova a ragged-looking patch of turbulent nebulosity which emits not only visible light but also a large amount of long-wave radiation; it is, in fact, a conspicuous source of radio radiation. By analogy with the better known supernova of the year 1054—the Crab Nebula—it is reasonable to conclude that the radiation of the remnants of Tycho's supernova is, at least in part, of the "synchrotron" type.

While a supernova may appear in a single galaxy at a rate of one in several hundred years, the less spectacular normal novae appear at a rate of several dozen per year. Such a nova may suddenly increase in brightness by a factor of about 10,000; and the velocity of the ejected gas (about 0.00001 of the mass of the star) is more moderate—of the order of a few hundred kilometers per second.

All types of novae are now believed to represent particular stages in the evolution of old and massive stars which have exhausted most of their nuclear energy sources and are in the process of readjusting themselves to the state of "white dwarfs," a process that must involve a drastic reduction in the mass of the star.

Cecilia Payne-Gaposchkin's new book is a comprehensive summary of everything that is now known about these stars. It describes and coordinates the observations made by hundreds of astronomers during the past nine hundred years, and it illustrates the enormous difference between the research methods of the astronomers and those of other scientists. The phenomenon of a nova is not only a relatively rare occurrence, it is also one of short duration. An individual astronomer may succeed in observing its brightness or its spectrum on only a few