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Fifty years of electron diffraction. Edited by P. Goodman. Pp. xiv + 432. Dordrecht, The Netherlands: Reidel, 1981. Price Cloth Dfl. 155, Paper Dfl. 80.

This is an important volume commemorating the 50th anniversary of the discovery of electron diffraction, published for the IUCr. In the last half-century, electron diffraction has played an important and unique role in the study of the structure of matter, and now it has found its own fields of application, ranging from scattering physics through to structure analysis. This volume gives full information on the history of electron diffraction and the current status report of this rapidly growing subject.

The text consists of three parts. Part I, with the title *The start*, contains all the history up to 1928. It consists of six invited contributions in 60 pages, including a short note entitled *A general view of my scientific works* written by Louis de Broglie and the frontispiece showing the pioneers of electron diffraction. Other articles, *The origin of de Broglie's concept* by H. A. Medicus, *Davisson and Germer* by R. K. Gehrenbeck, *George Paget Thomson* by P. B. Moon, *Seishi Kikuchi* by S. Miyake and *Louis de Broglie* by M. J. H. Ponte, all include good biographical sketches and details of working conditions, collaborators and outside contacts which led to the well-known discoveries. Readers will find how the exchange was made between the research workers at Davisson's laboratory and the European scientists, including those in de Broglie's laboratory and Thomson's group, in those days, and how the subject was introduced into Japan and developed.

The subsequent development at various centres of research is dealt with in part II. It includes 36 articles (250 pages in total) written in the form of personal memoirs by the most distinguished scholars and is divided conveniently into three periods. Period 1, 1928–1935, contains nine articles. C. J. Calbick writes reminiscences of Davisson's laboratory. H. A. Bethe, J. J. Trillat, M. Blackman and G. Hägg write reminiscences of the early days of electron diffraction in Germany, France, Imperial College (London) and Stockholm, respectively. Four articles written by H. Mark, L. O. Brockway, L. E. Sutton and S. H. Bauer are accounts of the birth and development of gas electron diffraction which started in 1930. The exchange with enthusiasm among the pioneers of this field in Europe and America is well explained, and readers will find how important a role was played by L. Pauling in those days.

Period 2, 1935–1945, consists of ten articles. Five were written by Japanese scholars, who were leaders of the research groups that contributed greatly to the development of theory and experiment of electron diffraction. S. Miyake gives an account of the works of his group up to the '70's, which are concerned mostly with dynamical diffraction effects of electrons. R. Uyeda outlines the important topics, *i.e.* dynamical theory, absorption of electrons, critical-voltage effect, metal smoke particles, instrumentation, *etc.*, out of research works of his school up to the present. T. Hibi writes an account of the pointed-filament source, S. Ogawa the studies on epitaxy, multiply twinned particles and alloy structures, and Y. Morimo writes an account of the start and development of gas diffraction in Japan. In the USSR, electron-diffraction studies started immediately after Thomson's early works. Z. G. Pinsker surveys the subsequent development of the electron-diffraction structure analyses which are mainly based on the kinematical theory and Fourier syntheses, using oblique texture patterns as well as spot patterns. H. Wilman deals with the extensive contributions to instrumentation, interpretation of various types of diffraction patterns and applications of electron diffraction of G. I. Finch's school up to 1952. H. Boersch reports his works on electron optics and electron spectroscopy of gases and solids carried out in Berlin. P. Goodman writes of the activities of G. Möllenstedt on convergent-beam electron diffraction and instrumental contributions to electron optics in Danzig and Tübingen, and C. H. MacGillavry, who adapted Bethe's theory to the transmission case, writes personal reminiscences of her academic life up to 1940.

Period 3, 1945–present, consists of 17 contributions; two LEED, five gas and ten HEED articles. The 'renaissance' of LEED came in the '60's, after the display system using the idea of post acceleration of electrons was introduced at Bell Laboratories in 1960. E. G. McRae surveys the surface studies at Bell Laboratories in the '60's and G. A. Somorjai reviews the development of experimental and theoretical works on LEED during the last 15 years. It seems that many readers of this book, except those working on LEED, are not aware that 'between 1960 and 1970 over 700 ordered-surface structures of adsorbed monolayers have been reported'. Five articles on gas diffraction are written by V. Schomaker & K. Hedberg, O. Bastiansen, L. S. Bartell, Jerome & Isabella Karle and L. V. Vilkov. It is evident that gas electron diffraction developed dramatically after World War II. That evolution was the consequence of improvement in the apparatus, including the introduction of the sector, introduction of high-speed computational methods and stimulating cooperation of many scientists in several different countries working on this field. Needless to say, the HEED also has advanced strikingly in this period and it is now an indispensable experimental method in materials science, chemistry, mineralogy and biology. This development is largely attributable to the rapid improvement of transmission electron microscopy, introduction of diffraction-contrast technique and development of image-contrast theory. In the articles by G. Honjo and H. Hashimoto & K. Tanaka, improvement of the instrument and its application to materials science carried out at their schools are briefly surveyed. After J. M. Cowley's article on the short history of HEED in Australia, J. V. Sanders & P. Goodman write an interesting background story of the start of the Cowley–Moodie theory on Fourier images and the multi-slice formulation, and S. C. Moss & P. Goodman give an account of the birth of the concept that short-range-order diffuse scattering reflects the form of the Fermi surface for some binary alloys. Doubtlessly, the contributions of the Cambridge group to the crystal defect studies are highly appreciated. P. B. Hirsch writes personal recollections of development at the Cavendish Laboratory in the period 1946–1962. L. Sturkey and F. Fujimoto, who contributed to the development of the scattering matrix, give their personal memoirs. There are two articles on the HEED studies in the USSR: B. B. Zvyagin surveys the works on minerals and S. A. Semiletov & R. M. Imamov those on thin-film structures of binary and ternary compounds.

As with part I, the individual periods in part II are introduced by picture pages displaying equipment, laboratories or personnel evocative of their period, and the contrast between typical laboratory equipment in use in the early '30's and the early '40's, for example, can be quickly assessed from these pages.

Part III consists of concise, self-contained reports on the present state of the subject on an international basis. The following six excellent articles are included in 105 pages: *Theory of forward elastic scattering* (A. F. Moodie), *Surface crystallography by LEED* (M. A. Van Hove), *Gas electron diffraction* (K. Kuchitsu), *Electron diffraction in TEM* (S. Amelinckx), *Inelastic electron scattering* (H. Raether), *Structure determination by HEED* (J. Gjønnes). They trace the historical development of the subject, describe important aspects of contemporary theory and practice, summarize some important results and give some indication of the capabilities of present-day electron diffraction. The articles are of a standard useful to a research student of electron diffraction.

Throughout this volume, readers will find many interesting episodes which are related to the important discoveries and development in electron diffraction. All the electron diffractionists as well as the crystallographers in the other fields and aspiring students should read this book.

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Diffraction studies on non-crystalline substances. Edited by ISTVÁN HARGITTAI and W. J. ORVILLE-THOMAS. Pp. 894. Amsterdam and Budapest: Elsevier, 1981. Price US $109.75, Dfl. 225.00.

Diffraction studies on non-crystalline substances is Volume 13 of Elsevier's *Studies in physical and theoretical chemistry*. The volume is based primarily on lectures given at a conference at Pécs, Hungary in 1978. The book consists of twenty-one chapters written by authors with backgrounds in different areas of diffraction studies. The book is loosely divided into five parts; gases, liquids, amorphous systems, polymers and metallic alloys.

The first part concentrates on electron diffraction from gases with chapters related to the history of electron diffraction, determination of geometrical parameters of free molecules, application to organic molecules, determination of the harmonic potential function, the study of large-amplitude motion and the determination of internal rotation. These six chapters cover the field of electron diffraction from gases quite adequately and with surprisingly little redundancy.

The three chapters on liquids discuss some of the more formidable applications of liquid diffraction. The chapter on the structure of molecular liquids describes the determination of the molecular pair-correlation function. This function contains information not only related to the separation of two molecules but also on their mutual orientation. The second chapter on liquids reviews the recent diffraction studies of aqueous electrolytes, giving major attention to the calculation of the partial pair-correlation functions of the different interactions. This chapter also gives an interesting account of the recent diffraction studies of water. The final chapter on liquids describes the use of molecular dynamics to arrive at computer simulations of liquid structure.

Approximately half the book is devoted to diffraction studies of solids. Appropriately, the first chapter by A. Guinier discusses a number of systems that he refers to as intermediary states between order and disorder. The chapters dealing with polymers stress applications of wide-angle scattering although both X-ray and light small-angle scattering are briefly reviewed. The chapter by P. W. Schmidt develops in detail the use of integral transforms for the determination of the particle-size distribution for a system of non-identical particles of similar shape. This is the only chapter in the book that deals extensively with a topic concerned with small-angle scattering. The fifth part of the book covers, with varying degree of detail, the major methods that have been used to study the structure of amorphous metallic alloys. In addition to a discussion of the large-angle X-ray and neutron scattering studies, mention is also made of small-angle scattering and a non-diffraction method, extended X-ray absorption fine structure. The final chapter describes various applications of the electron microscope to the study of amorphous solids. Electron microdiffraction, a technique for examining regions of about 20 Å, is the primary topic.

Most of the chapters are written in the style of a review article with the authors relying on the references for derivations of the relevant theory and detailed description of the experimental methods. The strength of the volume lies in the topics discussed, which for the most part are current and include many of the major recent contributions to the various areas.

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Experimental high-resolution electron microscopy. By J. C. H. SPENCE. Pp. xii + 370. Oxford University Press, 1980. Price £35·00.

As the two micrographs in the frontispiece of this book show very clearly, it is possible in electron microscopy to have detail at the atomic level for solid materials.

This itself is not particularly new; but in the last few years there have been important contributions to this expanding field. The good quality of the better commercial microscopes now permits, in principle, every microscopist who is interested in applications in materials science, mineralogy, solid-state physics and solid-state chemistry, ... to conduct research at this level.