books in a narrow field or a multi-author book in a wider field. This is a multi-author book in the specialized field of structural phase transitions, and is the first of an intended series of three volumes in this field. It is really a collection of review articles by experts, each one of whom describes the applications of a particular group of experimental techniques to the study of structural phase transitions. It is necessary to warn crystallographers that the book is not concerned with first-order polymorphic transitions of the reconstructive type, or processes of recrystallization, or the amorphous-to-crystalline transitions. It is also not concerned with martensitic phase transformations, though these find some mention in the last chapter. The book is intended primarily for solid-state physicists working on phase transitions involving only small displacements of atoms or their ordering among equivalent sites. These include displacive transformations which are 'weakly' first order, as well as disordering transformations of second order.

The type of phase transitions discussed in this book and the materials displaying them have been classified as follows.

1. *Materials for which strain is order parameter:* (*a*) Ferroelectric transitions, *e.g.* KH_2PO_4, CsH_2AsO_4, K–Na tartarate, *etc.* (*b*) Non-electronic transitions, *e.g.* KCN, NaCN and TeO_2. (*c*) Electronic transitions: (i) cooperative Jahn–Teller transitions, *e.g.* $Ni_xZn_{1-x}Cr_2O_4$, $CsCuCl_3$, $TbVO_4$, TmCd, $PrAlO_3$, UO_2, Fe_3O_4, *etc.*; (ii) band Jahn-Teller transitions, *e.g.* Nb_3Sn, V_3Si and $LaAg_xIn_{1-x}$; (iii) valence transitions, *e.g.* $Sm_{1-x}Y_xS$, $Ce_{1-x}Th_x$, and TmSe; (iv) martensitic transitions, *e.g.* In_xTl_{1-x}, $AuCuZn_2$, La_3Se_4, *etc.*

2. *Materials for which strain is not order parameter:* (*a*) Phonon transitions (phonon coordinate is order parameter), *e.g.* $SrTiO_3$, $CsPbBr_3$, $Sn_xGe_{1-x}Te$, SiO_2, $BaMnF_4$, $Gd_2(MoO_4)_3$, *etc.* (*b*) Ferroelectric transitions (electric polarization is order parameter), *e.g.* $Pb_5Ge_3O_{11}$, $BaTiO_3$ Ca_2Sr propionate, $NaNO_2$, triglycine sulphate (TGS), SbSI, *etc.* (*c*) Orientational transitions (orientational degree of freedom is order parameter), *e.g.* NH_4Cl and NH_4Br. (*d*) Charge density wave transitions, *e.g.* TTF–TCNQ, 2*H*-$TaSe_2$, 2*H*–$NbSe_2$ and $K_2Pt(CN)_4Br_{0\cdot3}3\cdot2H_2O$. (*e*) Solid electrolytes, *e.g.* $RbAg_4I_5$. (*f*) Incommensurate phase transitions, *e.g.* K_2SeO_4, Rb_2ZnCl_4, $K_2PbCu(NO_2)_6$, *etc.*

The first chapter by Müller gives a brief introduction to the general aspects of such structural phase transitions (SPT) and defines the various physical processes underlying them. This is followed by three chapters on experimental research by different techniques. Chapter 2 by Lyons & Fleury describes optical investigations of SPT. The techniques discussed include measurements of refractive index and birefringence as well as light scattering, infrared and optical absorption, fluorescence and the recent non-linear optical technique of second harmonic generation. The information that can be obtained by the application of these techniques to the various classes of phase transitions mentioned above is then discussed and compared with the results available from other techniques. Applications to magnetic transitions and recent work on plastic crystals have been excluded.

Chapter 3 by Dorner reviews the applications of inelastic neutron scattering to the study of SPT. The effects of the phase transformations on various types of molecular motions (such as librations, rotational reorientations, translations, soft modes, and relaxation of clusters) occurring in molecular crystals are first discussed. In recent years the dynamics of the incommensurably modulated structures has attracted considerable attention. Besides the conventional excitations like phonons, magnons and excitons, inelastic neutron scattering enables the study of 'phasons', 'amplitudons' and 'solitons' associated with the incommensurable phase transitions. Such studies are also described.

Chapter 4 by Lüthi & Rehwald, which is the last chapter, presents a review of ultrasonic studies of SPT. The ultrasound behaviour as a function of temperature depends on whether the strain in the crystal couples linearly with the order parameter or through a higher order. If it couples linearly then the strain itself can be taken as the order parameter and an elastic constant vanishes at a second-order phase transition. Examples of ferroelectric–ferroelastic as well as Jahn–Teller varieties are discussed in detail. This is followed by a review of cases where the order parameter couples quadratically with the strain. In such cases an enhanced ultrasound attenuation is observed near T_c. The determination of transition points and phase diagrams by elastic constant measurements is described.

This is an interesting book on a fascinating topic of current interest. Our understanding of structural phase transitions is far from complete and this book will constitute essential reading for those working in this field in future. The last two chapters are accompanied by an exhaustive bibliography listing references right up to 1980, which will prove invaluable to anyone wishing to enter this field of research. The second chapter (on optical studies), which apparently had to await the other two for publication, cites references up to 1977.

This book is the first of a planned series of three volumes on SPT. In the second volume the editors propose to describe the applications of EPR and NMR methods, dielectric measurements and calorimetric techniques to the study of SPT. A third volume on theoretical studies starting with dynamic lattice theory and describing the Landau theory, the general symmetry properties, the renormalization group theory, and the Jahn–Teller-induced SPT will complete the set. The editors are to be congratulated on planning this series of three volumes on SPT. If the subsequent volumes maintain the standards set by this one it will be undoubtedly an excellent series providing an invaluable and comprehensive survey of the present state of knowledge in the field of structural phase transitions.

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Proceedings of the VIth international conference on Raman spectroscopy: linear and nonlinear processes. Edited by W. F. MURPHY. Pp. xxvi + 710. Amsterdam: North Holland, 1981. Price US $86.50, Dfl 177.50.

All of the papers presented at the Raman Spectroscopy Conference, which took place in Ottawa, in August 1980, are published here 'in condensed form'.

The titles of the chapters in this volume are: *Scattering by condensed matter*; *Applications of Raman and laser* *spectroscopy*; *Raman studies of surfaces*; *Time dependence of scattering processes*; *Biological applications; CARS and other high-order processes*. The total coverage is comprehensive with contributions from almost every important research worker who is active in these fields. If one wanted to assess the current state of the art this would be a good book to browse through, but should it have been published at all?

All contributions are printed directly from masters provided (in typescript) by the authors. Therefore, something between 10 and 30% of this book is blank paper. The papers are adequate as summaries of conference reports, but so lacking in detail as to be almost worthless for reference purposes. One imagines that all work of substantial value will be published soon elsewhere. This reviewer finds difficulty in envisaging the readership which the publishers presumably hope will recommend purchase of this book.

It would be invidious to single out from the 350 or so articles any particular ones for mention here. After skimming through the book one is left with an overall impression of a field of great vitality covering an incredible diversity of subjects. A technique-orientated subject such as this is truly multi-disciplinary. This is laudable, but one must acknowledge that most scientists today have such specialized interests that much will be incomprehensible to the individual.

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Sputtering by particle bombardment. I. Physical sputtering of single element solids. Edited by R. Behrisch. **Topics in Applied Physics. Vol. 47.** Pp. x + 281. Berlin, Heidelberg, New York: Springer, 1981. Price US $46.00, DM 85.00.

The most recent book discussing all the different aspects of ion bombardment of solids was published more than ten years ago. This book and two further volumes, which are in print, are intended to update and summarize the knowledge in the fast-growing field of sputtering phenomena. It will be useful not only for scientists actually involved in this field but also for those using any of the many applications of sputtering, like thin-film deposition, micromachining or sputter etching for depth profiling in combination with a surface analytical technique.

Besides an overview by the editor, the four reviews of this first volume concentrate on the physical principles governing the sputtering process of single-element solids. However, not all aspects are dealt with. Some of them, like energy and angular distributions of sputtered particles will be contained in the following volumes.

Sputtering theory is discussed in two contributions. The first one by P. Sigmund brings an introduction to the theory for amorphous (polycrystalline) materials. Ion penetration and collision cascade theory are summarized and also the limits of the linear cascade theory and spike phenomena are discussed. The second contribution by M. T. Robinson focuses on computer simulation techniques for ion bombardment of single crystalline materials. Channeling of ions and focused collision sequences in low-index crystal directions are discussed.

These two theoretical contributions are supplemented by two chapters on sputtering yield measurements of polycrystalline materials (H. H. Andersen & H. L. Bay) and on single-crystalline targets (H. E. Roosendaal).

The sputtering yield, which is defined as the number of ejected target atoms per impinging particle, is of central importance in sputtering and its applications. Different methods to measure the yield are discussed and an extremely large amount of experimentally determined yield data has been collected from the literature. This chapter alone has over 400 references. These measured sputtering-yield data for over 40 elements are presented graphically as a function of bombarding ion energy for different noble gas ions and compared with calculated values according to the linear cascade theory as discussed in the first contribution. These data and those concerning the dependence of the sputtering coefficient on the angle of ion incidence are most valuable for anybody interested in actual sputtering yield data for a given ion–target combination.

The topic of the last contribution is the variation in the sputtering yield with angle of incidence of the incoming ion beam relative to the crystallographic orientation of a single-crystal target. This is discussed in terms of the channeling model.

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Photoelastic and electrooptic properties of crystals. By T. S. Narasimhamurty. Pp. xxix + 514. New York: Plenum, 1981. Price US $37.50.

This book starts with a short historical introduction and a reasonably concise review of mathematical tools that will be needed. This is followed by a discussion of symmetry requirements on the photoelastic constants. A section on elasticity including some discussion of experimental methods is then provided. Chapters on measurements of the photoelastic constants and a discussion of classical theories of photoelasticity then conclude this section of the book. The portion dealing with linear and quadratic electrooptic effects occupies the concluding chapter. This, together with a short chapter on piezoelectricity, is about 20% of the book. A bibliography with titles of over 1600 items ranges from Brewster's 1815 paper through 1979. The notation used appears consistent and is summarized in a convenient table. Some descriptions of and references to technical applications appear in various parts of the book. The principal emphasis throughout is on understanding the effects of crystal symmetry and this is, after all, the first thing one must do in studying the effects.

In order to get some idea of the flavor of this book, let us look in more detail at Chapter 3 which is entitled *Pockels'*