high-energy electrons found by radio telescopes in radio galaxies and quasars reach their extreme in pulsar magnetospheres.

Ginzburg is a generalist whose encyclopedic reading and depth permit coverage of a variety of such novel, specialized material. He uses order-of-magnitude (nearly dimensional) formulas, sufficient to provide quantitative estimates. He appreciates the experimenter's contribution. The book provides a model of how non-theorists can judge what realms of theory may be illuminated by work in a new range of photon and particle energy, how new technologies may be used to good effect.

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Light Scattering by Phonon–Polaritons

R. Claus, L. Merten, J. Brandmuller
237 pp. Springer-Verlag, New York, 1975. $29.70

For those of us who are neither too young nor too old (and who have been paying attention), polaritons have been a lively microlaboratory in which to learn physics, sharpen perceptions and gain sophistication. From the work of Kerson Huang, John J. Hopfield, and Ugo Fano in the 1950's we learned how the coupling of electromagnetic vibrations to crystalline excitations (either phonons or excitons) affects both the optical properties of the crystals and the behavior of the fundamental excitations themselves (the longitudinal–transverse frequency splitting, for example).

The coined term "polariton" stands for a wave of electric polarization shared between the electromagnetic field and the crystalline degrees of freedom. Although Huang demonstrated dispersion curves for phonon–polaritons in 1951, the existence of polaritons remained figmentary until they were observed directly as elementary excitations in their own right, in inelastic light-scattering spectroscopy, by Charles H. Henry and Hopfield in 1965. Thereafter the perception of polaritons' reality grew and their popularity spread to all corners of the earth, carried partly by the floodtide of laser-light-scattering spectroscopy and partly by the wonder of it all.

That the volume under review is entitled *Light Scattering by Phonon–Polaritons* is due to the fact that there is no other comparable way to study phonon–polaritons. Although some properties of polaritons are known from such indirect techniques as infrared reflectivity, to study them *in vivo*, as it were, one simply must penetrate the crystal as with light. Practitioners of the light-scattering art mapped out many beautiful polariton dispersion curves, and we came to regard these as *being* polaritons.

The study of these entities has helped us to understand other phenomena. Ferroelectricity, for example, is often associated with a "soft mode" exhibiting remarkable temperature sensitivity; its polariton does interesting tricks. Anharmonic phonon interactions have been fruitfully studied. Such marvels as frequency-dependent phonon damping and Fano interferences have been demonstrated with startling clarity and directness.

Polariton damping, however, brings a sticky end to the subject. When we contemplate the damping of such a composite excitation, we must keep clearly in sight the separate parts of which it is made, as well as the specific ways its parts are probed in an experiment. Representing the excitation as a point in complex frequency–wavevector space is inadequate and, in fact, thinking of it as a polariton no longer helps. I would therefore wish to augment my study of the living polaritons in this book by reading about dying polaritons in the response-function approach of A. S. Barker Jr and R. Loudon.

With this exception, I believe that the authors have given an excellent and complete account of the behavior of polaritons. They have included plenty of diagrams and formulas to make the ideas precise, but they have not neglected the philosophy that brings the ideas to life.

The book will be useful to students and practitioners of solid-state physics whose interests run to lattice dynamics and phonons, to light scattering or to electromagnetic propagation. Many of the ideas are, of course, generalizable to electromagnetic energy coupled to other excitations than phonons, so those interested in such diverse topics as plasmons and surface waves may also hope to find inspiration here.

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Detection and Spectrometry of Faint Light

J. Meaburn
270 pp. D. Reidel, Boston, 1976. $34.00

For the past 15 years John Meaburn has been designing spectrometers to analyze the visible and infrared emission from gaseous nebulae. In this fifty-sixth volume of the Astrophysics and Space Science Library he has set down a method for evaluating general types of spectrometers. His aim, as stated in the preface, is to "bridge the gap between the pure instrumental physicist and the user of detectors and spectrometers."

The monograph is organized into three general parts: introductory chapters on spectrometry, detectors, prism spectrometers and gratings; intermediate chapters describing various spectrometers, and a final chapter on signal-to-noise ratios as the principal criteria of merit. The introductory chapters are brief, tending more to definition of terms than explanation of principles. The intermediate chapters consist of an instrument-by-instrument analysis of the parameters needed to determine a potential factor of merit Z_{pot} for each spectrometer. The final chapter attempts to relate some of these parameters to the signal-to-noise ratio of a system.

The book is a rather complete catalog of individual instruments and combinations of instruments. Faced with the problem of choosing which instrument—a grating monochromator, a Michelson interferometer or a PEPSIOS or SISAM monochromator—to use in a particular experiment, one is likely to throw up his or her hands and use whatever is handy. With the method illustrated in the text, a rapid paper-and-pencil analysis of the Z_{pot} for the several spectrometer systems might be made without too much difficulty.

Despite the author's attempt in his final chapter to relate the parameters so carefully listed in the earlier chapters to the signal-to-noise ratios, much of the effort is abandoned in favor of an analysis that could have been carried forward without most of the material in the preceding chapters. Granted, as the author asserts, that factors listed in the intermediate chapters are related to the signal-to-noise ratios "in a very complex and often variable way," there is no indication of what importance the author puts on Z_{pot} relative to these ratios as calculated in the three illustrative problems in the final chapter.

Meaburn makes a modest attempt to explain the workings of the various instruments, but the sheer number of devices considered and the use of figures from original papers do not allow a pedagogical approach. One cannot understand many of the fine points unless one has read some of the basic references to spectrometers given in the text. The book needed the hand of a good copy editor—a lack of commas makes the text frustrating to read. Most readers, however, will use this as a reference, dipping in where needed and ignoring the rest.

The detection of faint light, mentioned in the title and covered in Chapter 2, is a brief review of most commonly used visible-light detectors and a description of