justification for the assumptions of the model. Because there is no theoretical prediction of the form of a property's dependence on ionicity, it is necessary to introduce new arguments and new ideas in the rationalization of each new observed trend. This feature, which in the past has been more common to chemical than to physical theory, tends to prevent the hoped-for conceptual unity of the work.

Perhaps the most unsettling properties, from the point of view of Phillips's model, are properties with which one associates effective charges, and which would therefore seem intuitively closest to the ionicity concept. One such property is the piezoelectric constant, for which the associated effective charge is found experimentally to change sign as the ionicity is increased. Another such property is the transverse effective charge that is associated with the splitting of the longitudinal and transverse optical vibrational modes. That charge shows so little trend with ionicity that it was necessary to define a somewhat unphysical charge (by dividing by the dielectric constant) to obtain a correlation. The difficulty of consistently squaring such features with the model could suggest that the model has not reached the essence of the problem, though the empirical correlation of properties with an ionicity defined spectroscopically is in no way affected by this.

What I feel is the inadequacy of the Universal Semiconductor Model does not reduce the great utility of this book in providing a comprehensive description of the electronic structure and the properties of semiconductors as well as the insight of one of the leading solid-state theorists. This will unquestionably prove an influential piece of work and an important addition to the library of all solid-state scientists and engineers.

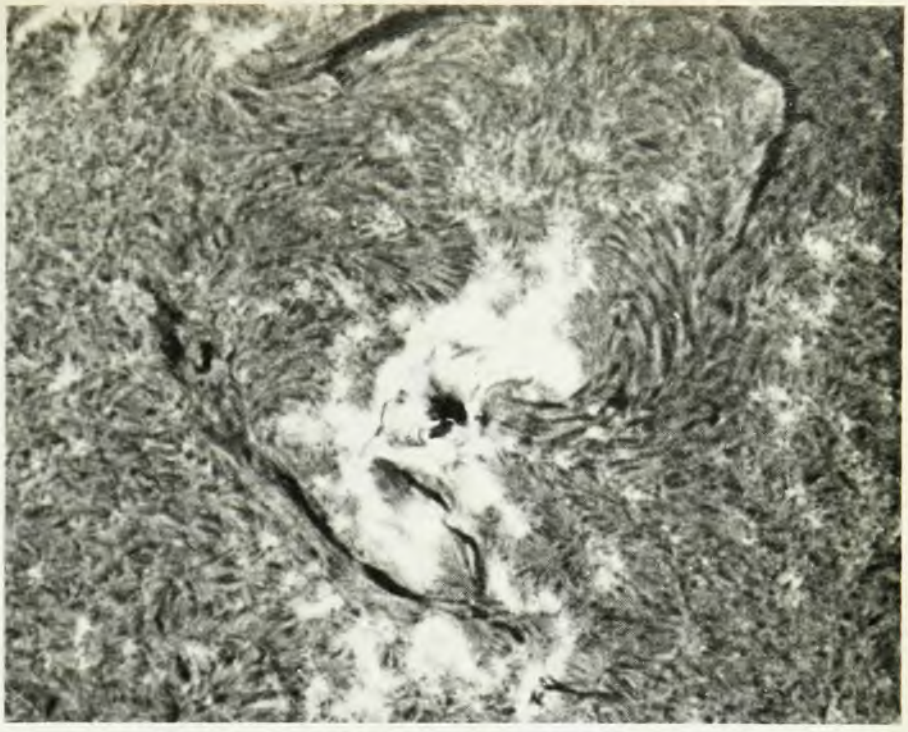
* * *

*Walter A. Harrison is professor of applied physics at Stanford University. He is the author of two books,* Pseudopotentials in the Theory of Metals *and* Solid State Theory.

## The Quiet Sun

**Edward G. Gibson**
330 pp. National Aeronautics and Space Administration, 1973. $6.20

Unmanned satellite observations of the sun in the first dozen years of the Orbiting Solar Observatory program have added immeasurably to our knowledge of solar-atmosphere physics. The solar instruments on board Skylab's Apollo Telescope Mount package have the potential of adding again as much information with many exciting results having already been announced. Edward G. Gibson is an integral part of the Skylab undertaking, as science pilot on the third manned mission. As part of his training for the Skylab 4 mission, Gibson, who holds a doctorate in engineering with a minor in physics, had to become conversant with the current state of solar-physics research. The result of his extensive studies is this excellent book, *The Quiet Sun.*



**The birth of a major solar flare** is recorded in this NOAA photograph of 7 August 1968. A flare extending over 800 million square miles broke out the next day.

The book fills a need for an up-to-date treatment of the full range of solar phenomena on a level suitable for use in an advanced undergraduate or beginning graduate-level course on solar physics. Most of the existing books that deal with the sun in whole or in part that come to mind have copyright dates within two years of 1965, and the books were probably written a full decade ago. In the intervening years, the role of dielectronic recombination in the corona has been fully recognized and a wealth of detail about chromospheric velocity fields has come to light. These matters, and many more, are dealt with by Gibson.

This book is clearly written, and the text is weighted toward the discussion of physical principles, with mathematical details kept to a minimum. It is abundantly clear that the author has spent considerable time thinking about the physics of the sun: the presentation is filled with physical insights.

The text begins with a brief summary of the central questions of solar physics including: What are the abundances of the elements in the sun? What is the total energy flux through the sun? What is the cause of the solar cycle? This summary is followed by a chapter entitled "A Description of Solar Structure and Processes," which is an excellent review of the current state of knowledge about the quiet and active sun. These first two chapters could be used in a first course for undergraduate physics and astronomy majors as a supplement to treatments in available general textbooks.

The remainder of the book is divided into four chapters dealing with, in turn, the interior, the photosphere, the chromosphere and the corona. The chapter on the solar interior is a competent discussion of the topic, giving equal space to the background theory and the specifics of existing solar models.

The discussion of the solar photosphere contains good treatments of the relevant parts of radiative transfer theory, basic atomic line formation theory, the theory of line broadening and of the thermodynamic state of the gas, as well as some discussion of the important observations and models of the photosphere. However, in this chapter I felt that theory had been emphasized too much relative to observations. Part of the problem may lie in a quirk in the organization of the book. Gibson decided to put his discussion of granulation in the chromosphere chapter in order to discuss all aspects of solar velocity fields in the same place. I believe that his decision to organize in this manner is potentially

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**Paul W. Hodge**, University of Washington
1974, 576 pages, (029125-x), $10.95
Instructor's Manual (029127-6)

**McGRAW-HILL BOOK COMPANY**, 1221 Avenue of the Americas, New York, New York 10020

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misleading. With only a cursory reading, the unsophisticated reader could conclude that granulation is a chromospheric phenomenon. I think the author should have kept strictly to his layer-by-layer discussion.

The description of vertical oscillations in the chromosphere and the question of mechanical heating of the whole outer solar atmosphere is treated in considerable detail. Because of the extreme importance of these topics to the understanding of the structure of the chromosphere, I feel the emphasis is warranted. It is unfortunate that a lot of contributions to chromospheric research from studies of the uv and euv solar spectrum were a little too late to be included in the book.

The final chapter of the book is a thorough and well balanced discussion of the physics of the quiet corona.

The entire volume is profusely illustrated. However, to fit the many figures in the text, it was necessary to reduce them in size to a point where it is a strain to read some of the material. Furthermore, the illustrations taken from other sources contain information that is not discussed in the text or the captions. In comparing these figures with the original sources, I find that many were redrawn for this book. It is unfortunate that the extraneous matter was not removed in the process.

It is quite clear that most of the negative comments above are of a rather unimportant nature. In fact, I can recommend the book to the reader without hesitation. It is most pleasant to report that the book is well printed, well bound, and well proofread and inexpensive!


ROBERT D. CHAPMAN
*Laboratory for Solar Physics*
*Goddard Space Flight Center*
*Greenbelt, Maryland*


## Optical Production Technology

**D. F. Horne**
567 pp. Crane, Russak; New York, 1972. $42.50

Lens making is an ancient art, and many principles and even materials used centuries ago are still in use today. But the scope of application of optical surfaces is now extremely wide, as is the base of technology that is applied to their manufacture. In its broadest sense, the term "optical production technology" would cover the manufacture of lens elements from, say, the cheapest condenser lens to the largest telescope mirror—a range of cost, precision and manufacturing time of perhaps seven orders of magnitude.

*Optical Production Technology* suc-