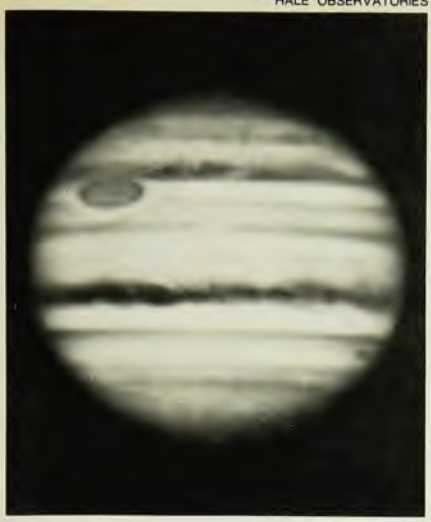
HALE OBSERVATORIES



planets takes place. The gravitational effect probably produces enhanced sunspot activity. The increased amount of solar wind (charged particles) incident on the Earth changes the weather patterns significantly. In turn, these unusual atmospheric disturbances increase stresses on the Earth's surface (such as wind pressures on mountains), and these trigger tectonic movements. In particular, the authors argue that the San Andreas fault is now strained, almost ready to rupture. Therefore, the whole causal chain might come into play during the next planetary alignment, in 1982, resulting in great earthquakes.

J. Gribbin and S. Plagemann are astronomers, both with PhD's from the Institute of Theoretical Astronomy at the University of Cambridge. The discussion is, however, not astronomical but mainly geophysical, in particular seismological.

Although the suggested trigger mechanism would apply to earthquakes anywhere, the authors concentrate on the San Andreas fault system in California. They set out to "warn the inhabitants of the imminence of a devastating earthquake about 1982." For seismologists with responsibilities in California, such a warning is not a light-hearted matter. The admirable concern of the authors will presumably lead to their publishing stricter arguments in appropriate journals.

Two key propositions are developed. First, the San Andreas fault now has sections that are "ominously quiet." Secondly, global forces are most effective along the edges of large tectonic plates such as the coast of California. The first proposition is debatable. Unfortunately, a number of seismological errors do not help. For example, on page 18, elastic rebound of the sides of a fault rupture is incorrectly defined as an overshoot "taking the sides even further" than the unstrained position. It is taken as dogma rather than hypothesis that, in slow fault creep, significant strain is being released and no great earthquake will occur. On page 60, the proposition is said to be proved that the effect of Earth tides is concentrated along plate boundaries, when this is also a speculation. In chapter 8, the crust of the Earth is confused with its mantle.

The search for earthquake periodicities in space and time has a considerable literature (not referenced in this book). Generally speaking, correlations between external events and major earthquakes have not turned out to be statistically significant. Here the authors adopt a rather different scientific method from the ordinary one. They show little interest in checking against observations. For example, on page 67 (et seq.) they give an account of large solar flares in July 1959 and August 1972. But seismicity records indicate that there were no great earthquakes anywhere in July 1959 and August 1972. Again, the planetary alignment of 1982 occurs about every 179 years. It is natural, therefore, to check seismicity catalogs within a few years of 1803 and 1624 and 1445. But California records (available from about 1800) indicate that 1803 or thereabouts was not specially active. For earlier periods, only one great earthquake (in Japan) is listed for 1445 (but 4 in 1448); and only one in 1624 (in the West Indies) but 5 in 1604! There are, of course, arguments against the hypothesis apart from difficulties with the historical record but these are not discussed.

A Jupiter effect? On the case presented—unlikely. The best prediction advice that one can now give, not only in California but in other seismically active areas, is that buildings should be constructed to resist great earthquakes on the assumption they will occur tomorrow.

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The Solid State: X-ray Spectroscopy

L. Jacob
85 pp. Halsted, New York, 1974. $10.50

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Spectroscopy, L. Jacob sketches the atomic and solid-state physics background, taking the reader from the Bohr atom to the Brillouin-zone concept, and then illustrates the contributions of x-ray spectroscopy to our knowledge of the electronic structure of metals, alloys, semiconductors and insulators.

The book was written with the undergraduate in mind; the more advanced reader will find it inadequate in many ways. The absence of references in the text make it difficult to use as a basis for further study, although a wide-ranging bibliography does provide some starting points. The coverage of x-ray spectroscopy is restricted to aspects related to valence-band spectroscopy. Jacob treats absorption spectra in less than four pages with no reference to extended x-ray absorption fine structure. The conventional x-ray terminology, such as $K\alpha_{1,2}$ and $K\beta$ is not used. Instrumentation is represented by equipment that operates at a pressure of 5×10^{-6} torr. The author does not mention high-vacuum instruments in which clean surfaces can be maintained even on reactive metals, and the recent use of multilayer soap films as diffraction gratings.

This slim volume offers a glimpse into the application of x-ray spectroscopy to solid-state problems that will not satisfy the serious reader.

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Injection Electroluminescent Devices

C. H. Gooch
198 pp. Wiley, New York, 1973. $15.95

Over the past ten years, the junction electroluminescent device has made the transition from a laboratory curiosity to a practical commercial product. The ubiquitous hand calculator and the growing desire for reliable solid-state indicators have led to a meteoric rise in the use of visible-light-emitting diodes and diode displays in commercial products. In the not-too-distant future, the use of optical data links, and optical communications in general, will undoubtedly lead to an even wider spread acceptance of junction electroluminescent devices. In this atmosphere, it is altogether appropriate for a book to be published that gives a basic understanding of the operation, fabrication and application of these devices. C. H. Gooch's book admirably fulfills this need. Far from being a detailed exposition in any one of these areas, the book nonetheless provides enough of the basic facts to allow the uninitiated to understand and to use these devices. Throughout, he has striven successfully to be concise and yet complete.

Gooch has organized the book in what seems to be a very rational way. The first fifth of the book is devoted to relating the general facts of radiative and nonradiative recombination processes in semiconductors, the physics of p–n junction, the properties of electroluminescent semiconductor materials and the special properties of stimulated emission and laser oscillation in a semiconductor. After this the book becomes more specific. In particular, various technologies used for bulk and epitaxial-layer growth as well as p–n junction formation in electroluminescent devices are described and compared. In the area of visible-light-emitting diodes, the book does an admirable job of pointing out those properties of materials that affect design considerations and the ultimate operating characteristics of the device. A prime example of this is, of course, differences in the properties of an indirect band-gap emitter such as gallium phosphide as compared to a direct band-gap emitter such as gallium arsenide phosphide. Gooch