Much that is presented concerning results in breast diseases, peripheral vascular problems, and cerebral vascular insufficiency is not new. This very fact is a point of some importance because it shows that the work of earlier investigators is substantiated and demonstrates the reliability and reproducibility of the results of thermography carried out with a variety of instruments.

The sample size is uniformly small, and arthritic diseases, orthopedic problems, and several other uses reported earlier are not mentioned. This minor weakness is adequately compensated by discussions of a number of previously unreported applications.

A unique feature of this book is the introduction of the concept that thermography should be considered a functional method. Readers with some experience in thermography will find the article by Heerma van Voss, which introduces this concept and discusses it in relation to cerebrovascular insufficiency, particularly interesting.

This collection of papers, which suggests a wider usefulness for this technique than was previously appreciated, is recommended for all those interested in the field of medical infrared and particularly for students of thermography, from paramedical personnel to clinical researchers.

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Events around the Sun

Mass Motions in Solar Flares and Related Phenomena. Proceedings of the ninth Nobel Symposium, Capri, Italy, 1968. YNGVE ÖHMAN, Ed. Interscience (Wiley), New York; Almqvist and Wiksell, Stockholm, 1968. 246 pp., illus. $22.

Solar flares and the phenomena related to them are the most spectacular events observed in the sun's atmosphere. Their very transient nature, their rapid changes in brightness and temperature, the violent motions of material seen in surges, sprays, and eruptive prominences, strong radio emissions, and the ejection of corpuscular radiation into space are all manifestations of very complex electromagnetic interactions which occur in active regions, usually at or near sunspots.

This book consists of papers presented at a 1968 symposium whose expressed purpose was primarily to study the mass motions in solar flares. This in itself is worthy of note, since most workers in the field have considered flares to be stationary phenomena. There is, to be sure, an apparent motion as a flare develops: the area of the chromosphere (usually observed in the hydrogen alpha line at 6563 angstroms) which is at flare brightness expands, contracts, moves across the surface or up or down at the limb. Is this, however, a true mass motion, or just heating of the region by an exciting medium (such as a shock wave) as this medium moves through the region? The latter view is the more widely accepted. Only velocities measured spectroscopically by the Doppler effect can unambiguously resolve this argument, and such measurements usually indicate little or no line-of-sight motion during a flare. This fact is related to the origin of the use of the term "flare" by McNish in 1937 to describe this solar phenomenon. For 45 years prior to that time, George Hale's "bright chromospheric eruption" terminology had been in vogue. But the word "eruption" implied a violent motion and outburst of material, which contradicted the observations, and astronomers abandoned this term in favor of the more descriptive "flare" in the early 1940's.

Thus the papers collected in this book, in order to discuss mass motions in flares, deal extensively with flare-related phenomena, such as sprays, surges, moustaches, loops, ejections, and eruptive prominences, some of which exhibit velocities up to 1000 to 1500 kilometers per second. Over three-fourths of the book consists of papers describing observations of flares and related phenomena; only a small section deals with theoretical aspects.

The reader, especially the newcomer to the field, will find the book most useful as an up-to-date compendium of our current knowledge of flares; it will be most valuable when read in conjunction with an earlier book by Smith and Smith (*Solar Flares*, Macmillan, 1963). This reviewer particularly enjoyed the introductory review paper by Švestka and the paper by Severny on the phenomena he calls "moustaches" (because on negatives they appear as broad dark wings in Fraunhofer line spectra) or "solar hydrogen bombs" (the term first used by Ellerman in 1917) among the observational articles. In addition, several authors (Öhman, Severny) discuss evidence for spiraling motions and twisted or helical magnetic fields in loops and prominences, the latter perhaps due to currents flowing in these regions. The release of magnetic energy from such twisted field configurations is a possible source of the energy ($\sim 10^{32}$ ergs) observed in a flare, and thus a most important theoretical consideration.

Theories of flares have been as numerous as they have been unsuccessful. Up to now, one still does not know enough of the temperature, densities, and magnetic fields in a flare to give the theorist much assistance. General comments on the requirements of a successful flare theory are discussed in papers by Gold, de Jager, and Kiepenheuer. There has been a tendency to describe theories which are to explain all flares. Such efforts seem doomed to failure, since it appears that there are several different types of flares, most likely due to different causes. One type of flare that is relatively amenable to analysis is the two-ribbon flare which Hyder attributes to an infall-impact mechanism: material falling from the corona impacts upon the chromospheric material, heating it to flare brightness. Clearly such a phenomenon is completely different from the release of energy through the annihilation of magnetic fields, which many theorists consider to be the primary cause of flares and which forms the basis for the remarks by Gold and de Jager, and the theories presented by Alfvén and Carlqvist. To confirm one of these latter theories, even to discriminate between them, is most difficult, since the changes in magnetic field strength (less than 100 gauss) necessary to produce the observed effects not only are usually too small to be measured accurately, but also may occur too quickly to be noticed, and, most importantly, are measured in the photosphere, that is, at a height in the atmosphere quite different from that of the optical flare observed in the chromosphere or corona.

The book concludes with articles by Godoli and Zirin on associated phenomena in stars other than the sun. In summary, this book serves as a good introduction to the very complex subject that is the solar flare. It demonstrates the difficulty of making definitive observations and of interpreting those that exist, and illustrates the wide diversity of current theoretical explanations, which will not be resolved for some time to come.

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