reviewed applied physics in a developing country.

This conference must be the forerunner of greater interaction between physicists from industry, universities and governments to stimulate industrial innovation and the technological growth of nations. This book will give the reader some ideas on the present institutional challenges and the opportunities ahead.

FRANK E. JAMERSON
*Physics Department*
*General Motors Research Laboratories*
*Warren, Mich.*

## Solar Flares

**Z. Švestka**
399 pp. D. Reidel, Boston, 1976.
$39.50 clothbound, $23.00 paperbound

The mystery of the solar flare, its origin and its incredible output of fast particles and hard radiation is attracting increasing attention in the physics community. The flare has been and continues to be one of the focal points of space missions. Flares range from tiny pinpoints that wink on and off for a few minutes to colossal explosions of $10^{25}$ joules in energy, while others fizzle on for hours or days with little or no explosive phase. Flare-like effects are seen in other stars, and the galactic x-ray sources have many of the behavioral traits of the solar flare. Indeed, the active galaxies, the double radio sources and quasars have flare-like features, though they are vastly different in scale and too distant to study in detail. Much of the theoretical modelling of active galaxies is based on ideas developed originally to explain the solar flare. But for all the fascination of active galaxies and quasars, the solar flare stands at the center of the stage, because it is the only example subject to direct observation with high resolution. The flare is visible at all wavelengths, from 3-meter radio waves to gamma rays, and it emits all nuclei, from neutrons and protons to iron—with an occasional extraordinary preference for $He^3$ and aversion to $H^2$.

Except for the homologous flares, which repeat the same pattern in space and time at intervals of one or two days, the individual flares on the Sun are as varied as the personalities of the individual members of the human race. Consequently, the development of a book on the morphology of solar flares is not unlike the task that confronted Gibbon in developing his work on the decline and fall of the Roman Empire.

Švestka's long experience with the observations of solar flares in both soft and hard radiation has served as an ideal starting point for his construction of this book. In spite of the diverse and uncoordinated aspect of many of the observational facts, Švestka's tight organization of observations, their interpretations and their current explanations never falters as the reader progresses through the 350 pages of text and accompanying tables and figures. The many "close-up" photographs of flare activity are reproduced well enough to convey their varied points to the reader, and the numerous graphs and plots of intensities, spectra and so forth are well composed and clearly described.

Concluding the observational analysis of the flare phenomenon on page 299, Švestka provides a seven-page outline of 37 outstanding features of flares; he then goes on to provide a 42-page review of the theoretical ideas that have been developed to make these features plausible.

One of the most valuable aspects of the book is the continual, critical evaluation of both the interpretation of the observations and the theoretical ideas that try to explain those interpretations. At no point is the reader without clear guidance from the author.

The book is deliberately aimed at the phenomenology of the solar flare. Except for some questions in radiative transfer, there is no attempt to delve into the purely theoretical problems posed by the many effects displayed in the context of flares. The theoretical work was to have been treated in a second volume, authored by L. D. deFeiter, whose untimely death left that work unfinished. The loss of the projected volume is a pity, but it detracts in no way from the book in hand. The physicist or astronomer who wishes to acquaint himself or herself with one of the most remarkable phenomena in Nature will find the book enjoyable and instructive for an hour, a week or a year of study.

EUGENE N. PARKER
*Laboratory for Astrophysics*
*and Space Research*
*The University of Chicago*
*Chicago, Ill.*

**Time development of a solar spray on the Sun's limb,** as photographed at the High Altitude Observatory, Boulder, Colorado on 28 October 1972. These eight stages in the spray's development (left to right top, then bottom), cover a 41-minute interval. (Photograph: Richard T. Hansen.)

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