

ECLIPSE PHENOMENA -- A BOOK REVIEW

G. F. Schilling

December 1969

P-4268

ABSTRACT

A review of Eclipse Phenomena in Astronomy by F. Link, Springer-Verlag, New York, 1969, 271 pages, for Sky and Telescope. The author of this book is a Czechoslovakian astronomer who has been associated with both Eastern and Western research in astronomy and space exploration.

ECLIPSE PHENOMENA -- A BOOK REVIEW*

G. F. Schilling
The Rand Corporation, Santa Monica, California

Twilight is an eclipse phenomenon where the Earth's shadow is thrown on the terrestrial atmosphere rather than on the surface of the Moon; Surveyor III took the first pictures of the eclipsed Sun from the Moon during the lunar eclipse of April 1967, while in October of that year, Mariner V was occulted by Venus as seen from Earth; in March of 1504, Columbus put his advance knowledge that an eclipse should happen, to good advantage; triple star 40 Eridani will occult a 15-magnitude star in 1988 and should make possible a quantitative verification of Einstein's photometrical effect.

These and many other "eclipse" phenomena are discussed in this treatise. Its wide scope can perhaps be best appreciated when recalling that eclipses, transits, and occultations are essentially a class of phenomena that involve the alignment of three bodies. What a specific event is called, depends primarily on the relative sizes and distances, and on the position of the observer on one of these bodies - or in one, if it is a spacecraft, for example.

The central theme of the book is the knowledge that can be obtained about celestial bodies by observing their photometric behavior while involved in an eclipse phenomenon. The emphasis is generally on the eclipsing or transiting body. Thus, coronal occultations are discussed, but solar eclipses as seen from the Earth are omitted. Analogously, lunar eclipses are shown to provide a wealth of information about the atmospheres of Earth and Sun, and only secondarily some indirect data on properties of the Moon.

* A review of Eclipse Phenomena in Astronomy, by F. Link, Springer-Verlag, New York, 1969, 271 pages, \$19.50.

Any views expressed in this paper are those of the authors. They should not be interpreted as reflecting the views of The Rand Corporation or the official opinion or policy of any of its governmental or private research sponsors. Papers are reproduced by The Rand Corporation as a courtesy to members of its staff.

Each section contains a thorough, quantitative analysis of a specific phenomenon with appropriate figures, tables, and equations, a description of its theory, a survey of the latest experimental results, historical comments, and a useful and up-to-date bibliography.

The first part of the book concentrates on lunar eclipses, and in six sections treats the general geometric circumstances, photometric theories and resultant information about the Earth's atmosphere, observational methods and instrumentation, lunar luminosity, shadow increase and shadow flattening, and thermal phenomena.

The next section deals with eclipses of artificial satellites and includes discussions of recent work by various scientific groups in Europe and in the United States. The subsequent section on twilight phenomena shows the dominating role of the variable structure of the Earth's atmosphere in eclipses in general.

A section on occultations and eclipses by other planets ranges from the famous occultation of Regulus by Venus and a concise treatment of eclipses of the Jovian Satellites to a brief discourse on the possible occultations of stars by the Earth as observed from the Moon.

The section on transits of planets over the Sun stresses the theoretical similarities to observations of lunar eclipses from the Moon, and deals also with the related phenomenon of the Venus cusp extensions.

A section on eclipse phenomena in radio astronomy is finally followed by an interesting treatment of Einstein's deflection of light as an eclipse phenomenon and an adequate, if brief, subject index.

The author is known as one of the foremost experts on the photometric behavior of eclipses. In addition to publications in his native Czech language, he has, since 1929, published in Russian, German, French, and English. His present book, incidentally, is based on a semester of lectures at the Faculté des Sciences in Paris in 1967-68, and was printed in Germany. Not so incidentally, some of the English expressions, such as the motion of a satellite being described as capricious, are amusing rather than distracting. A more serious impediment to easy comprehension of some parts, however, may be an occasional sparsity of captions and explanations for the more than 200 tables and figures.

In other words, some of the mathematical passages require studious

effort on behalf of the reader, due to difficulties of associating sometimes awkwardly expressed text passages with the appropriate tabular material. But the casual reader will be inclined to skip these and will seldom be affected.

The student of eclipses, as well as anybody who has personal observing experience with eclipse phenomena or is actively working in one of these fields, will find this book practically indispensable. Until now, his principal alternative was recourse to a collection of articles that are spread throughout the astronomical and geophysical literature.

For the casual as well as the serious reader it is therefore regrettable that the price of the book is relatively high for its rather slim size, although not for the wealth of material and concise information that it contains.

P - 4268

ECLIPSE PHENOMENA - - A BOOK REVIEW

G. F. Schilling