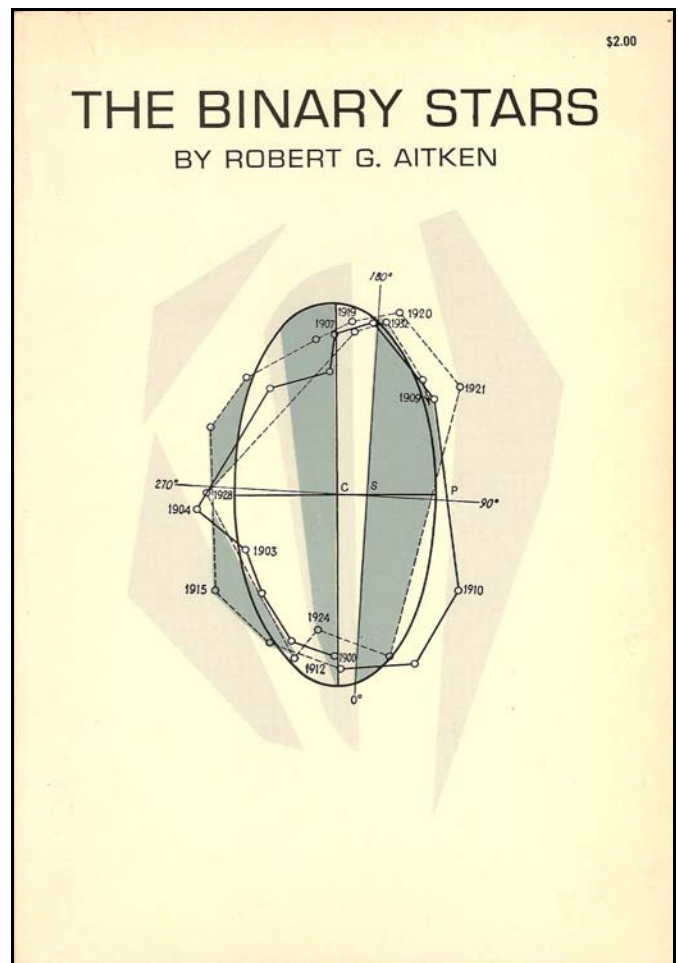## BOOK REVIEW

The Binary Stars

Robert Grant Aitken. Series of Semi-Centennial Publications, University of California. New York: Douglas C. McMurtrie, 1918. 2nd edn. New York: McGraw-Hill, 1935; rpt. New York: Dover, 1935, 1964.

The Binary Stars is R. G. Aitken's first general synthesis of double star research and is dedicated to Sherburne Wesley Burnham. The book is organized into two preliminary chapters on the history of reach on binary stars followed by nine chapters that cover visual, spectrographic, and eclipsing binaries: what can be learned from known orbits, how to assess the statistical data on visuals, and what is known of the origins of binaries. Chapter Four, "The Radial Velocity of a Star," is written by J. H. Moore, and is the only section not written by Aitken.

Aitken (1864-1951) is an excellent but demanding writer who assumes the reader is somewhat familiar with Latin and the calculus, meaning one needs more than a passing knowledge of algebra and trigonometry. Aitken takes us through what many of us value the most—specific, practical examples of micrometer measuring and orbital determination. For example, in the section on observing methods of visual binaries, we are treated to the detailed case of Barnard's calibration of the micrometer screw of the 40-inch Yerkes refractor followed by Aitken's own data reduction. After explaining approaches to orbital determination for visual binaries, he offers several examples that illustrate methods of determining orbits.

Moore's chapter is a nicely crafted introduction to spectography and how the photographic study of stellar spectra revolutionized the study of radial velocity. Radial velocities are important parameters because they allow us to determine motion along line-of sight and this is critical to establishing the linear dimensions of an orbit, given the relative proportions via orbital calculations. And, of course, it allows the additional bonus of the possible discovery of new spectrographic binaries, analysis of eclipsing binaries, and periodic variations in radial velocity to identify a binary system (but watch out for the Cepheid variables!). The theme of radial velocity and its uses is carried over by Aitken into subsequent chapters on orbital calculations for spectroscopic binaries and eclipsing binaries, all supported by detailed examples. Of course, not all eclipsing binaries were (or are)

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bright enough for spectroscopic analysis, so Aitken also covers what we can know about those for which we have only have light curves.

Three of the remaining chapters synthesize what we can know of and learn from binaries. Perhaps most importantly, binaries of known orbit are the only means by which we can calculate stellar mass and density. In the chapter on binaries of special interest we find discussion of examples of determining the nature of pairs (optical, binary) from diverse data sources that discuss the discovery of the nature of these systems. The penultimate chapter details Aitken's attempts to understand the general nature of visual binary systems through statistical study of northern visual binaries. The book ends, predictably, with a chapter offering theories as to the possible origins of binary systems.

The 1918 edition is a classic for all interested in binary stars and is free via the Google Book Project (Google Books: enter "The Binary Stars"). Print copies are occasionally available (ca. $60-$100). A second edition (1935, McGraw-Hill; ca. $40-$110) updates the first (you will find the "Aitken Criterion" in the second edition, not the first) and was reprinted in soft cover by Dover Publishing in 1964 (ca. $20-$40).

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