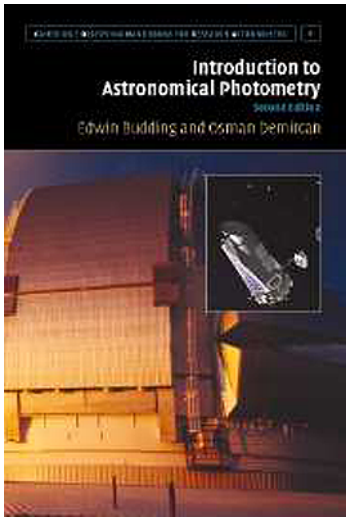
Introduction to astronomical photometry

by Edwin Budding & Osman Demircan

Cambridge University Press, 2007. ISBN 0-521-84711-7. Pp xvi + 434, £45.00 (hbk).

The authors describe this book as 'a textbook on astronomical photometry intended for university students, research starters, advanced amateurs and others with this special interest'. This is an accurate assessment of its level and target audience. It is a major rewrite of the first edition and includes much new material. Although originally written from the perspective of single channel photoelectric photometry, this new edition recognises the important role which CCDs now play in this field. Although it is entitled an introduction, prospective readers should note that reasonable fluency in mathematics is required to follow some of the explanations and examples. Nevertheless it is well written and readable and will repay careful study with a deeper understanding of the fundamentals of photometry than is offered by some other introductory texts.

The book is logically in three parts. The first three chapters provide a general introduction to the basic concepts and terminology of photometry followed by core material about the measurement of radiation from astronomical sources which underpins the rest of the book. The next three chapters introduce the essentials of practical photometry. Chapter 4 covers atmospheric and interstellar extinction, photometric filter systems, photometry of extended objects including solar system bodies, nebulae and galaxies, and photopolarimetry of stars and asteroids. Chapter 5 provides an overview of instrumentation, detectors and measurement techniques. Chapter 6 describes procedures for calibrating filters and transforming measurements to the standard photometric system, for applying these in differential photometry and for generating light curves. The final section of the book, chapters 7 to 11, describes a range of techniques for analysing light curves in order to estimate physical parameters for several types of variable star. Many examples are included throughout the book and each chapter is followed by a comprehensive set of bibliographical notes and a list of references. These enable the reader to seek further information on the topics covered and greatly extend the usefulness of the book.



The last section of the book is likely to be of most interest to serious amateurs looking for a scientific application for their newly-learnt photometry skills, so is worth describing in more detail. Chapter 7 discusses the analysis of light curves of eclipsing binaries and the derivation from these of physical parameters using a chi-squared technique. Chapter 8 describes use of the O–C diagram to study period changes in pulsating variables and eclipsing binaries, and discusses physical reasons for their many possible observed behaviours. Chapter 9 reviews a number of issues related to the analysis of close binary systems. Chapter 10 deals with the analysis of stars with starspots, including RS CVn stars, and describes how the parameters of possible starspots may be derived. Finally, chapter 11 discusses pulsating stars, particularly Cepheids, and shows how an understanding of their physical behaviour may be obtained by fitting a model to the light curve using the Baade–Wesselink procedure. This is advanced stuff, but it will surely tempt adventurous amateurs to investigate some of these analyses for themselves and in doing so begin to equip themselves to collaborate with professional astronomers.

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Dr David Boyd is a retired physicist and an active variable star photometrist.