

## Ancient supernovae

*The Historical Supernovae.* By D. H. Clark and F. R. Stephenson. Pp.x+233. (Pergamon: Oxford and New York, 1977.) Hardback £8.50; paperback £3.95.

THE history of astronomy is a history of man struggling with new ideas and painstakingly trying to make accurate observations of celestial objects. Ideas were easier and their reporting is more widespread; flat earths, geocentric systems, perfectly smooth and spherical moons and planets, crop up in many of the contemporary books and manuscripts. Reports of observations are rarer and less easy to decipher. Some examples are Eratosthenes's estimation of the size of the Earth, the measurement of the Earth-Moon distance by Aristarchus of Samos, and the catalogue of 1,080 stars made by Hipparchus which not only gave the celestial latitude and longitude of each star but also divided them into six magnitudes according to their brightness.

Legend has it that one of the factors that motivated Hipparchus to perform this task was the appearance of a nova in Scorpio in 134 BC. Interestingly, two of the greatest astronomers of the past millennium, Tycho Brahe and Johannes Kepler, were also fascinated by the new stars which appeared in AD 1572 and 1604. Novae, supernovae and supernovae remnants also seem to have fascinated David Clark of the Mullard Space Science Laboratory, University College, London, and Richard Stephenson of the Institute of Lunar and Planetary Sciences, University of Newcastle upon Tyne, and motivated them to write this book; we should be thankful they did. Their task was one of the more difficult tasks in the study of the history of astronomy, the careful and painstaking perusal of historical records for references to new stars.

The book is divided into twelve chapters. The first sets the scene and convinces the reader as to the reasons why supernovae are so important. Not only are they one of the more spectacular of stellar events but also their remnants, the ejecta of the explosion, are amongst the most unusual and exciting astrophysical phenomena. Supernovae are thought to be responsible for pulsars, black holes, runaway stars, extended sources of radio emission, beautiful expanding nebulous objects, galactic X-ray sources and possibly gravitational radiation. About one supernova occurs in our galaxy every 120 years, the high degree of obscuration cutting down the number observed from Earth. Luckily, observa-

tions of supernovae and their remnants in other galaxies has increased our knowledge of these objects enormously.

The second chapter reviews the historical sources used—Far Eastern histories and diaries (remarkably detailed records from Chinese professional astronomers/astrologers going back to about 200 BC), Arabic astrological works, medieval European monastic chronicles and post-Renaissance European scientific writings. Chapter three considers three types of new stars recognised by Far Eastern observers—the quest stars, rayed stars and sweeping stars, the latter two being tail-less and tailed comets. It also contains a catalogue of pre-telescope novae and supernovae complete with durations and approximate celestial galactic coordinates. Chapter four discusses the characteristics of supernovae remnants and lists the rem-

nants within 10 kpc of the Sun. Chapters 5 to 11 present a detailed discussion of the new stars of AD 185, 386, 393, 1006, 1181, 1572 and 1604, the prime supernovae candidates. The book ends with the authors' thoughts on the evolution of supernova remnants and a review of the possible effects a nearby supernova would have on the Earth and its environment.

At times, this book tends to exude the musty, mothbally smell of a doctoral thesis, an impression that is not helped by the fact that the book is typed, all 232 camera-ready pages of it. It is still, however, a fascinating account of these enigmatic early observations and is well worth reading.

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## X-ray structural analysis

*Structure Determination by X-Ray Crystallography.* By M. C. F. Ladd and R. A. Palmer. Pp. 393. (Plenum: New York and London, 1977.) \$35.40.

THE jacket description claims this book to be "an indispensable guide for advanced undergraduates and beginning postgraduates", as well as being of interest to the large number of workers using crystallographic structure determination as a research tool. It is the first reasonably comprehensive textbook on the subject to be published for several years, and its emphasis differs somewhat from its companions.

The introductory chapters on crystal geometry are extremely thorough; the detailed analysis of space groups and their symbols, in particular, should prevent much of the confusion which a newcomer to the field experiences on first meeting them. The following chapter describes preliminary examination of crystals, and is less satisfactory in that it gives considerable space to techniques not frequently used (optical properties, indexing of oscillation photographs) yet only three-and-half pages to Weissenberg and precession methods, one or both of which is used in virtually every structure determination. There is, furthermore, no mention of the determination of crystal system and unit cell dimensions from Weissenberg photographs.

Chapter 4 derives structure factor equations from first principles; as throughout the book, the derivations

are clearly expressed and attractively presented, and the worked examples (particular space groups, systematic absences) provide considerable illumination of the principles involved.

The detailed methods of X-ray structure analysis are introduced gently and relatively early via simple (but real) examples involving consideration only of special positions; it is doubtless encouraging to the beginner to see 'real' structure determinations before considering more complex topics such as Fourier series and Patterson functions. These are introduced in chapter 6, again clearly derived and with several detailed examples of the application of Patterson methods, leading naturally to a discussion of heavy atom methods and difference syntheses.

The major disappointment is the relegation of direct methods to a chapter headed "Some Further Topics". In recent years, many advances have been made in the theory and practice of direct methods, and yet no material is presented which is not in Stout and Jensen's *X-Ray Structure Determination* (Macmillan, 1968). Some mention should have been made of non-centrosymmetric direct methods and the MULTAN philosophy, at the very least.

One might disagree with the authors' choice of material and emphasis (which they defend in the Preface), but one cannot criticise the quality of presentation. It must be asked, however, whether this book represents any substantial advance on other (cheaper) books already available on the subject; regrettably, it does not.

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