REVIEWS

The Barnard Objects: Then and Now, by Tim B. Hunter, Gerald O. Dobek & James E. McGaha (Springer), 2023. Pp. 344, 23·5 × 15·5 cm. Price £32·99/$44·99 (paperback; ISBN 978 3 031 31484 1).

E. E. Barnard has always been one of my astronomical heroes, and a reprint signed by him is a treasured possession. This new addition to *The Patrick Moore Practical Astronomy Series* has been compiled by three deep-sky enthusiasts and writers who all made practical observations of these objects. One recalls the excellent modern edition of the *A Photographic Atlas of Selected Regions of the Milky Way* prepared by Dobek a few years ago (see *The Observatory*, **131**, 320, 2011), while the many colour images by Hunter reproduced upon glossy paper in this new book look quite superb.

A comprehensive Foreword by William Sheehan admirably sketches Barnard's life. Barnard was a perfectionist who personally inspected all the prints intended to be bound into his atlases, and whom I have found from archival sources was overly fond of last-minute proof corrections. Barnard brought out a book of photos of the Milky Way and of comets in 1913, and a later Milky Way atlas appeared posthumously.

The term 'Barnard Object' refers here to anything the great man caught upon a photographic emulsion. They range from comets to deep-sky objects, and in particular the dark nebulae which he catalogued in such detail. It also should have been mentioned that he took some photographs of Mars in 1909 which were excellent for their time. He was well aware of the differential colour sensitivity of the plates of his day, so that stars would often not show up in the same order of brightness as they did to the naked eye. The authors provide very comprehensive lists and descriptions of the objects Barnard recorded, with modern colour images of many of them added for comparison alongside the plates and charts from Barnard's atlases. Barnard's photography was extensive but covered only a part of the sky.

Chapter 1 gives a potted history of photography and astrophotography, with details of the instrumentation used by Barnard. Chapter 2 gives an overview of nebulae in general. In the next chapter there are very useful lists of atlases, catalogues, and surveys covering all the different classes of celestial objects, not just the dark nebulae, right up to the present day. So we can find full details of the catalogues by Abell, Arp, Collinder, Gum, Lynds, Shapley-Ames, Sharpless, Van den Berg, and all the rest. To have all this information collected in one place is very useful.

Chapters 5 and 6, respectively, discuss visual observation and modern imaging techniques, while Chapter 7 examines and illustrates a selection of the Barnard Objects. Barnard's *A Photographic Atlas of Selected Regions of the Milky Way* was edited and published four years after his death by Frost and Calvert. Mary Calvert's charts showed 52 dark nebulae that had been identified from Barnard's notes, but which she did not label. Furthermore, for reasons discussed by the authors, catalogue numbers 176–200 were not used, the 1927 *Atlas* starting again at No. 201. As a result, the authors set out to assign objects to the missing numbers, and in Chapter 8 they make a good job in dealing with this historical omission. In Chapter 9 the authors in similar vein list the 31 objects described by Barnard in the *Atlas*, but which were neither catalogued nor charted therein.

The authors devote Chapter 9 to setting Barnard's work in a modern context. Many of his objects are known today as regions of active star formation, while the

term 'dark' is now limited to the visible spectrum. Some objects are recognized as Bok globules. A short summary of our current understanding of the Milky Way galaxy is given. Tables of the objects, a glossary, further references, and an index conclude the book.

If I have one small quibble it concerns the arrangement of the illustrations upon the pages. These, particularly where comparisons with the past are presented, are often spread over as many as five pages. But the captions are always collected upon the first of those pages, hindering their practical usefulness. Cost probably precluded a larger format, but it would definitely have been better. And for the British reader, I would have preferred the terms (photographic) fixer instead of fixator, and (sodium) thiosulfate for hyposulfite.

This small point aside, I can thoroughly recommend this book. It clearly is the product of a huge amount of research and observational effort. It is written with authority and has a flowing style, and crammed with the fascinating detail that only such practical specialists in this field can provide. Patrick Moore would have approved! — RICHARD MCKIM.

Models of Time and Space from Astrophysics and World Cultures. The Foundations of Astrophysical Reality from Across the Centuries, by Bryan E. Penprase (Springer), 2023. Pp. 305, 23·5 × 15·5 cm. Price £27·99 (paperback; ISBN 978 3 031 27889 1).

When you first leaf through this book, you get the impression of an all-around blow of the changes in knowledge about space, time, and matter. The extensive table of content ranges from Polynesian navigation, early star maps, Kant's philosophy, Einstein's relativity, quantum physics, dark energy to the multiverse. The cover symbolizes this mixture, showing a surreal collage of Tehran's monumental Azadi Tower, placed with shadowy persons on a lunar-like surface with the glowing Fingers of Creation in the background. How does the author manage to fit the wide-ranging topics into a 300-page book? Is he a polymath with a clear concept or are we faced with a hodgepodge of popular snippets of knowledge?

Bryan Edward Penprase has studied physics at Stanford University, receiving a PhD in astrophysics from the University of Chicago. Currently, he acts as Vice President of Sponsored Research and External Academic Relations at the private Soka University of America (SUA) in Aliso Viejo, California. We read in the introduction: "The deeper cultural roots of astrophysical reality and the ways in which space and time craft objective reality and our subjective experience are typically not part of the discussion in university classes." This deficit has motivated Penprase to offer a suitable course at SUA that "enables students to comprehend how physics and astrophysics shape our observable universe and how the process of building a cosmic perspective creates a deeper understanding of the human condition that transcends cultures and makes us all 'planetary citizens'." The book is based on his lectures and is aimed at readers "interested in the fields of historical and cultural astronomy, as well as for anyone interested in learning about the latest finds from the field of physics and astrophysics." Does it live up to these high standards?

The soft-cover book is printed on high-quality paper, a good choice given the many full-colour illustrations, showing historical charts, modern astronomical images, or graphics (some made by the author himself). Presentation and layout of the medium-format publication are convincing. The text is fluid, informative, and easy to understand. It contains a few mathematical calculations (*e.g.*, for time dilation) and formulae, like the Maxwell equations. The content