be predicted by those familiar with the research interests of the authors. Topics covered include LMXBs, IMXBs, HMXBs, and ULXs, and the discussion begins with the observational viewpoint before moving on to the theoretical framework. A clear description of the evolution of single stars follows, and then is extended to cover the evolution of stars in binary systems. The final chapters concern interacting binaries in globular clusters, supernovae, binary and millisecond pulsars, gravitational-wave events, and binary-population synthesis. More detailed treatments of some of these concepts are available elsewhere, but Tauris & van den Heuvel cover a huge amount in one place. It goes well beyond what a typical 'binary stars' module would cover at the undergraduate level, and will be useful for anyone undertaking research in this area from PhD students onwards.

The writing style throughout is clear and easy to read, which is impressive given the material covered. There are many diagrams, illustrating both physical concepts and observational data, and a good number of pretty pictures. Colour is present in those pictures and in the majority of the diagrams. Careful attention is paid to tracing the evolutionary pathways of binary systems, which can otherwise be hard to tease from other sources. A fair number of exercises are given at the end of many of the chapters, with (extremely brief) answers in an appendix. The book is also produced to a high standard, and I did not find any grammatical or typographical errors. Tauris & van den Heuvel's book has immediately become the standard text in this science area and I recommend it unreservedly. — John Southworth.

Astronomy of Ancient Egypt: A Cultural Perspective, by Juan Antonio Belmonte & José Lull (Springer), 2023. Pp. 588, 21·5 × 15 cm. Price £129·99 (hardbound; ISBN 978 3 031 11828 9).

In 1969, the great historian of science, Otto Neugebauer, wrote: "Astronomy played a uniformly insignificant role in all periods of Egyptian history." And the present authors tell us: "However, there is not a single explicit or obvious reference to any lunar or solar eclipse in the entire history of Pharonic Egypt" (with the possible exception of a 610 BC* event). That remark occurs on page 516, leaving one to wonder what the previous 515 pages have been about.

The last, seventh, chapter deals with astronomy and chronology. It is followed by a generous glossary, a long list of works consulted, and a moderate index. But the chronological issues are real. When, for instance, did Khufu (Cheops) of the Fourth Dynasty build his pyramid (the biggest one)? Table 7.1 presents three chronologies from earlier authors in which Cheops' dates are 2554–2531 BC, 2589–2566 BC, and 2509–2482 BC, not even overlapping, and Belmonte and Lull tell us that all three are wrong.

By the time of the much-romanticized 18th Dynasty, the various numbers are at least overlapping, and the authors defend a chronology that puts Tutankamun's nine-year reign in 1322–1314 BC†. But numbers from all the authorities do not entirely converge until we reach the reign of 25th dynasty Pharaoh Taharqa, 690–664 BC, when Egyptian and chronologies from other civilizations can be synchronized.

*The Managing Editor and I have previously disagreed about the proper abbreviation for years long ago. I have a strong preference for CE (Common Era) and BCE (Before Common Era). The present authors, however, use AD and BC and are entitled to their insensitive choice.

†Zahi Hawass, in *Tutankhamen: Treasures of the Golden Pharaoh* (IMG Melchior, New York), 2018, chooses 1336–1327 BC in a volume that came with the higher-priced tickets to a presentation in San Diego in spring 2013, part of his national fund-raising tour. He also declared during the book-signing event that "Badawy was a genius", a point to which I shall return.

There are, of course, carbon-14 dates for materials from various periods. Most of these have error bars that extend across all reasonable choices. Years of spikes in C-14 contents of tree rings* happen not to come close in time to interesting events in Egyptian history. And a solar eclipse recorded only by nearby civilizations† is too late at 1209 BC to constrain anyone before Merneptah and Ramesses II (the Great), who were already pinned down to within plus/minus a couple of years anyway.

We turn with relief to things that can be observed and measured today. First, the book itself is gorgeous, printed on paper glossy enough for the colour photographs to look real and for names in hieroglyphs printed within lines of ordinary text to be readable (if you are at least a little bit used to reading such things). Yes, modern technology has made it possible for every major publisher, not just Oxford and Chicago University Presses to have full sets of hieroglyphic type fonts. These are based on carved versions dating from the Middle Kingdom, and I was greatly pleased to spot the stack of three wiggly lines (read mw or mu, which is close to the Coptic word for water), the one sign correctly interpreted by Athanasias Kircher (1598–1680), which form part of the name of a dean‡ called Stars of the Water.

As for what is illustrated and named in the book, two of the important topics are alignments of temples, pyramids, and other buildings and images of the sky, or at least its constellations. Alignments of faces, entrances, corridors, shafts, and such favour the cardinal compass points and the directions of sunrise and sunset on the solstices often enough for the authors to conclude that these must have been deliberate and determined from observations, and not just a tendency to make things parallel to the Nile (their Figures 6.6 and 6.7, for instance). The preface to the book discusses at some length how those alignments might have been achieved using various possible astronomical observations, plumb lines, and artificial horizons. One alignment not discussed is "the controversial issue of the air-shafts in the Great Pyramid as hypothetical stellar channels" because the senior author has already written on the topic in a 2012 book on "*Piramides, templos, y estrellas*" (that is, in Spanish, his native language). A harsh attack on the hypothesis¶ is, however, cited without comment. It is not often that an author receives the dubious honour of being attacked for something published 55 years before (60 by the time this appears), and I made no attempt to respond at the time. But here, for the record, is what I believe to be the first published suggestion on the controversial issue: "They are usually thought to be ventilation-channels, but would be better considered as open ways for the king's soul to reach the circumpolar stars to the North and the Orion constellation to the South."§

As for the images, some are cosmogonic, for instance, a very brightly coloured version of the sky goddess Nut being held up by the air god She, who is in turn supported by the Earth god Geb (Figure 1.4), though we have to skip to page 232 to

* See Miyake event on Wikipedia and keep your fingers crossed we don't have another one soon.

† C. J. Humphreys & W. G. Waddington, *A&G*, **58**, 5.39, 2017

‡ A group of a few stars used to tell time at night.

¶ R. Krauss in *Studien zur altaegyptichen Kultur*, **48**, 151, 2019. '*Die Kanaele in der Cheops-Pyramide: Luftschaechte, Modellkoridore oder Leitwege zu den Sternen?*' in German, his native language.

§ Page 138 of *A History of Egyptian Architecture*: Vol. I. *From the earliest times to the end of the old kingdom*, by Alexander Badawy, Architect, Cairo, 1954, the author being at that time an associate professor at Cairo University, a member of the Egyptian Exploration Society, and so forth (1913–1987).

find the epagomenal decan of the Senenmut list called sh-t-w-i, the Two Turtles. And as this is a family publication, I am probably not allowed to tell you what Nut and Geb are doing in Figure 1.13. There are also many illustrations of constellations and related patterns of stars in the sky, many clearly distorted from what was actually seen. The question most often asked is whether, and if so how, the Egyptian constellations are related to the ones we learned from the Babylonians, the Greeks, and the International Astronomical Union. The standard answer has been that Orion is recognizable as a striding man and the hippopotamus includes Sirius. The authors, however, have evolved a "working hypothesis" that identifies many more of the patterns shown in the Dendara astronomical ceiling (which you must now travel to Paris to see), including a Zodiac with Gemini, Taurus, Leo, Pisces, Cancer, and so forth, with the planets scattered among them. Their Sirius lives in the head of a recumbent cow, though the hippo is there (page 305) and seems to be carrying a folded umbrella.

Let us end with one item that lets us feel at home. The standard symbol for a celestial body (pronounced, roughly, seba) is a "five pointed star formed by an internal dot and five rays. The universal five-pointed star symbol presumably originated in Egypt in pre-Dynastic times" (page 540). — Virginia Trimble.

The ALMA Telescope. The Story of a Science Mega-Project, by Paul A. Vanden Bout, Robert L. Dickman & Adele L. Plunkett (Cambridge University Press), 2023. Pp. 264, 24·5 × 17 cm. Price £39·99/$49·99 (paperback; ISBN 978 1 009 27968 0).

ALMA took over 30 years to gestate, during which a great many committees, working groups, boards, and similar organizational bodies came and went. Each involved the dedicated services of numerous scientists, administrators, technicians, and financiers, and won the support and gratitude of innumerable (if understandably a little impatient) would-be users worldwide. This book is in many senses a corporate journal of the multitude of events, tasks, decisions, and recollections of how *ALMA* finally emerged in all its unique and transformational glory. An inevitable consequence is that the story moves painstakingly slowly, at times a little too much so, but the authors were present officially at, or not far removed from, the action during much of the period in question, thereby endowing the book with the status of a reference manual as well as a finely-interrelated collection of facts and figures.

This story of *ALMA* commences right at the start when a project of such magnitude could not be more than a pipe-dream, but that first distant whisper was sufficiently fertile to tickle the imagination of the more powerful activists among communities of millimetre and infrared astronomers, building on projects like the USA's *Millimeter Array* (*MMA*) already advanced in planning. And although it is freely admitted that this account of *ALMA* has been told from the perspective of the USA, in the end *ALMA* became a world project, not just an enhanced one owned and operated by that country alone. Indeed, as the concept slowly morphed into *ALMA* it became clear that one country alone simply could not manufacture, staff, or (most importantly) fund the entire project in all its complicated and detailed magnificence. A consequence of that somewhat myopic view is that no mention is made of the fact that it was British and Canadian radio astronomers who made breakthroughs in interstellar molecular physics, or that the all-important success with such a fundamental procedure as 'very long baseline interferometry' (VLBI) was initially a Canadian achievement.