brain activity in the anterior cingulate cortex, which serves as a kind of internal alert system within the brain signaling when a mistake has been made (an anomaly is perceived). Liberals tend to have heightened ERN, indicating a cognitive system that acknowledges the need for adjustments in perspective and strategy. On the other hand, conservatives exhibit a small ERN, which suggests their cognitive system is more resistant to signals advocating change or reconsideration. This suggests a neural reflection of their preference for stability, tradition and consistency. One can speculate on which of the figures Carleton describes would have had heightened ERN (Nichol, Proctor) and who would have had small ERN (Whewell, Robinson).

I would add, finally, that to a greater extent than many scientists would admit, their commitments to certain ideas owe more to their emotional than strictly rational belief systems. For example: term *L* in the Drake Equation, which denotes the length of time technological civilizations send communications into space, seems to be the most important in determining the prevalence of extraterrestrial civilizations in the Galaxy (or Universe). If the term is 1,000,000 years, there should be scads of ETs out there sending signals; but if it is 10,000 years or less, virtually none. Whether one believes the first or second scenario to be more probable depends largely on whether one is optimistic or pessimistic about humans' survivability as a species; this in turn has to some degree an emotional component, and ties in with whether one believes that we can (collectively) learn from experience and adjust or whether we are doomed to enact forever (or at least until extinction) primitive instinctive patterns of behaviors such as religious tribalisms, tendencies to emphasize short- term unsustainable developments over long-term stability, and above all a propensity to see violence (toward others) as a viable solution to our problems.

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Chronicling the Golden Age of Astronomy: A History of Visual Observing from Harriot to Moore, by Neil English. (Cham, Springer, 2018). Pp. xiv + 665. ISBN 978-3-319-97706-5 (hardcover), 164 mm × 241 mm, EUR 246.09.

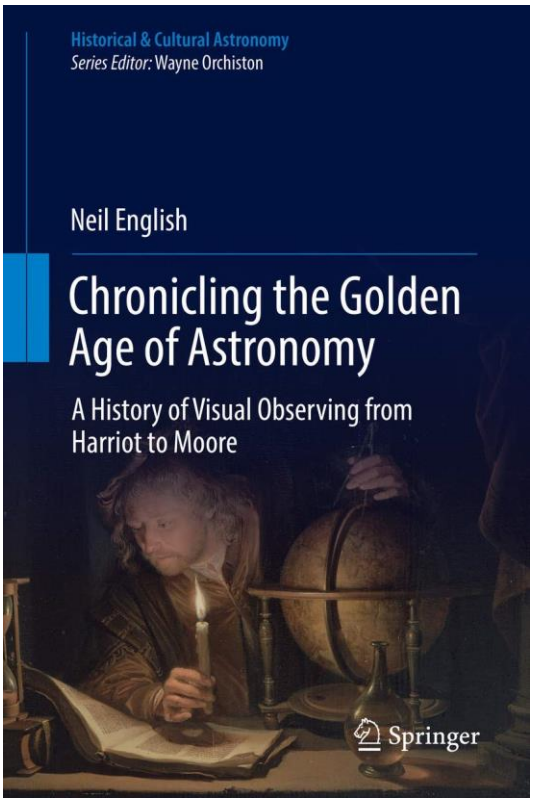
The Scot, Neil English, has a BSc Hons. in astronomy and physics and a PhD in biochemistry. The author's academic background, the publication in the renowned Springer series 'Historical and Cultural Astronomy', and the book's large size (and high price!) suggest a higher level of scholarship compared to his previous ones, mainly treating amateur astronomical topics. The table of contents, representing over 450 years of celestial observation, confirms this. On the back cover we read: "Generously illustrated throughout, this treasure trove of astronomical history shows how the work of each observer led to groundbreaking developments in science and provides important insights into the way we explore the heavens today." Does the author live up to this high standard?

The focus of the book is on the history of the telescope, its skilled constructors and keen observers. Of course, the author also treats other fields, like photography, meteors, space flight or even ET. Both amateurs and professionals are featured, the latter often having started astronomy as a hobby, using small instruments before moving on to an observatory. We meet many big names, but also rather unknown observers. Overall, the result is an interesting mix of characters, objects, instruments and methods. The theme is presented in an easy-to-understand manner and at first glance appears to be well researched. You can tell that the author is an experienced visual observer with a profound knowledge of instruments. The reader does not have to be a specialist in astronomy and its history. Is all that money well spent?

The hardcover book has an impressive 679 pages. The table of contents is a chain of 41 chapters. However, it would have been more user-friendly to divide it into several sections. The book shows 84 black/white and 182 color images (some made by the author), although not of consistently good quality. The layout and presentation are convincing. However, the fluently written text often reflects the author's personal opinion—you don't have to agree with everything here. Six chapters are introduced by a quote from a prominent person; all end with a list of sources: books, articles and links (some are pretty long). The Appendix presents a timeline, headed "Achievements of the Classical Refractor", listing 43 important events between 1733 and 2016. The book has a relatively short Index in relation to its size. Many names and topics that appear in the text are missing. You can

search for it in the e-book version, but the printed book is not exactly user-friendly in this regard.

The chapters generally follow a chronological order, but there are also many cross-references. 32 feature a person, named in the heading; they cover 6 to 40 pages and take us from Thomas Harriot (b. 1560) to Patrick Moore (d. 2012). Curiously, four names do not appear in the Index: Harriot, Jefferson, Burnham Jr. and Alcock. Seven chapters are on telescopes: from long air-refractors to the big reflectors on Mount Wilson (6 to 30 pages). Then there are five which introduce a famous book: William Denning's *Telescopic Work for Starlight*



Evenings, Percival Lowell's *Mars as the Abode of Life*, Robert Aitken's *The Binary Stars*, Walter Scott Houston's *Deep Sky Wonders* and David Levy's *The Quest for Comets*. The author goes through the entire content, gives longer quotes, followed by his comments. The review of Denning's book runs to 66 pages (preceded by a 10-page chapter on the character); all 17 chapters are treated. Houston's book contains the annual cycle of deep sky objects, based on his monthly column in *Sky & Telescope* magazine. Stephen O'Meara later compiled the material into a book; so, it was not written by Houston himself. The author presents the content in detail in 12 subchapters (January to December). Although headed "A Short Commentary", this chapter is the largest in the book with 70 pages! Given these two long reviews, one might ask: isn't that too much of a good thing?

As far as celebrities go, Galileo, Messier and Herschel are the most important, followed (in the reviewer's ranking) by Thomas Jefferson, William Lassell, Friedrich Bessel, Wilhelm Struve, Edward Barnard, Angelo Secchi, Clyde Tombaugh, John Dobson and Patrick Moore. Less known for the common reader may be Thomas Harriot, Simon Marius, William Smyth, William Dawes, Thomas Webb, William Denning, Asaph Hall, John Birmingham, Thomas Espin, Sherburne Burnham, Leslie Peltier, George Alcock and Robert Burnham jr. Finally, we have Nathaniel Green, Charles Grover, Arthur Williams, Theodore Philips and William Hay. The latter appears in the 6-page chapter "Seeing Saturnian Spots" (Hay is not mentioned in the heading).

Astronomers, to whom a separate chapter is dedicated, are first introduced in a biography, mentioning personal relationships and places of work. The scientific background, including the political and cultural situation, is also discussed. Other people involved are briefly introduced with their live facts (occasionally there is a subsection). However, if a person appears again in the text, the year of birth and death is often repeated unnecessarily (up to four times for Struve, Williams and Moore). It would have been better to provide this information in the Index. In the text, it is missing (in the standard form) for three astronomers: Galileo Galilei (1564–1642), Nathaniel Green (1833–1899) and Robert Burnham Jr. (1931–1993). Moreover, images (portraits) are not shown for eight people (although they are available): William Herschel (!), Nathaniel Green (*BAA Journal*!), William Denning, John Birmingham, Thomas Espin, Arthur Williams, Walter Scott Houston and David Levy. On the other hand, we see Patrick Moore four times! Anyway, compiling all the information undoubtedly required time-consuming research for the author.

All relevant telescope types are discussed in the book. It is obvious that the author prefers the achromatic refractor, while he apparently does not value the modern apochromatic variant very much (I don't find his arguments convincing). English also has experience with reflectors, particularly the popular Dobsonian. His fondness for the refractor may have stemmed from his love of binary stars, their classic target. This object

class dominates the book, followed by planets and comets. Concerning nebulae and star clusters, one gets the impression that these fascinating targets are quite underrepresented in the book (significantly, the terms 'nebula' and 'star cluster' do not appear in the Index). These objects are primarily covered in the lengthy review of Houston's *Deep Sky Wonders*; a few also appear in the chapters on Messier and Herschel. As a consequence, many visual observers who have made important contributions to the field are missing. Some are mentioned briefly, but often in a different context. Their numerous discoveries of nebulae and star clusters were not given due credit. Examples are: Lewis Swift (finding 898 NGC/IC objects), Édouard Stephan (442), Heinrich d'Arrest (274), Francis Leavenworth (247) or Wilhelm Tempel (104). Albert Marth (559) is overshadowed by Lassell and Edward E. Barnard is celebrated, but nothing is said about his 137 nebulae and clusters, found visually with refractors, described in the text. And there are deep-sky observers who are ignored completely, like Stéphane Javelle (1325), James Dunlop (277) and Guillaume Bigourdan (115). There should have been separate chapters for the mos important discoverers. Is this shortcoming a question of space? Certainly not! The five book reviews, which make up around 30% of the entire text, could have been shorter. The reason is probably the author's lack of knowledge and insufficient research.

The first targets to be discussed were Solar System objects, represented by the work of Harriot, Galileo and Marius [chapters 1–3]. The first years of small refractors soon developed into "The Era of Long Telescopes" [4], featuring Johannes Hevelius, Christiaan Huygens and Giovanni Cassini. An interesting excursion is made to a modern 'long refractor', built by an American telescope enthusiast. The story progresses to the "Workers of Speculum" [5]. Here we encounter the first reflectors, equipped with metal mirrors, made by Gregory, Newton, Cassegrain or Short. We are led back to objects, mainly comets, in the chapter about Messier [6]. Thomas Jefferson, following next, is relatively unknown as an astronomer—a surprising lesson [7].

At 40 pages, the chapter "The Herschel Legacy" [8] is rightly the most extensive about an astronomer. The work of William Herschel marks the beginning of a new era (a division in the table of contents would be useful here). Of course, Caroline and John Herschel are also treated. A good read, but with some weaknesses. Lord Rosse, outperforming Herschel's large reflectors, is the theme of the next chapter, titled "Thinking Big: The Pioneers of Parsonstown" [9]. The metal mirror telescope of the nineteenth century was further perfected by William Lassell, who enjoyed "Astronomical Adventures" on Malta [10]. Then the author returns to the refractor, meanwhile equipped with an achromatic objective. Fraunhofer has developed it into a precision instrument for astrometry, used by Wilhelm Bessel and Wilhelm Struve [11, 13]. The result was the first measured parallaxes. Struve also revolutionized double star astronomy, which was later the field of the eagle-eyed William R. Dawes [14]. Meanwhile, William H. Smyth was doing some good work for amateurs, publishing a book about the best objects for small telescopes [12]. He was followed in this task by Thomas W. Webb [15]. A rather unknown person is presented next, Nathaniel E. Green, an astronomical artist [16]. Then the author comes to a master of visual observing: Edward E. Barnard, who spent his early years in Nashville [17]. We see him again as a professional astronomer using the large refractors erected at Lick and Yerkes Observatory and the 60-inch reflector on Mount Wilson. Another famous refractor, the 26-inch in Washington, brought the discovery of the two tiny Martian moons by Asaph Hall [20]. The intermediate chapters [18, 19] are dedicated to the Bristol amateur William F. Denning. Somewhat less well known is Charles Grover, one of the first to use a silver-on-glass mirror [21].

Another division should be made when the "Father of Astrophysics", Angelo Secchi, enters the scene [22]. Using a spectroscope at his Merz refractor he was able to define five classes of stars by their spectral features. Among them are very red objects that the British amateurs John Birmingham and Thomas Espin were looking for [23]. Important refractors are the focus of the next three chapters. First, we encounter the 24-inch at Flagstaff, which Percival Lovell used to look for 'canals' on Mars [24]; the chapter is followed by a review of his book [25]. Then the author features the "Great Meudon Refractor" [26]. Next Robert Aitken's book on binary stars is reviewed [27]. In the following chapter we meet another giant of visual observing and congenial partner of Barnard at Lick and Yerkes, Sherburne W. Burnham [28]. Comparatively unknown are Arthur S. Williams and Theodore Phillips [29, 30], both keen planet observers. Leslie C. Peltier was famous for his visual comet discoveries [31], while Clyde Tombaugh even found a new

'planet,' Pluto, through photography [32].

When Walter Scott Houston brings us to modern amateur astronomy [33], where a further division would make sense. His book *Deep Sky Wonders* has inspired many visual observers. Another comet hunter is featured in the following chapter, David Levy; the author reviews his popular book *The Quest for Comets* [34]. George Alcock, using a "Historic Ross Refractor" is also known for his comets [35]. In "Whatever Happened to Robert Burnham Junior?", English covers the impressive 3-volume Burnham's Celestial Handbook, meanwhile a standard work, and the sad story of its author [36]. The next chapter describes "The Impact of Mount Wilson's 60-inch Reflector" [37], which in the hands of Edwin Hubble represents an essential tool for modern astrophysics. A bit off the path appears the chapter on Saturn [38]. Of course, a book like this cannot miss John Dobson, the American revolutionary of the amateur reflector [39]. And, for the British readers, Patrick Moore is a must too [40]—the author describes himself as a fan of Sir Patrick. The book ends with the story of the 'silver telescope', likely of Galilean design, which was given to Japan by England in 1613 [41].

This is not a book in the sense of historical and cultural studies represented by people like Michael Hoskin or Allan Chapman. One of the most important rules for a scientist is not to judge historical facts from today's perspective. This principle is often violated by the author by making negative, positive or even euphoric comments. And then there are his religious views, which have no place in a serious scientific book! In many places English comes out as a creationist and spares no effort in conveying his beliefs. In addition, some of his statements—after all, he is a biochemist—reveal a fundamental lack of understanding of the theory of evolution. The subject is enriched with ideology-driven views. A revealing example is found in the chapter about David Levy: "As a long-time skeptic of the evolutionary paradigm, this author would suggest to Dr. Levy that there is no mechanism yet identified that can transform one kind of animal into another. If that really were the case, scientists would be creating novel organisms every other day. Until scientists can clearly demonstrate a step by step mechanism for the transformation of one kind of animal into another, their speculations have no scientific merit." (page 588). It is also noticeable that the author alternately refers to himself in the first or third person. The latter ('he') causes confusion: does English mean himself or the person discussed in the text?

What is amazing is that the book has been highly praised, for instance on the popular Cloudy Nights website. And all the more so because there are serious negative aspects that go beyond those already mentioned. For reasons of scientific seriousness and historical accuracy, they must be presented in detail. Overall, the reviewer comes to a completely different verdict.

In my private hit list of reviewed books with the most errors found, this one ends up in one of the top places! If they were created during the publication process, the author must be blamed for not carrying out a thorough final check. In the opposite case, however, one would have to question his professional competence. I suspect that both English and Springer are responsible for the problems. The severity ranges from typos, which are not always obvious, to incorrect content, which is likely the result of ignorance or even sloppiness. Errors can be found in the normal text, in the captions, in the sources, in the Appendix and in the Index—i.e. practically everywhere! Some are systematic in nature, particularly when it comes to misspellings of names or inconsistent terms. The list of cases is pretty long!

Let's start with incorrect first/last names (the correct one is given in [ ]). In many cases, the text contains both the correct and incorrect spelling (indicated by +). Here are all 48 finds: Borrely [Borrelly], Brunnow [Brünnow], Chamber's [Chambers'], Christian Huygens [Christiaan +], Macholz [Machholz], Edmond Halley [Edmund +], Edward Heiss [Eduard], Eugene Antoniadi [Eugène], Francoise Messier [Françoise], Georg Hegel [Friedrich], Gutav Kirchhoff [Gustav], Heinrich D'Arrest [d'Arrest], Henri Alexandre Deslandres [Henri-Alexandre], Hershel [Herschel +], Hertzprung [Hertzsprung +], Horatio Grassi [Oratio], Jean Louis Pons [Jean-Louis], Jean Phillipe Loys de Chesaux [Jean-Phillipe Loys de Chéseaux +], Jerome Lalande [Jérôme], Johan Helfenreider [Johann Helfenzrieder], Johann Hevelius [Johannes +], Johannes Fabricius [Johann +], John Banks [Joseph +], John Komarzewski [Jéan-Baptiste], Kembe [Kemble +], Kruger [Krüger], Leon Foucault [Léon +], Mathieu Prosper Henry [Mathieu-Prosper], Mechain [Méchain], Neville Maskelyne [Nevil +], Niccolo Zucchi [Niccolò], O' Meara [O'Meara +], Palitzch [Palitzsch], Perotin [Perrotin +], Philips [Phillips], Pierre Paul Henry [Pierre-Paul], Pingre [Pingré], Plossl [Plössl +], Reeta

Beebe [Reta], Römer [Rømer +], Rumker [Rümker], Schröter [Schroeter], Snellus [Snellius], Spiridion Gopchevic [Spiridon Gopčević], Tebutt [Tebbutt +], Temple [Tempel +], Tully [Tulley +], William Saddler Franks [Sadler]. A strange case appears on pages 262 and 299: "Dr. M. Wolf" and "M. Perotin", respectively (for the latter, the wrong name is not meant). The persons, both missing in the Index, are Charles Wolf and Henri Perrotin. The author obviously doesn't know that in French texts "M." is not an abbreviation of the first name, but stands for "Monsieur"! On page 301 we read about the "comet discoveries of Holmes and E Hind". I wonder if the "E" is misplaced because Edwin Holmes discovered Comet 17P/Holmes in 1892; Hind is John R. Hind, although it is unclear what he has to do with the comets mentioned in the text (both names do not appear in the Index). On page 304 we read about "Professor Swift"—Lewis Swift was only called a 'Professor' by his admirers. On page 344 we see "John Tebutt. Sr." (the wrong name appears even in the heading on p. 345). On page 423 we read "Cardinal Secchi"—the Jesuit never held this office. On p. 511 "Lucien J. Kembe" appears in the text, quoted from Houston's book. This should read Kemble (see above). Here we have one of several cases of an incorrect transcription. A strange name appears on page 560: "Dr. Francis Gladheim", mentioned as the discoverer of the planetary nebula in M 15 in 1928. This actually is Francis Gladheim Pease! A few lines above, the tiny object is correctly called Pease 1. However, we were not informed that it was already catalogued in 1916 as star K648 by Karl Friedrich Küstner. On page 612 we see Francis G. Pease. Like many others, the name is not in the Index. Some are missing, even if they appear frequently in the text: Otto Struve, George W. Hough, Pierre Méchain, Edward S. Holden, William and George Bond, Lewis Swift, Thomas R. Robinson and the brothers Henry. Some Index entries are problematic or even incorrect, like *Dembowski* (written in italics), Dreyer (E. instead of J.), Galileo (last name is Galilei), Huygens (see above), Mayer (not divided into T. and C., as done in other cases), Father Clavius and Dr. Lee (the only appearances of a title). We further read 'Cassini. G.D.'. The case of Laurence Parsons is discussed below.

There are incorrect words or designations (places, objects etc.): 6 nova [novae +], Academie des Sciences [Académie des Sciences +], Angstrom [Ångstrom +], Aquilla [Aquila +], Arceti [Arcetri +], Astronome Voluntaire [volontaire], Bilboa [Bilbao], Cassiopieae [Cassiopeiae +], Chimboroza [Chimborazo], Chixulub [Chicxulub], Dantzig [Danzig +], Horsehoe [Horseshoe], John Dollond & Sons [Son], Las Crusces [Cruces +], nee [née +], Mannheim in Pennsylvania [Manheim], Mechanique Celeste [Méchanique Céleste], Pleaides [Pleiades +], Televue [Tele Vue +], Thorowgood refractor [Thorrowgood +], Viva La France [Vive], Ohio's Wesleyan's University [Wesleyan +]. On p. 485 we read "Carl Zeiss Stiftung"—this was a Company not a Foundation. On page 495 the 'New Mexico State University' is mentioned, but the acronym NMSU appears without explanation on the next page.

Content errors belong to the severe problems. Here is a selection. It is claimed that Cassini discovered the division in the rings of Saturn in 1673 (pages 52 and 296)—this was Campani in 1664. On page 80 we wrongly read that "John Maurice, Count of Bruhl … ended up at Gotha Observatory". Hans Moritz v. Brühl (known as Count Brühl) never 'ended up' there, he only recommended Franz Xaver v. Zach for the position of Director of the new observatory. On page 91 it is claimed about the catalogue of Messier: "By the middle of April [March!] 1781, he had logged his 100th comet-like object, but instead of leaving it at that, he decided at the last minute to include a further three objects that had been discovered by Pierre Mechain [sic] between 1780 and 1781." Méchain's finds were made on 27 March (M 101, M 102) and in April 1781 (M 103). "The 103 objects formed the corpus of his completed list, published in the *Connaissance des Temps* in 1783." (page 91). The catalogue appeared in 1781. Further, we learn that Méchain was "… adding three newly discovered objects to Messier's list: M105, M106 and M107 in 1783." (page 91). The three were actually found 1781–1782, and were not 'added' until 1947.

The author has a problem with William Herschel's telescopes and observations, including the work of Caroline and John. On page 109 we read about a "7-foot" reflector with "6.3-inch aperture" which he "… used for his first 'review' of the heavens and the one with which he discovered the planet Uranus." Herschel's first review was made with a 4.5-inch of 5.5 feet focus. Uranus was found in the second review, using a 7-foot of 6.2 inches aperture (later the author gives 6.3- and 6.2-inch, 7- and 8-foot). On page 111 the first review is mentioned again (making the same error) and on page 127 we even

read "… 7-foot Newtonian telescope with 4.5 inches aperture". A confusing mix of data. We further read: "Most of the objects Herschel discovered in his first review … were double and multiple stars, but he also found a number of his early clusters and nebulae." (page 127). Actually, the first review was just a trial that yielded no results (except finding that Castor is a double star). The author's statement applies actually applies the second review! The third review is treated on page 127, using "… powers as high as 6000!" compared to "… about 220 …" in the second. The standard power in the third review was 460. We further learn that Herschel "… examined as many as 400 stars in the course of a night's work." (page 127). According to the reviewer's research, 387 nights were used in the third review (17 August 1779 to 26 September 1783), inspecting a total number of 13,300 stars (re-observations included). Thus, there is a mean of 34 stars per night. In 311 nights, 50 stars or less were observed (the maximum was 312 stars on 7 September 1782). So, the number '400' is just an unfounded guess.

On page 114 we learn that Herschel's 20-foot reflectors (referred to as his two 'workhouse' telescopes) were used for his 'future reviews', meaning the 'Small 20-Foot' and the 'Large 20-Foot' with apertures of 12 and 18.7 inches, respectively. There was only one "future review": Herschel's sweep campaign made with the 18.7-inch. The 12-inch was cumbersome and mainly used for observing some Messier objects in 1783. On page 553, William's 18.7-inch reflector is wrongly called 18.25-inch—this was John's telescope. William Herschel made many more observations with the easy-to-use 7-foot and 10-foot reflectors, which continued until 1819! It is also claimed "… that the very few objects contained in the Herschel catalog [of nebulae and star clusters] were actually discovered with the 40-foot." (page 118). The fact is that only three non-stellar objects were discovered with the 40-foot (between 1789 and 1793), and they are not included in the three (!) catalogues. On page 118 we learn that "Patrick Wilson, Professor of Astronomy at Glasgow, after his retirement, came with his sister on a visit to Telescope House." Actually, after 1799 Wilson (who had no sister) was joined by his wife and daughter. Moreover, the home of the Herschels in Slough was called Observatory House by its residents. William's final sweep on 30 September 1802, was not "No 112" (as written on page 121) but 1112—a typo perhaps? Caroline's seven sweep books were not presented to the "Royal Society" (page 121) but to the Royal Astronomical Society. On page 123 we read that Herschel has "… observed … the Encke division" in the Saturnian ring—this was the "Cassini division" (Encke saw the much smaller gap in 1837). On the next page it is claimed that William Herschel named the two satellites of Uranus that he found in 1787. Actually, the names Oberon and Titania are due to his son John (in 1852). On page 130 the author tells us something about Herschel's star counts ("gages"): "He would turn his telescope to one part of the sky after another and count the number of stars visible in the field of view at each setting of the instrument." Star counts were a by-product of sweeping, done with the 18.7-inch. There was no "turn" or "setting", just the up-down movement of the tube, fixed to the meridian. On page 131 the author writes about Messier's catalogue and that it "… was presented to Herschel by his friend Alexander Aubert, who gave him a copy of 103 of these objects compiled by … Messier, which was published in 1783-4". As already mentioned, the catalogue with 103 entries appeared already in 1781. Herschel received an earlier version (with 70 objects, published in 1780) from William Watson in December 1781. He purchased the final catalogue in July 1783; the associated documentation makes no mention of Aubert.

There is a strange sentence about Caroline on page 136: "Observing with her brother's colossal telescope at Slough was not without its risks." William's sister and assistant never used the 18.7-inch reflector! The author gives the impression that this was the case, because "Caroline tripped and fell on a snow-covered field in the dead of night and impaled her leg on a large iron hook that was used to adjust the position of the telescope." (page 136). The accident happened on 31 December 1783, when the siblings were preparing the instrument for a sweep. We further read that Caroline discovered 14 deep-sky objects of which 11 were new—the correct numbers are 22 and 10. Moreover, her last object, found with the small refractor, was not M 48 (page 137) but M 29. It is also claimed that the open cluster IC 4756 was discovered while examining photographic plates. This points to Solon Bailey (1893), but the credit goes to the visual observer Thomas Webb (1859). Next the open cluster NGC 6633, found by de Chéseaux, is called "NGC 663"—another typo? Caroline's star cluster NGC 752 was first seen by Hodierna in 1654. We further read that Caroline's eight "… comets were almost invariably discover-

ed using a 9-inch Newtonian reflector of 5 feet focus, designed by her brother." (page 139). The facts are: this telescope, known as the Large Sweeper, was used in the case of comets no. 5–7, while the Small Sweeper brought no. 1–4; no. 8 was found with the naked eye. On page 140 we read that John Herschel "… did form warm and enduring bonds with his two cousins, Sophia and Mary Baldwin"—the latter was his mother! On page 141 the author claims that the double star observations of William and John were done with the "18-inch reflector" and "18.25-inch reflector during the 1820s", respectively. William mainly used his 6.2-inch Newtonian (the 18.7-inch was not suitable for this task) and John a 3.75-inch Tully refractor. On page 303, the author mentions (without comment) that "William Herschel may have mistakenly identified some comets as nebulae." According to the reviewer's research there are 12 missing objects, but none can be associated with a comet. On page 504 we learn (from Houston's book) that "William Herschel turned his first homemade reflecting telescope toward it [the Orion Nebula] in 1774 in the aftermath of some two hundred failed attempts to fashion a decent speculum metal mirror"! Despite the fact that it was his second telescope, there is no reference to these many attempts in the documents. On page 529, NGC 2548 = M 48 is credited to Caroline Herschel (1783), not mentioning that Bradley saw the open cluster in 1727 and Messier in 1771.

In Chapter 9, the Earls of Rosse are discussed. There is a confusing mix of names and titles: Parsons, Earl of Rosse, Lord Rosse, Lord Oxmantown. For readers not familiar with these matters it is unclear who is who. 'Lord Rosse' is used for both William and Laurence Parsons, though this commonly means the former. Lord Oxmantown is the title given to the first son of a living Earl. On page 160 the author writes: "Many of these new objects [found at Birr Castle] were recorded in a catalog compiled by the fourth Earl covering the three decades between 1848 and 1878." This was the work of Dreyer and not Laurence Parsons (who is missing in the Index). On the next page we read that "… on the night of September 17, 1877, Lord Rosse was able to confirm the existence of the tiny Martian satellites, Deimos and Phobos …" (we see the same on page 260). In fact, only the outer moon, Deimos, was seen by Dreyer and Laurence Parsons (called "Lord Rosse"). In the original publication an exact date for the observation with the 72-inch is not given. The text about the Trapezium on page 166 is incomplete, when only writing "Lassell discovered the sixth member." The star was first seen by John Herschel on 13 February 1830, while Lassell found it independently in February 1847. Below, Lassell's membership in the Royal Society is mentioned, but we further read that he wrote a paper for "… the society's *Memoires* of 1842." But the *Memoirs* referred to were published by the Royal Astronomical Society. On page 171 we read that "… in the autumn of 1852 … Lassell and his assistant, the German astronomer Albert Marth (1828–1897), set up their observing station at St. John Cavalier, Valletta." Although Lassell did start his Malta sojourn that year, Marth was not hired by him until 1862. The observations by Lassell's assistant were published in 1867 and not in 1866 (as stated on page 177); the cited paper in the References gives the correct year.

On page 189 we read: "… the earliest example of a divided object glass was realized by George Dollond in 1753." Because George was born in 1774, his father John is meant; further the date must read 1754. On page 198 Smyth's book *A Cycle of Celestial Objects* is called "*Cycle in the Heavens*". Another case is "*Chamber's Descriptive Astronomy*" (page 275); the author, George F. Chambers, should not be listed in italics! On page 203 we read about "Dorpat (modern Estonia)", but the Estonian town is now named Tartu (and Figure 13.2 shows the "University of Tartu Old Observatory"). On page 220 we encounter the double stars "Sigma Canis Majoris" and "Sigma 1517 Leonis". The former is σ CMa, but the latter is not σ Leo; "1517" remains unexplained. There is number 1517 in Wilhelm Struve's catalogue of double stars, normally designated as Σ1517 (a star in Leo). The book does not use Greek letters, which obviously can lead to problems. However, on page 261 we find an exception: "γ2 Andromedae"; normally this is written γ^2. Superscript numbers are also omitted, leading to designations like "Epsilon 1 & 2 Lyrae" (page 600). The table on page 349 lists %-values; the symbol % is not given, but the last entry curiously reads "7.0".

On page 314, the parallaxes of 61 Cygni, Vega and "Alpha Crucis" are mentioned—but this last-mentioned is for Alpha Centauri (Denning, who is cited here, was correct). On page 319 it is stated that Denning (according to his book) has discovered "10 nebulae … between 1889 and 1893." It is long known from historic catalogues, published by the reviewer, that Denning found 17 nebulae up till 1893. The author also copies Denning's

"remarkable story" of the Merope Nebula, barely covering a quarter of a page. English ignores that the reviewer has given a comprehensive 40-page account of this in his book on the history of the NGC, published in 2010. On page 326 Einstein's General Theory of Relativity is dated 1916 instead of 1915—is this yet another typo?

On page 366 "… the double star lists of Struve and Herschel …" are mentioned, but the author should have written that Wilhelm Struve and John Herschel are meant. On page 398, we read that Leo Brenner's observatory is located "… at his villa in Manora …", but his Manora Observatory was in the Croatian village of Mali Löčinj. Magnification is expressed in several different ways: "150 diameters", "150x" or "150×" (note the different symbols), but on page 406 we read "150x diameters". The dwarf planet Pluto is designated "134,340 Pluto" (page 497), but he number with the comma makes no sense! On page 505 the Flame Nebula in Orion is wrongly called "IC 434"—it should read NGC 2024 (IC 434 is actually around the Horsehead). On page 510 it is claimed that IC 342 was discovered by "Denning in the 1890s", but this galaxy was found by Barnard on 11 August 1890 (whereas Denning saw it on 19 August 1892). In the caption of Figure 33.10 (page 514) we read "The Little Dumbbell Nebula (M76) in Vulpecula", but this object is in Perseus (which is correctly given on the next page). On page 519 the Rosette Nebula (NGC 2237–39) with the embedded cluster NGC 2244 is introduced, writing that the nebula was missed by "… William Herschel … Charles Messier and Admiral W. H. Smyth", but "William Lassell, however, observing with his splendid 48-inch reflector … in the 1860s, described the same cluster with the nebulosity. Why are the discoverers, John Herschel (NGC 2239 in 1830), Marth (NGC 2238 in 1864) and Swift (NGC 2237 in 1865), not mentioned? Obviously, in this and many other cases the author did not consult the reviewer's data on the Internet (the standard source for H, M, NGC and IC objects). Figure 33.13 on page 520 shows the cluster pair M 35 and NGC 2158. In the caption we read that the former is at the 'lower right', the latter 'just off the center [sic] right'. In fact, M 35 is located at upper left and NGC 2158 at lower right. On page 544 the Hubble Constant is abbreviated to "Ho" instead of H_0. On page 612 the 60-inch reflector on Mount Wilson is called the "60-inch Hale telescope" (and "Hale 60-inch" on the next page), but this is the author's own creation because the name 'Hale Telescope' is used exclusively for the 200-inch telescope on Mount Palomar. On page 616 the "… Dutch chemist and astronomer Enjar Hertzprung … " is mentioned. Despite the incorrect last name (see above), he was a Dane! In the timeline (Appendix) we read for 1857 that Secchi has divided the "… stars into four spectral classes …", whereas on page 355 they are "… divided into five distinct categories …"; the latter is correct, representing Type I to Type V.

There are also problems in the References listed after each chapter. In case of Charles Mollan's book on William Parsons (page 164) there is no hint that he was the editor. On page 181 Chapman's article on Lassell appears twice, but with different information: "Vistas Astron. **32**(Part 4), 341–370 (1988a)" and "Vistas Astron. **4**, 341–370 (1988b)"; note the missing space in the former version between '**32**' and 'Part'). On page 230 we read "Robinson, J.M. (ed.)" but on page 455 "Robinson, J., Robinson. M. (eds.)"—of course, the Robinson couple is correct! On page 373 "W.H." is given as author of the Espin obituary, but this was William McCrae. For longer quotations, normally italics is used, but not throughout; page 580 shows a strange mix. The author has also a problem with comet designations (as in many other cases, the presentation is inconsistent). Both the new version, used since 1995, like C/1786 P1, and the old one, like 1937c, are used. This wouldn't be a problem (if explained!), but we do see variations, like 1988 g (with a space), 1909E (upper case), 1932 K (upper case with a space) or C/1743X1 (without a space). On page 301 we also have the designation, according to the discovery order: "1881V, 1890VI, 1892 II and 1894 I" (with a space and without one). The list of Alcock's comets on page 602 features the new terminology, while that for Peltier on page 476 the old one. In the latter case, Comet 1937c must be credited to Whipple (C/1937 C1). Special comets bear a name or a combination of names, like Swift-Tuttle. A problem are the missing hyphens: we find Swift Tuttle, Shoemaker Levy 9, or even Latyshev Wild Burnham. A strange case is "Comet-Winnecke" (page 482).

The hyphenation problem is much larger —and obviously systematic. Here are examples (without page number): "musically-minded", "non -English", "state -of -the -art", "1.5 -seconds of arc", "silver -on -glass", "three– inch aperture and five– foot focus" (note the n-dash *in lieu* of a hyphen, also used in "farmer–turned–astronomer"). On page 449 we find a missing hyphen in the heading "Arthur Stanley Williams (1861

1938)". In case of aperture/focus values we correctly find "8-inch" or "10-foot", but also "2 inch", "10 foot" or even "6- inch" (there are more than 60 cases). Other units are also problematic, some are missing, others incorrect: "4.5 Cooke refractor", "77-cm (30-) Nice Observatory", "5.1 reflector", "–19C" [–19°C], we also see "degree C"), "48 ° F" [48°F], "between – 30° and the South Pole" [–30°]. There is no unique capitalization: "xi Persei" and "Xi Persei". Often a full-stop is missing: "Washington D.C", "[Admiral W. H] Smyth", "J. H Schröter" or "H.C Vogel" (abbreviated first names appear with/without space). Missing spaces are also a problem: "A. E.Levin", "Zucchi(1586–1670)", "*Handbook*(1958)", "his 'makeshift' Clark achromatic", "NGC 1129(+14.5)". The last-mentioned case also refers to magnitudes; on page 516 we read "13.0" and "+15.5" (for faint objects + is meaningless). Messier objects are written with or without a space: "M 13" and "M31". A comma should be avoided in "John, a.k.a., Der Admiral". On pages 369 and 502 we also find missing right parentheses.

On pages 424–426 we find the author's calculation of the masses in a binary system according to Newtonian mechanics. Alas, the presented formulae have nothing to do with the standard scientific notation. First, symbols are confusing: the labels of the stars, M and N in Figure 27.5, stand also for their masses. They should be designated, as usual, by m_1 and m_2. However, indices are not used: Vm, Vn and Fm, Fn denote the stars orbital velocities (v_1, v_2) and centrifugal forces, usually v_1, v_2 and F_1, F_2, respectively. The distances to the centre of gravity are y and x (note the reversed sequence; moreover, x appears also in italics: *x*); usually r_1, r_2. This strange notation leads to cryptic formulae, like $Fn = NVn^2/x$, $M+N = [(a''/pi'')]^3/p^2$ or N/M = 10/20 = % (p is the period, usually T). This is hard work for the common reader. The professional version of the first formula is $F_2 = m_2v_2^2/r_2$.

This looks like I'm pretty pedantic. But I checked the book very carefully and even seemingly small things are important. Some cases are certainly a matter of opinion, but ultimately there are too many for such a voluminous and demanding academic book. The reader can expect a flawless and consistent presentation. This is all the more true since the publisher is aiming more at a specialist audience, i.e. academics and scientists (hence the high price). The positive response from some amateurs who spend their scarce money on it shows that they are impressed by the amount of historical and astronomical information. However, as we have seen, a closer look may reveal a very different picture. It is not enough to simply collect as many details as possible. This poses the risk of errors creeping in, and English should have been more thorough. For example, regarding deep sky objects and their visual observers (particularly the Herschels), he should have consulted the reviewer's books and numerous published papers well as the historical and modern object data available on the Internet.

This review should not be construed as a personal attack, but as an astronomical historian with a PhD in astrophysics, and a long-time visual observer, I have tried to present things as objectively as possible. But even with good will we cannot get past the book's many shortcomings. The author's own preferences ultimately lead to an incomplete and sometimes distorted picture of the promised topic: "Visual Observation". The book *Chronicling the Golden Age of Astronomy* is far from perfect and should be read with caution!

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Editing and Analysing Numerical Tables: Towards a Digital Information System for the History of Astral Sciences, edited by Matthieu Husson, Clemency Montelle, and Benno van Dalen. (Turnhout, Brepols, 2021). Pp. ix + 610. ISBN 978-2-503-59606-8 (hardback) 175 × 258 mm, Euro 95.00

Going back in history, tables of astronomical data have been published. There have been many almanacs based on planetary theories and ephemerides. There have also been tables of data published in scientific papers. The source of the data in these almanacs and tables and their accuracy are in many cases uncertain. The tables of data present a challenge to historians. A large effort has been made in identifying the sources and accuracies of ephemerides and almanacs from the Roman, Greek, Egyptian, and Babylonian cultures. The history of these efforts is presented in the introduction of this book, giving many references to the resulting publications.

This book seeks to move forward and discuss the power of digital tools to edit the process and analyze astronomical tables. The first step in this process is the collection and consideration of the issues in the editing