BOOK REVIEWS

***Jesse Ramsden (1735-1800) London's Leading Scientific Instrument Maker*, by Anita McConnell (Ashgate Publishing House, Aldershot, 2007), pp. 340, ISBN-13: 978 0 7546 6136 8 (hardback), GB£60.00, 232 x 158 mm.**

Before reading this book (Figure 1), my only knowledge about Jesse Ramsden was that he was the inventor of the Ramsden eyepiece. Dr McConnell's excellent biography of the man shows that there was much more. She quotes extensively from documents written by his contemporaries to show that they considered him the finest instrument-maker of his time. It was recognized that not only were the instruments constructed extremely well, but that they often showed innovation of design which in one case would lead the Royal Society to award him the Copley Medal.

Ramsden was also famous for his tardiness, with instruments delivered often years after being ordered. Dunsink Observatory had its transit circle delivered 23 years late. An acquaintance, Richard Edgeworth remarked that not only was Ramsden a mechanical genius, but he was also a genius at the invention of another sort, the invention of excuses. McConnell relates many such anecdotes, and one of the more amusing ones has Ramsden showing up unannounced at the residence of King George III declaring that the King wished to see him. The pages and attendants were rather dubious, but checked with the King just in case, and much to their amazement the King insisted that Ramsden be brought to his presence at once. Ramsden had with him an item that the King had ordered. After examining it and finding that it met expectations, he said to Ramsden that he "… brought home the instrument on the very day that was appointed. You have only mistaken the year."

We have little to go on with respects to Ramsden the man, because few of his personal documents have survived. For example, we know that he was born in Yorkshire, but after he moved to London we have no idea whether he maintained contact with friends or relatives. Ramsden did marry Sarah Dollond, the daughter of the optician John Dollond, who held the patent for the achromatic lens, but nothing is known on why the marriage broke up after eighteen years, which was after the death of the elder Dollond. Very possibly it had something to do with an argument that Ramsden had with Sarah's brother Peter, on who really invented the achromatic lens, an argument that would lead to Peter Dollond denouncing Ramsden at a meeting of the Royal Society.

The book also gives us some idea of what it was like to have an instrument-making business. Ramsden had upwards of fifty people working for him who put in 72 hours of work per week. Orders for expensive items like transit telescopes, transit circles, large quadrants and astronomical telescopes were rare, so Ramsden also sold devices such as compasses and sextants, for which there was a big demand from the various naval and commercial ships, while his theodolites and other surveying and cartographic instruments found a ready market.

Dr McConnell has written a book of great scholarship that is also fascinating reading. The book is well illustrated and makes extensive use of the available documentation. And the price of 60 pounds is reasonable for a book of this kind.

David Blank
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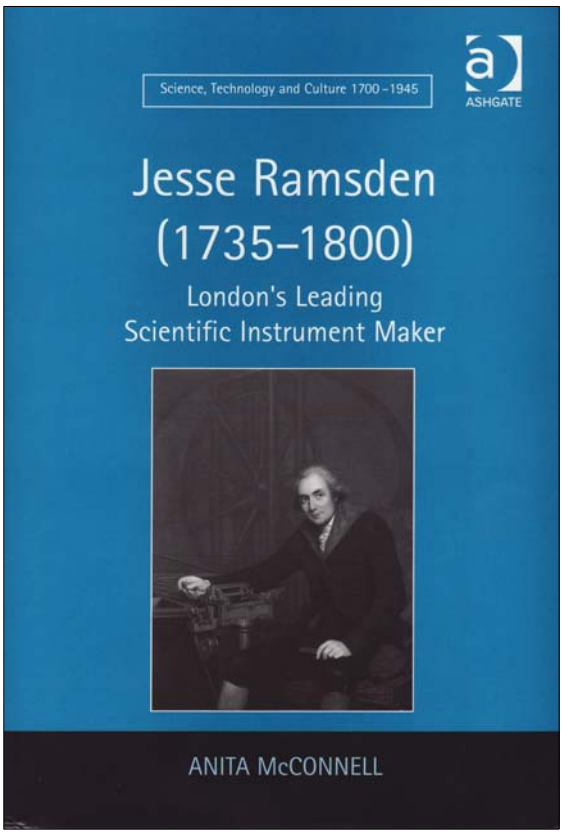

Figure 1: Dust jacket of the Jesse Ramsden book.

***Mission to Jupiter: A History of the Galileo Project*, by Michael Meltzer (NASA SP 2007-4231, Washington, DC, 2007), pp. 318 (hardback), US$25.00, 250 x 165 mm.**

Michael Meltzer's *Mission to Jupiter: A History of the Galileo Project* (NASA SP 2007-4231) describes the first program to investigate Jupiter from orbit and by entry into the planet's atmosphere. Not counting perhaps twenty years of preliminary activity, the project lasted from 1977, when the United States Congress gave authorization, until 2003, when the orbiter was intentionally destroyed. Of these twenty-six years, twelve were spent in a long struggle to build and launch the spacecraft, while six more passed with it *en route* to Jupiter. Galileo spent eight productive years at Jupiter.

Meltzer has written a well-documented history. His access to persons who were closely involved with the program adds authority to his presentation. He gives credit to the people who operated Galileo through its many challenges to make the program a long-term success story. The book summarizes many technical facts. It seems likely that only the most specialized readers will want more detail. Less specialized readers could better appreciate the spectacles of the planet's atmosphere and the four main satellites if more color images had been used. As it is, their use is only representative.

Who is the audience for this book? A senior manager in the Galileo program wrote in the preface: "I think that people who are interested in the space program, its science achievements, and its contributions to technology in general will really appreciate this history. It's comprehensive, it's complete, and it seems to me to be pretty

even-handed." The most likely audience is persons who participated in the Galileo Project, but historians will find useful material, and space exploration enthusiasts may be interested. What about the general public? Meltzer has summarized much in straightforward language, yet despite his hopeful inclusivity that Galileo was "... the eyes, ears, and fingertips of humankind ... it is we who were exploring uncharted frontiers …" (p. 299), his presentation is unlikely to be popular. Its thoroughly technical nature will appeal to technical people but may be perceived as dry by general readers. *Mission to Jupiter: A History of the Galileo Project* is a useful and worthwhile record of the first long-term visit to a gas giant planet.

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***"... eine ausnehmende Zierde und Vortheil" – Geschichte der Kieler Universitätssternwarte und ihrer Vorgängerinnen 1770-1950,* by Felix Lühning, (Wachholtz Verlag, Neumünster, 2007), pp. 752, ISBN-13: 978 529 02497 9 (hardback), €35,00, 236 x 160 mm.**

This book, which tells the detailed history of Kiel University Observatory and its predecessors, comprises the habilitation thesis submitted by F. Lühning to the Faculty of Mathematics at Hamburg University in 2004. With financial support from various organizations, it was issued in a very attractive form as a special publication of the Society for the history of the city of Kiel. The nice layout, the graphical sketches of buildings, instruments, and astronomical connections—often designed by the author—the scientifically-precise text, written with a sense of humor, make a pleasant reading, in spite of sometimes quite extensive descriptions of architectural details or 'operating instructions' for meridan circles etc. I have rarely read such an appealing text on astronomical history.

The single chapters deal with the beginnings of astronomy in Kiel (1770-1820), Schrader's giant telescope from the late eighteenth century, Altona Observatory (1823-1850), the first years of the journal *Astronomische Nachrichten*, the last years of Altona Observatory (1850-1872), the private Bothkamp Observatory (1870-1914), the genesis of Kiel Observatory (1874-1880), the era of its Director, Krueger (1880-1896), the Kiel Chronometer Observatory (1893-1913), the era of Harzer (1897-1925), the era of Rosenberg (1927-1934), the decline of Kiel Observatory (1935-1950) and the evolution of *Astronomische Nachrichten* under its editor Kobold (1907-1938). The book concludes with a glossary of technical terms, biographical sketches of known and unknown persons, as well as a list of references.

The author presents lively sketches of people who were astronomically active in Altona, Kiel and its surroundings for a time interval of about two hundred years. To achieve this, he studied many files from the Secret State Archive Preussischer Kulturbesitz (Berlin), the Schleswig-Holsteinisches State Archive (Schleswig) and the Hamburg State Archive, from which he quotes extensively. He also has evaluated private documents, and has interviewed surviving witnesses of the 1930s and 1940s. Nevertheless, such sources may turn out to be unreliable: the custodian said that the spouse of the last official Observatory Director, Hans Oswald Rosenberg, was "… Verena Borchardt, a Jewess from St. Petersburg." (p. 583). Her family, however, lived for some years in Moscow, where her father was the representative of the *Königsberger Thee-Compagnie*. In 1880, his daughter Helene was born there, and she later married the astronomer Wirtz. In 1882, the Borchardt family moved to Berlin, where Verena was born. The family was "… of reformed confession, of Jewish origin." (Rudolf Borchardt)—only in Nazi ideology was she a *Jewess*.

On page 583, too, Wirtz' capricious political views are quoted: "The day when the French troops entered Strasbourg was the happiest one in my life."—taken from a 1999 paper by Theiss, where the author states that the source is not given. In fact, Theiss uses a study by Duerbeck and Seitter (1990), where the precise reference in the *Kiel Acta* (kept in the Prussian State Archive) is given, and an explanation of this statement is offered. Another overlooked—although not very informative—source is the voluminous edition of the collected letters of Rudolf Borchardt, the poetical brother of 'Vera' Rosenberg and 'Lene' Wirtz.

Another series of peculiar statements refers to the *Astronomische Nachrichten* (p. 666): neither did they publish, after 1945, "… sometimes only Russian articles …", nor "… only articles in English …" after 1993; some later German astrometric articles will presumably stand the test of time better than the plethora of English articles on cosmology of that time. Totally fabricated is the author's statement that the journal is now published by "… the Astronomical Computing Centre [sic] in Heidelberg."

In spite of my critical notes on some irrelevant details, I can wholeheartedly recommend this book: it is an indispensable source of information for anyone who is interested in the history of astronomy in German-speaking lands in the nineteenth and the first half of the twentieth centuries.

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***Un Astronome des Lumières: Jérôme Lalande,* by Simone Dumont (coédition Vuibert, Paris/Observatoire de Paris, 2007), pp. 359, ISBN-13 Vuibert: 978 2 7117 4028 4, ISBN-13 Obs. de Paris: 978 2 901057 54 3, €35,00, 240 x 158mm.**

The infant baptised on 12 July 1732 as Joseph Hyérosme Lefrançois was born at Bourg-en-Bresse and educated there by the Jesuits. Arriving in Paris as a young law student, he expanded his surname to Lefrançois de La Lande, and by happy chance took lodgings at the hotel de Cluny (now the Musée de Cluny) where the astronomer Joseph Nicolas Delisle had an observatory. This proximity allowed him to develop his boyhood interest in the heavens into serious observation; with his law studies completed, he became totally dedicated to astronomy and its mathematical underpinning. When La Caille departed to make observations at the Cape, Lalande was sent in 1751 to Berlin (at a similar longitude in the northern hemisphere) to make similar observations. Here his youthfulness and competence surely boosted his reputation. Returning the following year, he moved easily into the Parisian astronomical circle, becoming one of its brightest planets, and soon became known to the wider astronomical world as Jérôme Lalande. Given the limited membership of the Académie Royale des Sciences, only the wait for dead men's shoes slowed his way up the various rungs of that gilded ladder.

Undoubtedly Lalande benefited from favourable circumstances in his early life, which nurtured his driving ambition, his self-esteem, and his desire to control the society in which he moved (in which nepotism played a large, and indeed acceptable part). Thus he was able to recommend for promotion the competent young men he encountered in the various public and private observatories in Paris and the provinces, and those he met on his

travels in Germany, Italy and England. Although Lalande seems to have put eye to telescope at most, if not all, of the military, college and private observatories in Paris, given his long absences it must have devolved to his students and employees to maintain the observations and calculations while he was away. Their results contributed to his fame as it expanded with the publication between 1764 and 1792 of the three editions of his *Astronomie* and the *Connaissance des Temps* for 1760-1772. This happy era ended with the French Revolution.

Lalande's influence on the upper echelons of government derived from his Directorship of the Paris Observatory, and that of the Bureau des Longitudes, set up in 1795. His initial respect for Napoleon changed as the political aftermath of the Revolution imposed new unsympathetic masters, and far worse—indeed impossible for an astronomer concerned with the provision of a nautical almanac (the *Connaissance des Temps*) for 1795-1807. From 1793 to 1806 he battled against the imperial decree to adopt the new metric system, with its total revision of dimensions (where 400 grads replaced the ancient circle of 360 degrees), and the calendar (where hours, days, months and years were reformulated to a decimal system).

The private lives of such men are often hidden from posterity by the 'delicacy' of friends and the lack of personal letters, but this was not so with Lalande, as 'official', personal and family letters flew from his pen. His friendship with two non-Parisian astronomers in particular, Honoré Flaugergues and Franz Xaver von Zach, generating many letters and exchanges of data, is examined here. Simone Dumont has delved into the wealth of correspondence, now dispersed on both sides of the Atlantic, in order to uncover aspects of his 'other' lives. We learn about Lalande's participation in the Académie des Sciences, his role as a freemason, his atheism, his pleasure in the company of educated ladies and the way in which he dealt with the resulting offspring of these passions. In death, as in life, Lalande continued on the move; his expressed wish to make his body available for dissection then to be interred under the instruments at the Ecole Militaire was overruled. His heart was given to his family but his bones were shifted from place to place until they were rescued from possible transfer into the Paris Catacombs, reunited with his heart and, forty-five years after his demise, laid to rest in Père Lachaise Cemetery.

Such a busy life inevitably poses structural problems for the biographer—resolved here by breaking the story into five chronological chapters: (1) Jesuit college to the Académie and the Collège Royale, 1732-1770; (2) Lalande, encyclopedist and freemason, 1770-1789; (3) From the start of the Revolution to the Directoire, 1789-1795; (4) From the Directoire to the Empire, 1795-1804; and (5) Last years, 1804-1807. Each chapter is subdivided into the various aspects of his professional life, namely his astronomical and mathematical achievements, his publications, students, correspondents, travels and so forth, also his family life at Bourg-en-Bresse, freemasonry and personal life; these subdivisions are clearly set out in the Table of Contents. Useful appendixes cover the 'Character and opinions of Lalande', the afterlife of his works, the dispersal of his papers, and generally wind up the story. A Bibliography and Index to names are provided.

I was left undecided as to whether I should admire or dislike Jérôme Lalande. A man obsessed, he generated an immense amount of numbers and writings. Yet this productive work is tainted by his domineering character, perhaps compensating for his small size and unshapely appearance; he was a man who gave orders to all and sundry, from his students to the Emperor Napoleon, and expected his will to be obeyed. On the credit side, he was a man who having dallied with certain ladies then arranged their marriages and ensured that his children (who fortunately seem to have inherited their parents' mathematical abilities) were brought into his own astronomical world as his 'nieces' and 'nephews'. He was a man with a vast number of correspondents, some close friends and a few enemies; a man whose comprehensive books on astronomy the modern historian turns to with gratitude, just as we shall turn to Simone Dumont's biography, knowing that here we surely have The Complete Lalande, Astronomer of the Enlightenment.

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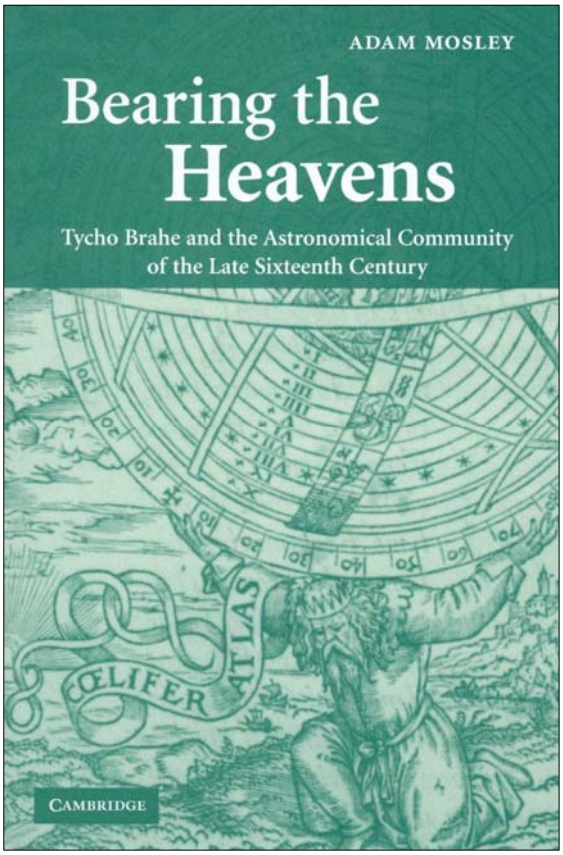

Figure 2: Front cover of Adam Mosley's book.

***Bearing the Heavens: Tycho Brahe and the Astronomical Community of the Late Sixteenth Century*, by Adam Mosley (Cambridge, Cambridge University Press, 2007), pp. 354, ISBN 978 0 521 83866 5 (hardback), GB£55.00, 228 x 158mm.**

> "We need therefore to press on with studying the astronomy of the early modern period via a history of communication; a history in which we consider both who was communicating with whom, and how, as well as what it was what they said. For the history of communication must be a part, and an important one, of the history of science as a practice. Only a history that encompasses the transmission and evolution of techniques and technologies, as well as the sharing and evaluation of data and ideas, can claim to represent the culture of science, and hence account for what is taken to be its product, knowledge of the world." (p. 297).

This is the conclusion and quintessence of Mosley's book (Figure 2), which was submitted in 2000 as a PhD thesis at Cambridge University ("Bearing the Heavens: Astronomers, Instruments and the Communication of Astronomy in Early Modern Europe"). Consequently the author sets out to examine the ways in which members of the nascent international astronomical community shared information, attracted patronage and respect for their work, and conducted their disputes. It highlights the significance of instruments, letters and books for the development of astronomy in the sixteenth century.

The practice of astronomy in the early modern period consisted not only in reading and writing books, but also in reading and writing letters. Mosley utilizes correspondence as a key resource and examines the 'epistolary culture' of the 16th century. His study is centered on Tycho Brahe, who published a selection of his correspondence in 1596.

Tycho's *Epistolae Astronomicae*, consisting mainly of letters he had exchanged with Landgrave Wilhelm IV of Hesse-Kassel and his court mathematician Christoph Rothmann, was a means of communicating valuable information about the practice of astronomy and its theoretical development in Hven and Kassel, but—as Mosley argues—these letters

> … are not incidentally instructive about the astronomical activities and cosmological beliefs of Rothmann and Tycho, but are actually constitutive of a form of astronomical practice. Communication by letter was one way for astronomers to overcome the contingent obstacles that prevented observation of phenomena at one particular location. (p. 113 seq.).

Mosley points out that Tycho's *Epistolae* is not a mere edition of letters. Their publication served manifold purposes: this book was intended as a serious scholarly text and vehicle for propagating the Tychonic reform of astronomy, but it was also seen as a memorial and gift for an audience of nobles. In order to correct the astronomy of the ancients, comparisons of observations were necessary at different sites, and the exchange of information between Hven and Kassel was partly collaborative and partly adversarial. The questions of instrument-construction and alignment, observing methods, techniques of recording and retrieving data and the corrections applied for atmospheric refraction, were all subjects that were discussed by Tycho and Rothmann. Tycho's collection of astronomical data and modelling of his world system were elaborated within a community of scholars bound together by letters. The correspondence network established precedence and was a forum for the public resolution of academic disputes.

Alongside the letters and books, a third realm is treated: instruments (such as globes, armillary spheres and models of planetary motion) conveyed astronomical knowledge and concepts in a visual way. Astronomical instruments were not only technical devices suitable for angular measurements, but their decoration also carried symbolic meanings concerning status, expertise, patronage and wealth. By distributing engravings and descriptions of his apparatus Tycho established the credentials of his observational programme, and by dedicating his *Astronomiae Instauratae Mechanica* (1598) to Rudolf II he presented his work symbolically to the Emperor.

In this book, Mosley displays a painstaking handling of original sources. This very valuable study will be of interest not only to historians of astronomy in the narrower sense, but also to historians of early modern culture in general.

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***One Time Fits All: The Campaign for Global Uniformity*, by Ian J. Bartky (Stanford, Stanford University Press, 2007), pp. xiv + 292, ISBN-13: 978-0804756426, US$49.95, 231 x 152 mm.**

As a former member of the staff of the Royal Greenwich Observatory and a co-author of a paper on the astronomical background to the International Meridian Conference of 1884, I was shocked to read in the preface to this book that the author, Ian Bartky, considered that it was a failure. After all, the Greenwich meridian became the initial meridian for the measurement of longitude and Greenwich midnight came into use for the beginning of the universal day for mapping and timekeeping throughout the world. This account of the campaigns for the adoption of international time systems shows, however, that opposition to the recommendations and lobbying for alternative proposals continued for many years. This book contains detailed accounts of these campaigns, and also of those for the introduction of standard time zones and later of daylight saving (or summer) time, up to the 1920s, by which period these ideas had become generally accepted. The book starts, however, with the events and arguments that led to the evolution of a date line in the Pacific area on either side of which the date and day of the week are different. Otherwise, there is no consideration of calendarial matters and the change from the use of apparent time to mean time is not discussed.

There is no doubt that Bartky has gone to enormous lengths to find and document the fine detail of this complex story. This is shown first of all in the long list of acknowledgements to persons who helped him in his searches, then in the text itself, in the many pages of notes and in the long bibliography. A great deal of effort has been devoted to the index, which includes helpful references to individual notes that often give information about aspects of the story that might not be expected from the text that prompted the note. The whole volume has been very carefully edited and checked. It is, however, ironic that one typographical error is in the spelling of my name in the bibliography and that Bartky did not appreciate the subtle distinction between the Royal Greenwich Observatory and the Royal Observatory at Greenwich.

Eight of the eleven chapters of the book are concerned with the campaigns for a uniform time system for the world, starting with the review by Otto Struve of Russia in 1870 of the multiplicity of initial meridians used for land maps, marine charts, atlases and other purposes. He found that the most common initial meridian for scientific and practical purposes was that of Greenwich, and after reviewing the advantages and disadvantages of other options, he concluded that this would be best choice for general use. His views were, however, strongly contested and, for example, others argued for neutral meridians not related to a particular observatory. There was an even greater diversity in the local mean time systems that were in use for particular areas and by railway companies as they were usually based on that for an important town. The differences between 'railway times' and the local times at the stations on long routes, such as those in the United States, led to suggestions for the adoption of a single timescale for all purposes. These were, however, soon replaced by proposals for the use of timescales that differed by an integral number of hours from that of a standard longitude, but there was at first no agreement on a single standard for all countries.

A large measure of agreement at the scientific level was reached at the meeting of the International Geodetic Association at Rome in 1883 and the U.S. Government was persuaded to call the conference in 1884 at which it

was hoped that representatives of the governments would agree to adopt the proposals for the use of the Greenwich meridian for the unification of longitude and time. An amended set of proposals was eventually adopted, but with some objections and abstentions. One major change was that the 'universal day' is to begin at mean midnight of the initial meridian rather than at noon as was then the case with the astronomical and nautical days. The hope was expressed that these days would be arranged to begin at midnight 'as soon as may be practicable', but even the British *Nautical Almanac* did not change until 1925. The national governments also failed to adopt the other resolutions. A table shows that in 1898 none of the 16 principal countries (other than Great Britain) used the Greenwich meridian to define longitude on their topographic maps. It was later found (in 1957) that the British Ordnance Survey continued to use longitudes measured from the Bradley meridian, rather than from the Airy meridian that was implied in 1884.

The resolutions of the 1884 conference did not include any direct reference to the introduction of hourly time zones, but during the following years the benefits of using such zones gradually overcame local objections. The boundaries between the zones were, however, usually chosen to match the frontiers between countries or other civil administrative areas. France continued to use time based on the meridian of the Paris Observatory until 1911 after it had started in 1910 to broadcast from the Eiffel Tower high-power time signals based on Paris mean time, which conflicted with the signals broadcast by Germany and the U.S.A. The French then, however, took the lead and the Bureau International de l'Heure was established in Paris later in 1911. France adopted the international meridian for its hydrographic charts in 1914, by which date all the other principal countries had at last adopted the 1884 resolution for such charts, but not for topographic maps.

The last two chapters of the book deal with the 'employment of clock time as a social instrument' and, especially, with the proposals and counter arguments concerning the introduction of daylight-saving time during extended summer periods. The system was first introduced in Germany in 1916 during World War I in order to save fuel used for generating electricity for lighting, and this lead was soon followed by Great Britain and other countries. The change was not introduced in the U.S.A. until 1918, but even then some states changed their standard times or the boundaries of their time zones so as to nullify the effect. Further changes took place during the following years, and local options destroyed the attempts to introduce uniformity across the country.

This book provides a detailed and fascinating account of the campaigns to promote the unification of the time systems in use throughout the world. The differences and similarities in approach in the activities in North America and Europe are made apparent and attention is drawn to the important contributions of many individuals who are not mentioned in popular accounts of these matters. The negative attitudes of some scientists now seem surprising, while the reluctance of legislators to reduce the confusion that must have been caused by the multiplicity of timescales seems to have been common to all societies.

Apart from an epilogue that is mainly concerned with recent developments, the account closes in the 1920s. Unfortunately, the author died in December 2007 and so we must hope that someone else will write a similar comprehensive account of the subsequent changes in the use and basis of the timescales for both civil and scientific use. None of the persons mentioned by Bartky could have imagined the high precision with which time is now determined and made readily available throughout the world. The unit of time is no longer based on the rotation of the Earth, but the distribution of accurate time still depends on the monitoring of the changes in rate and direction its rotation. Astronomy still has a vital role in global positioning and timekeeping!

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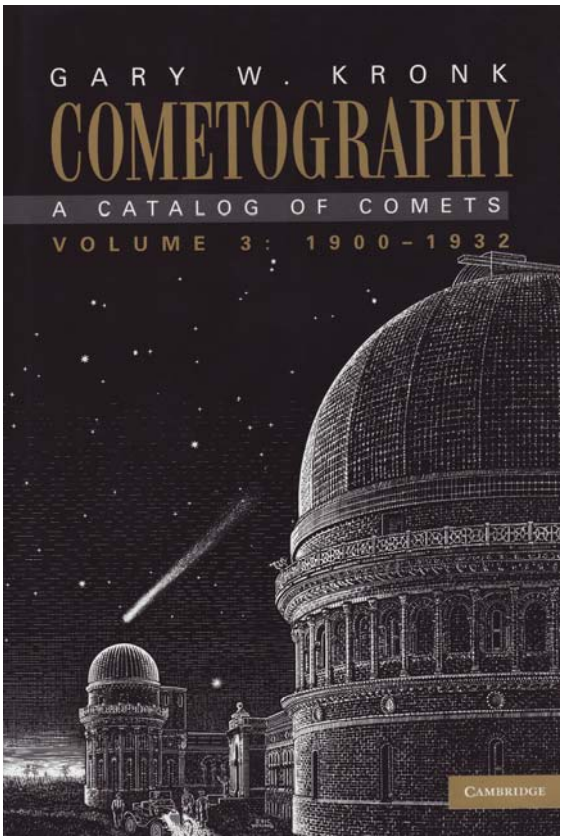

Figure 3: The attractive dust jacket of Kronk's third book in the Cometography series.

***Cometography. A Catalog of Comets. Volume 3: 1900–1932,* by Gary W. Kronk (Cambridge, Cambridge University Press, 2007), pp. xvi + 650, ISBN 978-0-521-58506-4, £150, 259 x 185 mm.**

For those of us with a research interest in the history of cometary astronomy, the *Cometography* series by Gary Kronk is an absolutely indispensable resource, and each new volume is looked forward to with great anticipation.

The first volume in this series focused on comets from ancient times to 1799 and was published in 1999. Volume 2 covered the period 1800-1899 and was published in 2004, and now we have the third in the series, which discusses comets observed between 1900 and 1932 (see Figure 3). The progress of each comet, from discovery until disappearance, is discussed in detail, and each entry is accompanied by a full suite of references, so if perchance there is inadequate information in Kronk's weighty tome to satisfy all of your research needs then you know precisely where to look.

Although they were not nearly as abundant as during the glorious thirty years from 1860 to 1889, a number of majestic comets did make an appearance in the first three decades of the twentieth century, beginning with the

Great Comet of 1901, which was conspicuous in southern skies during April and May. Halley made its long-awaited appearance in 1910, but this same year is also remembered for the Great January Comet which, from all accounts, was equally impressive. Another prominent naked eye comet was C/1927 X1 (Skjellerup-Maristany). In Kronk's book you will find 3.5, 9, 24 and 5 pages respectively assigned to these four comets. Two other comets that were widely photographed because of their impressive and changing tails were C/1907 L2 (Daniel) and C/1908 R1 (Morehouse), and Krong devotes 9 and 10 pages to them.

From my own personal perspective, one of the curious features of cometary astronomy during the period 1900-1932 is the comparatively large number of officially credited discoveries and recoveries made from Australia (e.g. by Dodwell, Gale, Ross, Skjellerup), New Zealand (Grigg, Geddes) and South Africa (Blathwayt, Ensor, Forbes, Houghton, Reid, Skjellerup, Taylor, Woodgate). When independent discoveries are added, the list becomes even longer.

Apart from the dossier of information on each comet, Kronk provides a 24-page Appendix with material on "Uncertain Objects", some of which were undoubtedly comets but simply lacked the requisite number of reliable reported observations.

This is a beautifully-prepared and beautifully-presented book, and at 666 pages is no lightweight effort! Gary Kronk is to be commended for his scholarship and for once again providing us with an invaluable repository of information. Although the third volume of *Cometography* belongs on the bookshelf of all those with an interest in the history of cometary astronomy, I worry that the relatively high purchase price may deter some astronomers.

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