Iqbar, M., 2018. Islamic theology meets ETI. In Peters, T. (ed.), *Astrotheology: Science and Theology Meet Extraterrestrial Life*. Eugene, Wipf and Stock, Cascade Books. Pp. 216–227.

Library of Congress, 2014. Preparing for Discovery: A Rational Approach to the Impact of Finding Microbial, Complex, or Intelligent Life Beyond Earth. https://www.loc.gov/search/?fa=partof:preparing+for+discovery

Lupisella, M., 2020. *Cosmological Theories of Value: Science, Philosophy, and Meaning in Cosmic Evolution.* New York, Springer.

McIntosh, C.A., and McNabb, T.D., 2021. Houston, do we have a problem? Extraterrestrial Intelli-gent life and Christian belief. *Philosophia Christi*, 21(1), 101–124.

Palmeri, J., 2009. Bringing cosmos to culture: Harlow Shapley and the uses of cosmic evolution. In Dick and Lupisella, 489–521.

Parkyn, J.L., 2021. *Exotheology: Theological Explorations of Intelligent Extraterrestrial Life*. Eugene, Pickwick Publications.

Peters, T., 2018. *Astrotheology: Science and Theology Meet Extraterrestrial Life.* Eugene, Cascade Books.

Shapley, H., 1958. *Of Stars and Men: The Human Response to an Expanding Universe*. Boston, Beacon Press.

Vidal, C., 2014. *The Beginning and the End: The Meaning of Life in a Cosmological Perspective.* Heidelberg, Springer

Weintraub, D., 2014. *Religions and Extraterrestrial Life: How Will We Deal with It?* Cham, Springer

Dr. Steven J. Dick
21406 Clearfork Ct., Ashburn,
VA 20147, USA.
Cell phone: 703-909-0521
E-mail: stevedick1@comcast.net

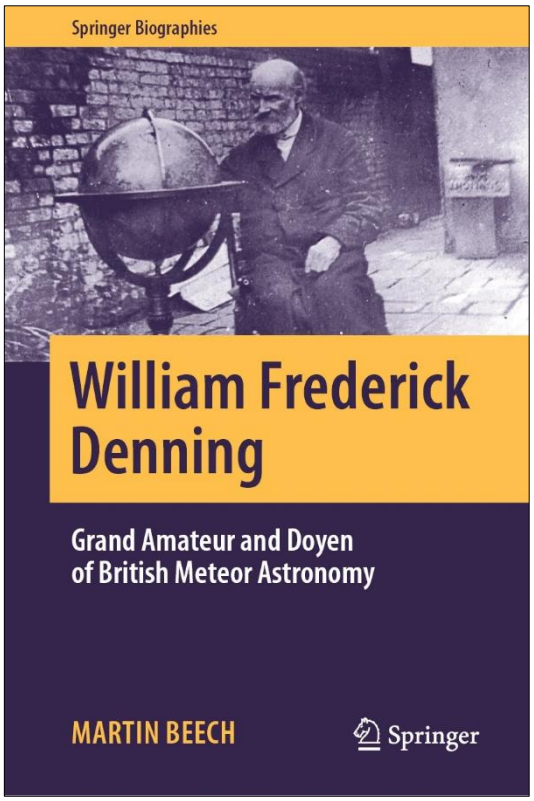
***William Frederick Denning: Grand Amateur and Doyen of British Meteor Astronomy*, by Martin Beech (Cham, Springer, 2023), Pp. xiv +334. ISBN 978-3-031-44442-5 (hardback), 160 × 240, €39.99.**

This is a long-awaited book about one of my favourite characters in visual meteor observing. I use the term 'characters' intentionally for William Frederick Denning (1848–1931), although an amateur astronomer, held firm beliefs about meteors and shower radiants and was not afraid to defend these against allcomers, professional astronomers included. So, he was seen by some as a controversial figure.

Denning was born in a small Somerset village, but spent much of his life living in or near Bristol. During the 1870s he became a prominent figure in British astronomy, so Beech's subtitle for this book, *Grand Amateur and Doyen of British Meteor Astronomy*, is apt.

Chapter 1, "A Man of Parts", discusses Denning's formative years in amateur astronomy, which began in earnest in 1864 or 1865 when his father bought him a 4.5-in refractor. But in 1866 he witnessed the unforgettable Leonid meteor storm and on 6 November 1869 an awe-inspiring fireball, and Beech concludes that

> It seems reasonable to suppose that it was the observation of these two celestial events … that turned Denning's interest towards meteor astronomy … (page 5).



Meteor astronomy was then at a formative stage and Denning's key involvement in its development is explored in Chapter 2, "In Quest of Meteors".

In this 53-page chapter Beech starts by noting that

> Meteor astronomy in the mid-nineteenth century was a topic primed, ready, and waiting for the appearance of an enthusiastic and dedicated observer to carry its cause forward—Denning was destined to be that key figure. (page 38).

From 1868 to 1932 Denning published a succession of astronomical papers in 18 different

British or overseas journals, with a significant percentage of these on meteors (see Figure 2.2 on page 39). As Beech notes, it was especially Dennings' papers published in France, Germany and the USA that "… helped to establish his name as an internationally recognized figure." (page 40). Using ADS statistics, Beech identified Denning's top-12 publications, which ranged in date from 1879 to 1923 (see Table 2.1 on page 41). All but one of these related specifically to meteors. Scoring top ranking was his 1899 *Monthly Notices of the Royal Astronomical Society* paper "General catalogue of the radiant points of meteoric showers and fireballs and shooting stars observed at more than one station". Surprisingly, this outranked his second-rated publication, the 1891 popular book *Telescopic Works for Starlight Evenings*.

The papers listed in Table 2.1 indicate Denning's primary meteor interests: individual showers, radiants, and fireballs. Denning sometimes used observational data supplied by other meteor observers in his analyses. As was 'prevailing wisdom' at that time, Denning believed that every meteor belonged to a shower, and that every shower was associated with a specific parent comet. Consequently, he grossly over-estimated the true number of meteor showers (which we would now judge to be between 50 and 60). But without doubt the most controversial papers Denning published were those that claimed that meteor shower radiants were stationary, when observations by other observers showed conclusively that radiant positions changed with time. On this point Denning was unyielding, which led to acrimonious relations with some international colleagues (amateurs and professionals). Here was another case where Denning's meteor astronomy was steeped in controversy—for further details, including the publication by Professor C.P. Olivier of his hallmark book *Meteors* (1925), see pages 52–64. Yet another contentious case, this time involving the Epsilon Arietids shower, is recounted on pages 64–68.

As a Kiwi and someone committed to New Zealand astronomy (Orchiston, 2016) and meteoritics (Evans and Orchiston, 2023) I was more than a little surprised to learn at the end of Chapter 2 that Denning's interest in meteors extended to meteorites and that he once owned "… at least a few fragments …" of the Mokoia Meteorite (page 85). This was a carbonaceous chondrite that was observed to fall on 26 November 1908 (Marriner, 1909) and Denning's fragments were obtained from Joseph Thomas Ward, an accomplished amateur astronomer who ran a professional telescope-making business in the nearby city of Wanganui (Orchiston, 2016: 315–335). Ward also was responsible for establishing the Wanganui Astronomical Society and its observatory, which hosted (and continues to host) a 9.5-in Cooke refractor. What Beech neglects to mention is that this is an internationally significant instrument as it boasts the first ever all-metal English equatorial mounting, with previous telescopes featuring wooden mountings. So, in museum parlance, this is a 'type specimen' (for details see Orchiston 2016: 293–313).

While Denning is undoubtedly best known for his meteor work, he also had other astronomical interests. He tried his hand at telescope-making, but like the writer of this review quickly discovered that telescopes were made to be viewed through, not constructed! Thus, in 1871 Denning graduated from a 4.5-inch refractor to a 10-in altazimuth-mounted Browning–With reflector. This allowed him to observe

> … the planets, and [he] was an avid sweeper of comets. In practice, his field of interest was wide, and his enthusiasm for observing inexhaustible. (page 2).

Denning also observed sunspots, Jovian satellite phenomena, a transit of Mercury, and in 1869 he and a group of companions searched (unsuccessfully) for the postulated intra-Mercurial planet Vulcan.

As an informative pie-chart on page 92 in Chapter 3 ("The Heavens Provide") informs, around 70% of Denning's publications were on meteors, 13.2% on Jupiter, 7.6% on comets, 2.2% on Saturn, and 7% on 'Other topics'. These 'Other topics' included Mercury, Mars, novae (he independently discovered 306 Aquilae in 1918 and 476 Cygni in 1920), aurorae, rainfall and local weather conditions. He also participated in the acrimonious debate (mainly with American professsional astronomers) on planetary observations and telescope type and aperture.

Denning's wide-ranging observational interests remind me of two well-known Antipodean amateur astronomers I have researched, Australia's John Tebbutt (1834–1916) and New Zealand's Ronald McIntosh (1904–1977). At a slightly later date than Denning,

McIntosh also was addicted to naked eye observations of meteors (Orchiston et al., 2021), but—like Denning—enjoyed viewing comets and Jupiter, using an equatorially-mounted 14-inch reflector housed in a roll-off roof observatory (Orchiston, 2016: 523–561). Tebbutt, meanwhile, was Denning's contemporary. His forté was comets, although he timed transits of Mercury, habitually observed Jovian satellite phenomena and occasionally wrote on Jovian features (Orchiston, 2017: 139–171, 255–291, 322–335, 367–375). Like Denning, Tebbutt collected meteorological data and reported on the weather (Orchiston, 2017: 490–492). He also was involved in a co-ordinated systematic search for new comets when he formed the 'Australian Comet Corps' in 1882 (Orchiston, 2017: 293–318), which—but for totally different reasons—soon went the way of Denning's short-lived Observational Astronomical Society.

William Frederick Denning features prominently in Chapter 1 to 3, but this book is far more than a biography of one man for it places that man in a national and international context. This, to my mind, is one of the great strengths of this remarkable book.

Beech does this in four chapters, sometimes expanding on territory covered in Chapters 1–3. In Chapter 4, "The Amateur Astronomer", he begins by distinguishing between the 'amateur astronomer' and the typical (armchair) 'dilettante'. Denning was an excellent example of the former, with his commitment to systematic observational astronomy and what we today would describe as education and outreach. The Canadian sociologist–astronomer Professor Robert A. Stebbins (1980; 1981; 1982) makes this point in his analysis of amateur astronomers. But, he goes much further and ends up ranking active amateur astronomers along an 'apprentice–journeyman–master' continuum.

Denning was without doubt a 'master', and he had very clear views on what types of observational projects were ideal for amateur astronomers, and which should be avoided. Critical, of course, was the instrumentation available. Beech noted, with some surprise, that the only obvious amateur observing projects Denning failed to mention centred on variable stars, aptly calling this a "… most remarkable oversight …" (page 149).

Beech then goes on to describe the emergence of professional astronomers in Britain (and elsewhere), particularly in the last decades of the nineteenth century with the growth of astrophysics.

In a section titled "The Professional Amateur", Beech describes how in 1915 Denning referred to

> … a new breed of writer—the astronomy popularizer—naming specifically Agnes Mary Clerke, Nicolas Camille Flammarion, Richard Proctor, William Smyth, and Thomas Webb. (page 157).

The final section of Chapter 4 discusses—amongst other topics—the founding and development of scientific and learned societies, when "Clearly, important changes were taking place, with respect to the advancement of science in England …" (page 160).

The 95-page Chapter 5 on "The Rise of Meteor Astronomy (1830–1930)" charts the remarkable century when

> … meteor astronomy evolved from that of a minor science, even a trivial preoccupation, to one of upmost scientific importance. (page 169).

In addition to Denning, all the 'key international players' are there (i.e. Benzenberg, Brandes, Browning, Chladni, de Konkoly, Elkin, Glaisher, Greg, Heis, A.S. Herschel, Kirkwood, Loomis, Lovell, McKinley, Millman, H. Newton, Olivier, Olmstead, Opik, Prentice, Schiaparelli, Schmidt, Throwbridge, Twining and Weiss). Also mentioned are the twentieth century Leonid meteor storms; the 'Luminous Meteors Committee' of the British Association for the Advancement of Science; the BAA Meteor Section; the dynamic American Meteor Society; and Denning, his adversary Charles P. Olivier and the early years of IAU Commission 22 (*Etoiles Filantes*).

We then come to Section 5.10 on "The Development of Instrumental Techniques", namely the birth and development of meteor spectroscopy, photography and radar observations—and this is not to mention Davidson's 'meteoroscope' or his 'meteorometer'! Finally, in Section 5.11 Beech explains how meteors were used to investigate the Earth's upper atmosphere.

Chapter 5 is a long chapter, packed with information, but I found it the most enjoyable chapter in the book. However, it merely provides an overview, and could easily be expanded into a full-scale book of its own. I hope that Martin Beech will rise to this challenge.

A favourite publication venue of many

dedicated nineteenth amateur astronomy was *The Astronomical Register* (henceforth *AR*), and this is the focus of Chapter 6. The *AR* was founded in 1863 and suffered a sudden demise in 1886. During the two decades, or so, of its existence this journal fostered the growth of amateur astronomy, not only in Britain, but internationally, and through its Letters Section "… enabled amateur astronomers to have a public voice." (page 292). The *AR* was founded by the Oxford-educated and independently wealthy Royal Astronomical Society member Sandford Gorton (1823–1879).

In his analysis of the *AR*, in Figure 6.2 (on page 263) Beech plots the location of British subscribers to the journal from January 1863 to January 1865. The distribution is not random, for there was a marked deficit of amateur astronomers from Ireland, Scotland and the northern third of England. Beech also examines the "For Sale and Wanted" advertisements in issues of the *AR* to find out

> … what sorts of instruments were these enthusiasts using, and who was … supplying them. (page 265).

He found instruments listed for sale or wanted ranged from 4.5 to 12-inch reflectors and 2 to 9.25-inch refractors. Refractors were far more common than reflectors, and the 14 refractors equalling or exceeding 6-inches in aperture are plotted in Figure 6.4 (on page 271). I found this statistic surprising, indicating that many readers of the *AR* were well-to-do. Completing this section of Chapter 6 are examples of professional telescope-makers' advertisements, and a list of manufacturers. Thirteen different professional manufacturers paid to advertise in the *AR*.

Section 6.4.4 focuses on the short-lived overlap of the Liverpool Astronomical Society (founded in 1881) and the *AR* (which closed in 1886). Denning was "… a major player in the Society's early years … [even though he] never actually attended a meeting …" (page 280). He also was a strong supporter of the *AR*, publishing the first of his 88 letters and observing notes in 1868, when he "… was very much the rising star, the young and enthusiastic up-and-comer ..." (page 290). Details of Denning's 88 *AR* publications are supplied in Table 6.6 on page 288.

Finally, Chapter 7 explores "The Observing Astronomical Society" which was founded in 1869 to promote amateur observational astronomy in Britain. Although Denning was only 21, he was one of the driving forces behind the new Society, and continued to play a key role until it folded in 1872. The reasons for its demise are not clear.

Rounding out the book is a 7-page "Epilogue", where Denning is seen as "… among the preeminent amateur practitioners of late nineteenth century astronomy." (page 319).

The author of this book, Martin Beech, is a retired Professor of Astronomy from the University of Regina in Canada, and arguably the world's leading authority on the history of meteor astronomy. He also writes well, making this book an easy read. But for those with a passion for meteor astronomy it is more than this: it is an inspirational read. Moreover, every chapter is well illustrated, and each chapter ends with a Bibliography for those seeking further details. This is an outstanding affordable book that deserves to be in university, institute, observatory and public libraries, and on the bookshelf of every astronomer with an interest in meteors.

References

Evans, R.W., and Orchiston, W., 2023. Accredited meteorites of New Zealand. 1: The Makarewa Meteorite. *Southern Stars*, 62(3), 7–15.

Marriner, G.R., 1909. The Mokoia aeolite; with a few introductory remarks on New Zealand meteoritic phenomena. *Transactions and Proceedings of the Royal Society of New Zealand*, 42, 176–185.

Orchiston, W., 2016. *Exploring the History of New Zealand Astronomy: Trials, Tribulations, Telescopes and Transits*. Cham, Springer.

Orchiston, W., 2017. *John Tebbutt: Rebuilding and Strengthening the Foundations of Australian Astronomy*. Cham, Springer.

Orchiston, W., Drummond, J., and Luciuk, M., 2021. Ronald A. McIntosh: pioneer Southern Hemisphere meteor observer. *Journal of Astronomical History and Heritage*, 24(3), 789–817.

Stebbins, R.A., 1980. Avocational science: the amateur routine in archaeology and astronomy. *International Journal of Comparative Sociology*, 21, 34–48.

Stebbins, R.A., 1981. Science amators? Rewards and cost in amateur astronomy and archaeology. *Journal of Leisure Research*, 13, 289–304.

Stebbins, R.A., 1982. Looking downwards: Sociological images of the vocation and avocation of astronomy. *Southern Stars*, 29, 177–188.

Professor Wayne Orchiston
University of Science and Technology of China, Hefei, and University of Southern Queensland, Toowoomba, Australia.
E-mail: wayne.orchiston@gmail.com