

range of topics to be presented by experts in those topics. Each chapter is self-contained and understandable without having to read those preceding it. On the other hand, the book lacks consistency in symbols used and style across the various chapters. There is also, on occasion, significant overlap between chapters, particularly Chapters 4 and 5, which explore the atmospheres of terrestrial planets. Each chapter is concluded by an “abbreviated” version of the question-and-answer sessions that followed the lectures during the school. These sections are a useful addition that would not be found in a standard textbook. In general, these are interesting and provide further helpful insight, though I am not sure why the question with the answer “I can’t remember” was included.

Planetary Systems Now is, in general, easy to read and contains many useful figures (often printed in beautiful full colour). It contains many examples of the latest thinking and results in each field in the pre-*JWST* era; for example, the lack of a significant spike in impact rate during the so-called ‘late heavy bombardment’, and a substantial chapter devoted to interstellar planetesimals — the first of which was only identified late in 2017. There are also, helpfully, many pointers to other published reviews for those looking to delve deeper. This book is probably of greatest interest to those beginning research in planetary or exoplanetary science, or existing research students seeking to broaden their background knowledge. If there is not a similar school that you can attend, I recommend this book as a good substitute. — PHILIP J. CARTER.

William Frederick Denning. Grand Amateur and Doyen of British Meteor Astronomy, by Martin Beech (Springer), 2023. Pp. 334, 24 × 16 cm. Price £34.99 (hardbound; ISBN 978 3 031 44442 5).

This is a very interesting and valuable biography of W. F. Denning, an individual who spent most of his life in Bristol, and whose work on meteor showers won him the Gold Medal of the RAS. I must take issue with ‘Grand Amateur’, a term invented by Allan Chapman in *The Victorian Amateur Astronomer* to describe those gentlemen who, upon retiring from business (if ever engaged upon it) devoted themselves to astronomy. They were wealthy, owned fine observatories, and had paid assistants. But Denning never fell into any of those categories, and it is not even certain that he ever enjoyed any systematic paid employment, other than as a journalist and writer. (As Beech shows, there is no proof that Denning was ever an accountant, like his father, as had once been thought.)

Beech writes very well, and gives us as comprehensive and lively a description of our subject’s life that the reclusive Denning allows us at this distance in time. He has researched Denning for decades, and gives us a really good history of the rise of meteor astronomy, a summary of meteor physics, and of Denning’s part in the field. Indeed, the young Denning was drawn into studying meteors by having witnessed the Leonid storm of 1866.

A lack of original Denning records is evident throughout this book. On display in its upper library, the RAS has Denning’s meteor globe, donated by his family in 1942. But we know of only a few letters and notebooks. Fortunately there is an abundance of Denning in print.

Much of Denning’s meteor work was conventional. His records of meteors were accurate, and his ability to sustain long watches was exceptional. In 1877 he was able to demonstrate the nightly motion of the Perseid radiant, as required by theory. But in deducing the coordinates of some meteor radiants, Denning tended to amalgamate observations over several nights instead

of reducing them night by night, and in many instances he even combined observations made upon the same date over intervals of several years. In this way he deduced a great many “centres of radiation”. We now know that the majority of these radiants were spurious, for he had greatly underestimated the number of sporadic meteors. Moreover, Denning put forward the idea that the radiant points of some showers, in particular the well-observed Orionids, were fixed in space. He clung to this idea till the very end of his days, even after he had served as the first Chair of the IAU Meteoritic Commission in 1922–1925, and by which time the tide had turned completely against him.

As Beech relates in detail, the rise of the American Association of Meteor Observers had brought Denning into direct conflict with its young and energetic leader, Charles Olivier, a trained scientist who insisted upon nightly data reductions. Denning had briefly seen office as the Director of the BAA Meteor Section, but his successors would adopt Olivier’s principles to put their work on a sound scientific footing.

Although not mentioned in this biography, I would like to add that J. P. Manning Prentice, long-time BAA Meteor Section Director, showed convincingly in 1933–1936 exactly how Denning may have been misled in the specific case of the Orionids¹. In fact the shower has several centres of radiation which are active over several nights and in just such a way that radiation from a certain fixed point could easily have been deduced over the period of ten days claimed by Denning.

We read about Denning’s work on Jupiter (especially its Great Red Spot) and the other planets. His study of Saturn’s Great White Spot of 1903 was particularly notable. Denning was also involved in the late-Victorian-era debate about large *versus* small telescopes. We then come to the matter of the short-lived Observing Astronomical Society in which Denning was closely involved: effectively a predecessor of the British Astronomical Association. Denning used to write regular summaries of the work submitted to it for the now defunct but excellent (1863–1886) periodical *The Astronomical Register*. We are presented with detailed descriptions and novel statistics and facts about the Society and its members. Denning is also remembered today as the discoverer of a comet and for being one of the discoverers of Nova Cygni in 1920. He abandoned telescopic work due to failure of his health in 1906, and by the 1920s was living in near-poverty. But he did not abandon naked-eye work, and he also studied natural history and meteorology.

The book is well printed and illustrated, using a plethora of Denning publications and a smaller amount of archival material. It is always clear and engaging, though more thorough proof reading would have helped in a few places: for instance, Denning’s father’s death (page 4) seems to have occurred in both 1884 and 1895.

It is sad that so few Denning manuscripts are extant, those that exist being limited mostly to the collections of the RAS and BAA. As Archivist for the latter organization I can add that the 1930s correspondence of Prentice suggests a reason. When Denning died, Prentice tried to obtain those old meteor records, intending to re-reduce them in what had become the accepted manner. But he formed the impression that Denning’s family, with whom he had exchanged letters, required payment for them. As that was against his principles, Prentice did not continue the discussions.

Denning was a prolific correspondent with an international circle of pen-friends. Except in the earlier part of his career when Denning appeared and lectured in public (serving as President of the Liverpool Astronomical Society),

his correspondents could only have imagined his character from his letters, and we still have to do the same today: in later life, Denning was a recluse who hardly ever met anybody. Beech gives us a detailed study of his astronomical work, with a great deal of fascinating contextual detail, and a very good outline of what is known of his private life. Concerning as it does one of history's greatest visual observers, I am sure that this reasonably priced biography will be found to be interesting and absorbing for many readers. — RICHARD MCKIM.

Reference

(1) J. P. M. Prentice, *JBAA*, 43, 376, 1933; and 46, 329, 1936.

A City on Mars: Can We Settle Space, Should We Settle Space, and Have We Really Thought This Through? by Kelly and Zach Weinersmith (Particular Books), 2023. Pp. 448, 24 × 16 cm. Price £25 (hardbound; ISBN 978 0 241 45493 0).

Perhaps because my parents were working for NASA at the time (my father indirectly at Chrysler, doing static testing of Saturn rockets, and my mother, who knew Wernher von Braun well, directly), as a child I developed an interest in space flight. We moved temporarily from Huntsville to Cape Canaveral for a few months around the end of 1968 and used to watch launches from the beach. When I was about 14, I started reading old-school pro-technology optimistic science fiction (initially because I had asked my father to bring me some books by Asimov — I was a fan of his non-fiction books — from the library and fiction books (ordered by author) were easier to find than non-fiction books (ordered by topic)). Despite exceptions such as Asimov's 'Ad Astra', which deals with public opposition to space flight, the general feeling was that the colonization of space would happen more or less naturally, and not that far in the future. However, it wasn't long before Apollo missions were no longer televised live, and the programme was cut short because the USA had won the space race. (Of course it was mainly about politics, and the first scientist on the Moon — geologist Harrison Schmitt — was the last person to set foot on it.) But that was seen to be a temporary setback due to distractions such as the war in Vietnam and the false dichotomy that other important issues, such as environmentalism, had to be addressed to the detriment of space flight. Though it was clear to me even then that science is better served by means not involving putting people into space (recalling Carl Sagan's description of the cost of space probes as "a penny a world for each person on Earth"), the conquest of space still seemed inevitable for other reasons, and a natural extension of the exploration and subsequent colonization of the Earth (whether by Europeans in the Age of Exploration or thousands of years earlier in various out-of-Africa migrations).

My interests then shifted. (My interest in astronomy didn't come from space flight, but rather grew out of a general interest in science, sparked initially by palaeontology. The fact that Asimov — although a biochemist by training — wrote much about astronomy was an important factor.) I still considered the general vision of the future more or less inevitable, but it was no longer clear when it would happen. More recently, things have changed, due not just to billionaire space geeks such as Elon Musk, Richard Branson, and Jeff Bezos actually doing something, but also to things such as physics Nobel laureate Gerard 't Hooft being an ambassador for Mars One¹ (an idea to send people on a one-way trip to Mars, financed *via* a proposed reality-TV show). It still seemed inevitable, but now on a much shorter time-scale, probably with