

Mars: an Introduction to its Interior, Surface and Atmosphere by Nadine G. Barlow, Cambridge University Press, Cambridge, 2008, pp. xii + 264. Scope: monograph. Level: undergraduate, postgraduate, and intelligent general reader.

People have been fascinated by Mars since the beginnings of recorded history, and no doubt they were equally intrigued in earlier eras too. Even before Galileo and the advent of the telescope in the seventeenth century, astronomers had charted the red planet's strange looping motion across the sky – retrograde motion that seemed to require a hugely complicated description in terms of epicycles and deferents until Copernicus proposed his heliocentric Solar System. The introduction of the telescope (1609) produced a continuing flow of discoveries, especially during close approaches of Mars and Earth, e.g. in 1830 leading to the first map of Mars, and in 1877 leading to the discoveries of the Martian satellites Phobos and Deimos – and to Schiaparelli's observation of “canali”, meaning channels, but mistranslated into English as “canals” implying waterways constructed by intelligent beings. These were of course artifacts due to the tendency of the human eye to “rationalise” by trying to make sense of observations at the limit of the available resolution. But they led to further intensive observation and to tantalising fantasies by Lowell on the history of the supposed “Martians”. The next generation of discoveries started with the despatch of space probes to Mars by the USSR and USA in the 1960s. The first successful ones were the Mariner fly-by missions, which returned high resolution images. Since then, there have been both Mars orbiters and landers, returning information of a quality and quantity undreamt of in earlier times.

Nadine Barlow has pulled all of this information together in the form of a book. It encompasses all scientific aspects of the planet, including a brief introductory review of the pre-telescopic, and terrestrial telescopic observations, and a summary of all 36 missions to Mars and what they consisted of: about two-thirds of them were partial or complete failures. The introductory chapter also discusses Mars' orbital properties, physical properties, and Moons. It sets the scene nicely for what follows.

Subsequent chapters provide a detailed account of what is now known about the planet, its formation, its probable interior structure, surface properties, geology, its thin atmosphere, and the 37 Martian meteorites known (as of 2006) to have reached Earth. The author devotes a full chapter to discussing the history of water on Mars, which will be of particular interest to the general reader given its relevance to possible life on the planet. She lays out the key questions very clearly. The amount of water needed to account for

all the fluviially created surface features is estimated to correspond to a global layer of average depth 400 m. This is to be compared with the water thought to be locked up in the polar icecaps (maximum 29.6 m) and in the atmosphere (10^{-5} m). So where has all the water gone? There are two points to bear in mind. First, the very low atmospheric pressure (see above) would not allow liquid water to exist for long: it would quickly boil away. Secondly, at present ambient temperatures (average around 210 K), any H₂O would be in the form of ice anyway so that it can, in many respects, be considered as a just another mineral or rock, albeit a rather low density one. The supposition is that the water is still there, but underneath the present surface and maybe concentrated near the poles. Future probes planned by NASA will be fitted with equipment to dig holes to see whether the excavated soil contains significant ice.

The author also looks to the future, and discusses the relative merits of robotic and manned missions to Mars, concluding that a balanced mix will give the best scientific return – despite the obvious and ever-present dangers posed to humans by unexpected solar flares.

The book is carefully constructed and very well written, and it immediately engages the reader's interest. It is rather a pity that so many of the figures had to be reproduced in black-and-white, especially as one can remember some of them printed in colour, and larger, in newspapers. But Nadine Barlow's *Mars* is a treasure trove of information, supported by numerous figures, photographs, tables, a very full bibliography and a detailed index. I anticipate that, on different levels, it will be read with enjoyment and found useful by experts and non-experts alike. Of course, as the author points out, it will inevitably be outdated by forthcoming Mars missions, but that is all the more reason to read it now. The author's closing comments are worth quoting in full:

“Our growing realisation that early Mars was more Earth-like, with liquid water, a thicker atmosphere, and warmer surface conditions leads me and many of my colleagues to investigate what happened to produce the cold dry planet we see at present. Such knowledge will help us to be better caretakers of the blue orb that we call home.”

One can only hope that she is right.

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