

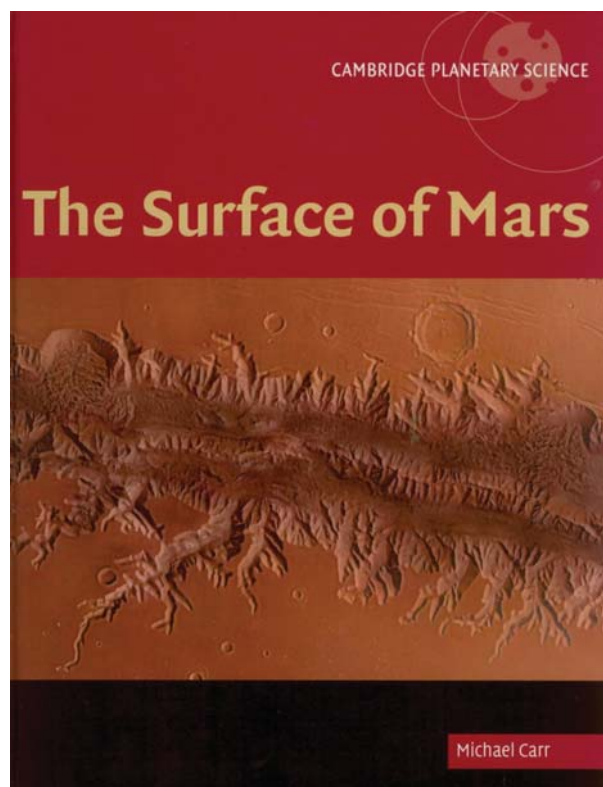
Book Review

The surface of Mars, by Michael H. Carr. New York: Cambridge University Press. 2006, 322 p., \$70, hardcover (ISBN 978-0-521-87201-0)

Over the past decade, the planet Mars has been investigated by several spacecraft both landed and orbiting. This followed a twenty-year gap in spacecraft exploration of the planet in which the data sets acquired in the 1970s were exhaustively analyzed. The relatively complete analysis of these older data sets allowed for the writing of comprehensive reviews that could offer a complete summary of our understanding of Mars. Unsurprisingly, the injection of massive amounts of fresh data into the Mars research community has ushered in a veritable revolution in our understanding of the planet. Such progress creates its own challenges in the education of the next generation of Mars scientists as there is now no neat-and-tidy summary of the current state of Mars science. Michael Carr's book, *The surface of Mars*, is an effort to address this pressing need (and is not to be confused with a book bearing the same title and written by the same author 25 years earlier!).

The scope of the book is ambitious, covering virtually every aspect of Martian surface geology while also touching on discussion of interior (in the case of the chapter on global structure and tectonics) and atmospheric (in the case of the chapter on eolian action and climate change) processes where appropriate. The book itself is organized into twelve sections plus an initial overview and a final summary. Several of these sections cover the basics you expect to find in every planetary geology text, such as the roles of impact cratering, volcanism, wind, and tectonics. Many of the new findings over the past several years concern the role of water (both frozen and liquid) in the planet's surface history. These topics are extensively dealt with in sections on channels, valleys and gullies, the polar deposits, ice in the regolith, and the evidence for paleolakes and oceans. An entire chapter is devoted to results from landed missions, although this (justifiably) concentrates almost exclusively on the Mars Exploration Rovers. Separate chapters dealing with climate change and life are also included. Although every text tends to put emphasis on what the author considers the most interesting material, *The surface of Mars* provides a balanced treatment of all these areas. The book is both well organized and contains a usefully populated index that allows the reader to locate relevant material quickly.

The book is lavishly illustrated, containing both images of shaded topography data for regional views and higher-



resolution visible images illustrating local features. All images have the image number or source referenced in the figure caption, which will be useful to the interested researcher that wants to take a closer look. Although the text leans heavily on these imaging data, cartoons and plots are also used to illustrate key points. The quality of most of the images is excellent; however, there are isolated examples where some have been sized much too large for their intrinsic resolution, leading to a blocky or blurry figure in the book (the chapter on the polar deposits suffers most from this). A minor gripe is that the illumination direction was rarely specified, although it was usually obvious from the context. It was also a little disappointing to find that the color plates were only available by going to the publisher's website. Additionally, many of the regional views of shaded topography data look like they were originally color coded for elevation and later converted to black and white for publication. This does not detract from the scientific points being made in the text, but more attractive (and information-rich) color versions of these figures could easily have been included with the other color plates.

As mentioned, the scope of the book is impressive and touches on virtually every area relevant to the study of the martian surface. It is pitched at a level suitable for use in upper level undergraduate or incoming graduate classes. However, researchers at all levels will benefit from the summaries of areas not directly connected to their own work. The bibliography is comprehensive and contains about 600 entries, a large fraction of which is comprised of papers written within the last ten years. Some minor omissions exist within the text, such as the lack of discussion of the Martian moons Phobos and Deimos and the improved gravity data sets we now possess. The time of writing also dictated that the surface penetrating radar data from the Mars Express and Mars Reconnaissance Orbiter missions could not be incorporated. However, the book includes most major findings of the Pathfinder, Mars Global Surveyor, Mars Odyssey, Mars Express, and Mars Exploration Rovers missions.

The current state of Mars research is extraordinarily active. The huge infusion of fresh data generated by a string of successful missions has allowed the pace of scientific study to accelerate considerably. Some searches on the NASA ADS reveal that, as a community, we are now generating close to 500 peer-reviewed publications related to Mars each year. This is almost double the average publication rate during the 1990s. This is quite an intimidating state of affairs for people entering the field, yet Michael Carr's book allows those

people to find all the important recent findings in one volume. More importantly, its large bibliography provides a gateway into the section of the Mars literature of interest to the researcher in question. The current pace of discovery makes this an exciting time to be active in Mars research. It also means, however, that it is impossible to pick a good time to write a summary or review of current knowledge. *The surface of Mars* does not include any discussion of results from the latest mission, Mars Reconnaissance Orbiter, nor of course will it include the findings of the Phoenix lander, which will touch down in a few months. These omissions are unavoidable (after all, the book must be finished at some point!), but mean that this summary is not entirely up-to-date. Hopefully, we can look forward to the second edition to include a summary of these findings.

In summary, this book will prove very useful both to incoming students in the field and researchers wishing to become more familiar with recent advances in subjects outside their usual area. It is excellently prepared and presented and likely to become a common feature on the bookshelves of planetary scientists everywhere.

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