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Preface

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The realization that the stars moving through the constellations of the zodiac were indeed other worlds and not sun-like stars initiated a fascination with the planets that exhibited itself most strikingly in the literary genre of science fiction. Of all the planets Mars has provided the most popular setting for science fiction. Mars is accessible. We can travel to Mars quickly and affordably. It has an atmosphere, sufficient to assist in decelerating an entry vehicle with a gravity field that is not so strong as to prevent return. While Percival Lowell's speculation about the existence of canals on Mars for transporting water was incorrect, the underlying hypothesis that Mars is a wet planet was not. That spacecraft could travel to Mars was then a fantasy but is so no longer. While unlike the stories of E.R. Burroughs we no longer expect astronauts to walk on the surface of the red planet and breathe the air or to have them encounter sentient beings, but we would not be surprised if one day we find evidence that life had existed on Mars or perhaps even exists today in some primitive form.

Our space systems have advanced steadily since the Mariner and Mars spacecraft that visited the red planet in the early months of the space age. Soon came the Viking Landers, and then the Mars Pathfinder with its tiny rover, Sojourner, and science fiction turned into science fact. The inhabitants of Earth had reached Mars and now could study its surface with robots perhaps but robots controlled by humans and reporting to humans. The inhabitants on Earth could now vicariously enjoy walks on the surface of Mars.

Then came the Mars Exploration Rover's Spirit and Opportunity, designed to move not just a few meters away from the landing site but hundreds of meters, turning into many tens of kilometers for Opportunity, surviving not just a Martian summer but also a winter

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followed by many additional Martian years of operation. As exciting and scientifically bountiful that these missions were, the scientific community knew there was much more to be done than the early rovers had been able to accomplish. However they needed a larger vehicle carrying more sophisticated instruments; they needed a science laboratory on the surface of Mars, a roving science laboratory. NASA heard the call and with the help of foreign partners designed and built the Mars Science Laboratory, the most sophisticated planetary rover ever, a most ambitious endeavor. This volume describes that mission, its implementation process, the instruments and their objectives.

The volume begins with a discussion of the mission and its science investigation by J. Grotzinger and colleagues. This is followed by a discussion by R. Anderson et al., of how this roving vehicle acquires, processes and handles samples of the Mars surface. A rover needs eyes and it has many. J.N. Maki et al. describe the engineering cameras. R. Wiens et al. and S. Maurice et al. cover the ChemCam investigation performance and objectives while D. Vaniman et al., describe its calibration target. Next follows a discussion of the hand lens imager by K.S. Edgett et al. There are many ways for instruments on Mars to see. J. Campbell et al. tell us how the rover can see in x-rays and alpha particles. David Blake et al. tell us how Curiosity can identify minerals. P.R. Mahaffy et al., describe the sample analysis suite. P.G. Conrad et al. cover the organic check material. D.M. Hassler et al. describe the radiation detector. M. Litvak et al. present their neutron spectrometer. J. Gomez-Elvira et al. describe the environmental sensor suite. M. Golombek et al. cover the process used for selecting the landing site. R. Fergason et al., describe the surface properties of the various landing sites considered. R.A. Beyer et al. discuss the slope analysis used to characterize the landing sites. A. Vasavada et al. describe their assessment of the environment expected during entry, descent and landing and finally P. Withers et al. present predictions of the Mars surface pressure in support of the landing.

The successful implementation of a mission as sophisticated as the Mars Science Laboratory requires the hard work and assistance of many talented and dedicated individuals. In this instance these are not just the scientists involved, many of who are authors and co-authors of these articles but also the engineers at the Jet Propulsion Laboratory who designed, implemented, tested, and integrated the rover and its payload, and the management within NASA and the partner space agencies around the world who contributed to this mission. We thank all those individuals for their contribution to the mission. We also wish to thank those who facilitated the assembly of this volume, especially the authors who have had to distill the contents of myriad reports and documents into the highly readable papers. The editors benefited from the advice of an excellent set of referees who carefully read each paper, providing positive feedback to the authors that improved the papers. These referees included R. Arvidson, A. Spiga, D. Banfield, J.-P. Bibring, P.R. Christensen, P. Christensen, L. Crumpler, M. Dyar, K. S. Edgett, T. Economou, R. M. Haberle, C. Hallmann, K. Herkenhoff, J. Johnson, P. King, A.O. Marshall, J. Mazur, P. Niles, D. McCarty, H. McSween, R.M. Milliken, A.M. Parsons, G.H. Peters, F. Rull, S. Rafkin, N. Schwadron, J.T. Schofield, P. Schenk, P. Smith, R. Schmidt, R. Starr, V. Sautter, S.K. Sharma, K.L. Tanaka, K. Zacny, R. Zurek. Equally important has been the strong support provided by Lalitha Jaganathan and Harry Blom at Springer. At UCLA we were skillfully assisted by Marjorie Sowmendran who acted as the interface between the editors, authors, referees and the publisher.

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