

# Contents

## CONTRIBUTORS ix

ABOUT THE EDITORS xiii

FOREWORD xv

PREFACE TO THE SECOND EDITION xvii

PREFACE TO THE FIRST EDITION xix

## CHAPTER 1

The Solar System and its Place in  
the Galaxy 1

*Paul R. Weiss man*

## CHAPTER 2

The Origin of the Solar System 29

*Alex N. Halliday and John E. Chambers*

## CHAPTER 3

A History of Solar System Studies 53

*David Leverington*

## CHAPTER 4

The Sun 71

*Markus J. Aschwanden*

## CHAPTER 5

The Solar Wind 99

*John T. Gosling*

## CHAPTER 6

Mercury 117

*Robert G. Strom*

## CHAPTER 7

Venus: Atmosphere 139

*Donald M. Hunten*

## CHAPTER 8

Venus: Surface and Interior 149

*Suzanne E. Smrekar and Ellen R. Stofan*

## CHAPTER 9

Earth as a Planet: Atmosphere and Oceans  
169

*Timothy E. Dowling and Adam R Showman*

## CHAPTER 10

Earth as a Planet: Surface and Interior 189

*David C. Pieri and Adam M. Dziewonski*

## CHAPTER 11

The Sun-Earth Connection 213

*Janet G. Luhmann and Stanley C. Solomon*

## CHAPTER 12

The Moon 227

*Stuart Ross Taylor*

## CHAPTER 13

Meteorites 251

*Michael E. Lipschutz and Ludolf Schultz*

## CHAPTER 14

Near-Earth Objects 283

*Lucy A. McFadden and Richard P. Binzel*

## CHAPTER 15

Mars Atmosphere: History and Surface  
Interactions 301

*David C. Catling and Conway Leovy*

## CHAPTER 16

Mars: Surface and Interior 315

*Michael H. Carr*

## CHAPTER 17

Mars: Landing Site Geology, Mineralogy, and  
Geochemistry 331

*Matthew P. Golombek and Harry Y. McSween, Jr.*

- CHAPTER 18**  
**Main-Belt Asteroids** 349  
*Daniel T. Britt, Gntj Colsohnagno, and Larry Lebofskij*
- CHAPTER 19**  
**Planetary Satellites** 365  
*Bonnie J. Buratti and Peter C. Thomas*
- CHAPTER 20**  
**Atmospheres of the Giant Planets** 383  
*Robert A. West*
- CHAPTER 21**  
**Interiors of the Giant Planets** 403  
*Mark S. Marley and Jonathan J. Fortney*
- CHAPTER 22**  
**Io: The Voleanic Moon** 419  
*Rosaly M. C. Lopes*
- CHAPTER 23**  
**Europa** 431  
*Louise M. Prockter and Robert T. Pappalardo*
- CHAPTER 24**  
**Ganymede and Callisto** 449  
*Geoffrey Collins and Torrence V. Johnson*
- CHAPTER 25**  
**Titan** 467  
*Athena Coustenis*
- CHAPTER 26**  
**Triton** 483  
*William B. McKinnon and Randolph L. Kirk*
- CHAPTER 27**  
**Planetary Rings** 503  
*Carolyn C. Porco and Douglas P. Hamilton*
- CHAPTER 28**  
**Planetary Magnetospheres** 519  
*Margaret C. Kivelson and Fran Bagenal*
- CHAPTER 29**  
**Pluto** 541  
*S. Alan Stern*
- CHAPTER 30**  
**Physics and Chemistry of Comets** 557  
*John C. Brandt*
- CHAPTER 31**  
**Comet Populations and Cometary Dynamics** 575  
*Harold F. Levison and Luke Dories*
- CHAPTER 32**  
**Kuiper Belt: Dynamics** 589  
*Alessandro Morbidelli and Harold F. Levison*
- CHAPTER 33**  
**Kuiper Belt Objects: Physical Studies** 605  
*Stephen C. Teller*
- CHAPTER 34**  
**Solar System Dust** 621  
*Eberhard Grin*
- CHAPTER 35**  
**X-Rays in the Solar System** 637  
*Anil Bhardwaj and Carey M. Lisse*
- CHAPTER 36**  
**The Solar System at Ultraviolet Wavelengths** 659  
*Amanda R. Hendrix, Robert M. Nelson, and Deborah L. Domingue*
- CHAPTER 37**  
**Infrared Views of the Solar System from Space** 681  
*Mark V. Sykes*
- CHAPTER 38**  
**The Solar System at Radio Wavelengths** 695  
*Imke de Pater and William S. Kurth*
- CHAPTER 39**  
**New Generation Ground-Based Optical/Infrared Telescopes** 719  
*Alan T. Tokunaga and Robert Jedieke*
- CHAPTER 40**  
**Planetary Radar** 735  
*Steven J. Ostro*
- CHAPTER 41**  
**Remote Chemical Sensing Using Nuclear Spectroscopy** 765  
*Thomas H. Prettyman*
- CHAPTER 42**  
**Solar System Dynamics: Regular and Chaotic Motion** 787  
*Jack J. Lissauer and Carl D. Murray*
- CHAPTER 43**  
**Planetary Impacts** 813  
*Richard A. F. Grieve, Mark J. Cintala and, Roald Tagle*

**CHAPTER 44**  
Planetary Volcanism 829  
*Lionel Wilson*

**CHAPTER 45**  
Astrobiology 849  
*Christopher P. McKay and Wanda L. Davis*

**CHAPTER 46**  
Planetary Exploration Missions 869  
*James D. Burke*

**CHAPTER 47**  
Extrasolar Planets 887  
*Michael Endl and William D. Cochran*

**APPENDIX** 903  
**GLOSSARY** 919  
**INDEX** 939