Vision and Voyages for Planetary Science in the Decade 2013-2022
Universe: Solar System, Stars, and Galaxies
Oxygen in the Solar System
The Solar System: Introduction to the Solar System
The Outer Planets and their Moons
Inner Solar System
Encyclopedia of the Solar System
Volcanism and Tectonism Across the Inner Solar System
Exploring Organic Environments in the Solar System
Physics and Chemistry of the Solar System
Explore the Solar System
The Cambridge Guide to the Solar System
Solar System Astrophysics
Physics and Chemistry of the Solar System
Exoplanet Science Strategy
Habitability of Other Planets and Satellites
How to Build a Habitable Planet
Earth Science
Encyclopedia of the Solar System
Water and Volatile Element Accretion to the Inner Planets
The Solar System: The Inner Planets
The Solar System: The Outer Planets
The Wrong-way Comet and Other Mysteries of Our Solar System
Rare Earth
Geology and Habitability of Terrestrial Planets
For Kids
The Ringed Planet, Second Edition
The Biological Universe
Chemistry of the Solar System

**This is the chapter slice "The Inner Planets" from the full lesson plan "Solar System"**

Thrill young astronomers with a journey through our Solar System. Find out all about the Inner and Outer Planets, the Moon, Stars, Constellations, Asteroids, Meteors and Comets. Using simplified language and vocabulary, concepts such as planetary orbits, the asteroid belt, the lunar cycle and phases of the moon, and shooting stars are all explored. Choked full of reading passages, comprehension questions, and hands-on activities, our resource is written for remedial students in grades five to eight. Science concepts are presented in a way that makes them accessible to students and easier to understand. Use our resource effectively for whole-class, small group and independent work. Color mini posters, Rubric, Crossword, Word Search, Comprehension Quiz and Answer Key are all included. All of our content meets the Common Core State Standards and are written to Bloom's Taxonomy and STEM initiatives.

The sources, distributions, and transformation of organic compounds in the solar system are active study areas as a means to provide information about the evolution of the solar system and the possibilities of life elsewhere in the universe. There are many organic synthesis processes, however, and ambiguity surrounds the relative effectiveness of these processes in explaining the distribution of organic compounds in the solar system. As a consequence, NASA directed the NRC to determine what processes account for the reduced carbon compounds found throughout the solar system and to examine how planetary exploration can advance understanding of this central issue. This report presents a discussion of the chemistry of carbon; an analysis of the formation, modification, and preservation of organic compounds in the solar system; and an assessment of research opportunities and strategies for enhancing our understanding of organic material in the solar system.

On September 15, 2017, the Cassini spacecraft sent its final transmission to the Earth as it entered the atmosphere of Saturn, ending its historic 13 year mission at the ringed planet. This book is a beautifully illustrated journey of discovery through the Saturn system. Cassini's instruments have revealed never seen before details, including the only extraterrestrial lakes known in the solar system, and have provided unprecedented views of the rings, moons, and the planet itself. Results from Cassini's dramatic Grand Finale of ring-grazing and planet-skimming orbits are included in this expanded and updated second edition. Saturn is the jewel of the solar system. The Cassini spacecraft has been exploring the ringed planet and its moons and rings since 2004 and has helped us solve many of its mysteries while generating a wealth of new questions. Cassini has observed the bizarre mountains of Iapetus, the geysers of Enceladus, the lakes of Titan, and the dynamic and evolving rings. Along the way, this book explores and explains the fundamental processes that shape not just the Saturn system, but planets and moons in general. Written for the general audience with an emphasis on the fundamental physics of planetary systems, The Ringed Planet is a fascinating exploration of the Saturn system that places Saturn in the context of the solar system as a whole. Cassini's instruments have revealed Enceladus and
Titan to have subsurface oceans of liquid water. Its cameras have returned stunning images of rings in turmoil, a tumbling moon, the only extraterrestrial lakes known in the solar system, a hexagon of clouds, some of the highest mountains in the solar system and much more. More than a journey of discovery at Saturn, The Ringed Planet is also an introduction to how planetary systems work. "Physical Geology is a comprehensive introductory text on the physical aspects of geology, including rocks and minerals, plate tectonics, earthquakes, volcanoes, glaciation, groundwater, streams, coasts, mass wasting, climate change, planetary geology and much more. It has a strong emphasis on examples from western Canada, especially British Columbia, and also includes a chapter devoted to the geological history of western Canada. The book is a collaboration of faculty from Earth Science departments at Universities and Colleges across British Columbia and elsewhere." -- BCcampus website.

Volume 68 of Reviews in Mineralogy and Geochemistry reviews Oxygen in the Solar System, an element that is so critically important in so many ways to planetary science. The book is based on three open workshops: Oxygen in the Terrestrial Planets, held in Santa Fe, NM July 20-23, 2004; Oxygen in Asteroids and Meteorites, held in Flagstaff, AZ June 2-3, 2005; and Oxygen in Earliest Solar System Materials and Processes (and including the outer planets and comets), held in Gatlinburg, TN September 19-22, 2005. As a consequence of the cross-cutting approach, the final book spans a wide range of fields relating to oxygen, from the stellar nucleosynthesis of oxygen, to its occurrence in the interstellar medium, to the oxidation and isotopic record preserved in 4.56 Ga grains formed at the Solar System's birth, to its abundance and speciation in planets large and small, to its role in the petrogenic and physical evolution of the terrestrial planets. Contents: Introduction Oxygen isotopes in the early Solar System - A historical perspective Abundance, notation, and fractionation of light stable isotopes Nucleosynthesis and chemical evolution of oxygen Oxygen in the interstellar medium Oxygen in the Sun Redox conditions in the solar nebula: observational, experimental, and theoretical constraints Oxygen isotopes of chondritic components Mass-independent oxygen isotope variation in the solar nebula Oxygen and other volatiles in the giant planets and their satellites Oxygen in comets and interplanetary dust particles Oxygen and asteroids Oxygen isotopes in asteroidal materials Oxygen isotopic composition and chemical correlations in meteorites and the terrestrial planets Record of low-temperature alteration in asteroids The oxygen cycle of the terrestrial planets: insights into the processing and history of oxygen in surface environments Redox conditions on small bodies, the Moon and Mars Terrestrial oxygen isotope variations and their implications for planetary lithospheres Basalts as probes of planetary interior redox state Rheological consequences of redox state Influenced by astronomy education research, 21st Century Astronomy offers a complete pedagogical and media package that facilitates learning by doing, while the new one-column design makes the Fifth Edition the most accessible introductory text available today. **This is the chapter slice "Introduction to the Solar System" from the full lesson plan "Solar System"** Thrill young astronomers with a journey through our Solar System. Find out all about the Inner and Outer Planets, the Moon, Stars, Constellations, Asteroids, Meteors and Comets. Using simplified language and vocabulary, concepts such as planetary orbits, the asteroid belt, the lunar cycle and phases of the moon, and shooting stars are all explored. Chocked full of reading passages, comprehension questions, and hands-on activities, our resource is written for remedial students in grades five to eight. Science concepts are presented in a way that makes them accessible to students and easier to understand. Use our resource effectively for whole-class, small group and independent work. Color mini posters, Rubric, Crossword, Word Search, Comprehension Quiz and Answer Key are all included. All of our content meets the Common Core State Standards and are written to Bloom's Taxonomy and STEM initiatives. Are we alone in the universe? How did life arise on our planet? How do we search for life beyond Earth? These profound questions excite and intrigue broad cross sections of science and society. Answering these questions is the province of the emerging, strongly interdisciplinary field of astrobiology. Life is inextricably tied to the formation, chemistry, and evolution of its host world, and multidisciplinary studies of solar system worlds can provide key insights into processes that govern planetary habitability; informing the search for life in our solar system and beyond. Planetary Astrobiology brings together current knowledge across astronomy, biology, geology, physics, chemistry, and related fields, and considers the synergies between studies of solar systems and exoplanets to identify the path needed to advance the exploration of these profound
questions. Planetary Astrobiology represents the combined efforts of more than seventy-five international experts consolidated into twenty chapters and provides an accessible, interdisciplinary gateway for new students and seasoned researchers who wish to learn more about this expanding field. Readers are brought to the frontiers of knowledge in astrobiology via results from the exploration of our own solar system and exoplanetary systems. The overarching goal of Planetary Astrobiology is to enhance and broaden the development of an interdisciplinary approach across the astrobiology, planetary science, and exoplanet communities, enabling a new era of comparative planetology that encompasses conditions and processes for the emergence, evolution, and detection of life. Current state of play in astrobiology, including exoplanets and their atmospheres, habitable zones and the likelihood of evolution elsewhere. Is the Earth the right model and the only universal key to understand habitability, the origin and maintenance of life? Are we able to detect life elsewhere in the universe by the existing techniques and by the upcoming space missions? This book tries to give answers by focusing on environmental properties, which are playing a major role in influencing planetary surfaces or the interior of planets and satellites. The book gives insights into the nature of planets or satellites and their potential to harbor life. Different scientific disciplines are searching for the clues to classify planetary bodies as a habitable object and what kind of instruments and what kind of space exploration missions are necessary to detect life. Results from model calculations, field studies and from laboratory studies in planetary simulation facilities will help to elucidate if some of the planets and satellites in our solar system as well as in extra-solar systems are potentially habitable for life. Representatives of several scientific communities, such as planetary scientists, astronomers, space physicists, chemists and astrobiologists have met with the aim to review the knowledge on four major themes: (1) the study of the formation and evolution processes of the outer planets and their satellites, beginning with the formation of compounds and planetesimals in the solar nebula, and the subsequent evolution of the interiors of the outer planets, (2) a comparative study of the atmospheres of the outer planets and Titan, (3) the study of the planetary magnetospheres and their interactions with the solar wind, and (4) the formation and properties of satellites and rings, including their interiors, surfaces, and their interaction with the solar wind and the magnetospheres of the outer planets. Beyond these topics, the implications for the prebiotic chemical evolution on Europa and Titan are reviewed. At the time of publication, the study of the outer planets is particularly motivated by the fact that the Saturn system is being investigated by the Cassini-Huygens mission. Theory of the Earth is a combination reference and textbook that every exploration geologist and research scientist should have on his/her bookshelf. It is also suitable for advanced undergraduate, as well as graduate level geophysics courses. The emphasis is on the origin, evolution, structure and composition of the earth’s interior. It treats the pertinent aspects of solid state physics, thermodynamics, geochemistry, petrology, and seismology in sufficient detail for all who seek current information on geochemistry, solid state physics, and physics of the earth or planets. From September 2007 to June 2008 the Space Studies Board conducted an international public seminar series, with each monthly talk highlighting a different topic in space and Earth science. The principal lectures from the series are compiled in Forging the Future of Space Science. The topics of these events covered the full spectrum of space and Earth science research, from global climate change, to the cosmic origins of life, to the exploration of the Moon and Mars, to the scientific research required to support human spaceflight. The prevailing messages throughout the seminar series as demonstrated by the lectures in this book are how much we have accomplished over the past 50 years, how profound are our discoveries, how much contributions from the space program affect our daily lives, and yet how much remains to be done. The age of discovery in space and Earth science is just beginning. Opportunities abound that will forever alter our destiny. Table of Contents Introduction Chapter 1: The Sun Chapter 2: Some Planet Basics Chapter 3: Mercury Chapter 4: Venus Chapter 5: Earth Chapter 6: Mars Chapter 7: Jupiter Chapter 8: Saturn Chapter 9: Uranus Chapter 10: Neptune Chapter 11: Pluto Chapter 12: Interesting Facts Conclusion Sources: Author Bio Publisher Introduction Space, the final frontier... to explore strange new worlds, to seek out new life and new civilizations, to boldly go where no man has gone before. ~ Gene Roddenberry We are living in an amazing place in the universe called: The Milky Way Galaxy. It is surrounded by lots and lots of stars, planets, asteroids, comets, and other celestial objects. One neat place in the Milky Way Galaxy is
where planet earth is found. Can you guess where we are? Did you guess: The solar system? Good job! The solar system has lots of fascinating things to discover. Let’s learn about some of them and don’t forget to share with others! First, let’s define our solar system. What is it? If someone asked you that question, what would you say? ESA for kids explains it in a nice and simple way: “The Solar System is made up of the Sun and all of the smaller objects that move around it.” Simple enough, right? It might sound that way, but it isn’t! The solar system has eight planets. Let’s start with the sun. It is the biggest part of our solar system and everything moves around this bright star. Since its first publication more than twenty-five years ago, How to Build a Habitable Planet has established a legendary reputation as an accessible yet scientifically impeccable introduction to the origin and evolution of Earth, from the Big Bang through the rise of human civilization. This classic account of how our habitable planet was assembled from the stuff of stars introduced readers to planetary, Earth, and climate science by way of a fascinating narrative. Now this great book has been made even better. Harvard geochemist Charles Langmuir has worked closely with the original author, Wally Broecker, one of the world’s leading Earth scientists, to revise and expand the book for a new generation of readers for whom active planetary stewardship is becoming imperative. Interweaving physics, astronomy, chemistry, geology, and biology, this sweeping account tells Earth’s complete story, from the synthesis of chemical elements in stars, to the formation of the Solar System, to the evolution of a habitable climate on Earth, to the origin of life and humankind. The book also addresses the search for other habitable worlds in the Milky Way and contemplates whether Earth will remain habitable as our influence on global climate grows. It concludes by considering the ways in which humankind can sustain Earth’s habitability and perhaps even participate in further planetary evolution. Like no other book, How to Build a Habitable Planet provides an understanding of Earth in its broadest context, as well as a greater appreciation of its possibly rare ability to sustain life over geologic time. Leading schools that have ordered, recommended for reading, or adopted this book for course use: Arizona State University, Brooklyn College, CUNY Columbia University, Cornell University, ETH Zurich, Georgia Institute of Technology, Harvard University, Johns Hopkins University, Luther College, Northwestern University, Ohio State University, Oxford Brookes University, Pan American University, Rutgers University State University of New York at Binghamton, Texas A&M University, Trinity College Dublin, University of Bristol, University of California-Los Angeles University, University of Cambridge, University of Chicago, University of Colorado at Boulder, University of Glasgow, University of Leicester, University of Maine, Farmington University of Michigan, University of North Carolina at Chapel Hill, University of North Georgia, University of Nottingham, University of Oregon University, University of Oxford, University of Portsmouth University of Southampton, University of Ulster, University of Victoria, University of Wyoming, Western Kentucky University, Yale University. This book is aimed at several distinct audiences: first, the upper division science major who wants an up-to-date appreciation of the present state of the planetary sciences for 'cultural' purposes; second, the first-year graduate student from any of several undergraduate disciplines who intends to take graduate courses in specialized areas of planetary sciences; and third, the practicing Ph. D. scientist with training in physics, chemistry, geology, astronomy, meteorology, biology, etc., who has a highly specialized knowledge of some portion of this material, but has not had the opportunity to study the broad context within which that specialty might be applied to current problems in this field. The past decade has delivered remarkable discoveries in the study of exoplanets. Hand-in-hand with these advances, a theoretical understanding of the myriad of processes that dictate the formation and evolution of planets has matured, spurred on by the avalanche of unexpected discoveries. Appreciation of the factors that make a planet hospitable to life has grown in sophistication, as has understanding of the context for biosignatures, the remotely detectable aspects of a planet's atmosphere or surface that reveal the presence of life. Exoplanet Science Strategy highlights strategic priorities for large, coordinated efforts that will support the scientific goals of the broad exoplanet science community. This report outlines a strategic plan that will answer lingering questions through a combination of large, ambitious community-supported efforts and support for diverse, creative, community-driven investigator research. The Encyclopedia of the Solar System, Third Edition—winner of the 2015 PROSE Award in Cosmology & Astronomy from the Association of American Publishers—provides a framework for understanding the origin and evolution of the solar system, historical discoveries, and details
about planetary bodies and how they interact—with an astounding breadth of content and breathtaking visual impact. The encyclopedia includes the latest explorations and observations, hundreds of color digital images and illustrations, and over 1,000 pages. It stands alone as the definitive work in this field, and will serve as a modern messenger of scientific discovery and provide a look into the future of our solar system. New additions to the third edition reflect the latest progress and growth in the field, including past and present space missions to the terrestrial planets, the outer solar systems and space telescopes used to detect extrasolar planets. Winner of the 2015 PROSE Award in Cosmology & Astronomy from the Association of American Publishers Presents 700 full-color digital images and diagrams from current space missions and observatories, bringing to life the content and aiding in the understanding and retention of key concepts. Includes a substantial appendix containing data on planetary missions, fundamental data of relevance for planets and satellites, and a glossary, providing immediately accessible mission data for ease of use in conducting further research or for use in presentations and instruction. Contains an extensive bibliography, providing a guide for deeper studies into broader aspects of the field and serving as an excellent entry point for graduate students aiming to broaden their study of planetary science. What determines whether complex life will arise on a planet, or even any life at all? Questions such as these are investigated in this groundbreaking book. In doing so, the authors synthesize information from astronomy, biology, and paleontology, and apply it to what we know about the rise of life on Earth and to what could possibly happen elsewhere in the universe. Everyone who has been thrilled by the recent discoveries of extrasolar planets and the indications of life on Mars and the Jovian moon Europa will be fascinated by Rare Earth, and its implications for those who look to the heavens for companionship. Physics and Chemistry of the Solar System, 2nd Edition, is a comprehensive survey of the planetary physics and physical chemistry of our own solar system. It covers current research in these areas and the planetary sciences that have benefited from both earth-based and spacecraft-based experimentation. These experiments form the basis of this encyclopedic reference, which skillfully fuses synthesis and explanation. Detailed chapters review each of the major planetary bodies as well as asteroids, comets, and other small orbitals. Astronomers, physicists, and planetary scientists can use this state-of-the-art book for both research and teaching. This Second Edition features extensive new material, including expanded treatment of new meteorite classes, spacecraft findings from Mars Pathfinder through Mars Odyssey 2001, recent reflections on brown dwarfs, and descriptions of planned NASA, ESA, and Japanese planetary missions. * New edition features expanded treatment of new meteorite classes, the latest spacecraft findings from Mars, information about 100+ new discoveries of planets and stars, planned lunar and planetary missions, more end-of-chapter exercises, and more * Includes extensive new material and is amply illustrated throughout * Reviews each major planetary body, asteroids, comets, and other small orbitals Sixty essays examine the nature of the solar system and explore such issues as new information gained from the Voyager project, the origin of Halley's Comet, and the sun's atomic secrets ** This is the chapter slice "The Outer Planets" from the full lesson plan "Solar System" *** Thrill young astronomers with a journey through our Solar System. Find out all about the Inner and Outer Planets, the Moon, Stars, Constellations, Asteroids, Meteors and Comets. Using simplified language and vocabulary, concepts such as planetary orbits, the asteroid belt, the lunar cycle and phases of the moon, and shooting stars are all explored. Chocked full of reading passages, comprehension questions, and hands-on activities, our resource is written for remedial students in grades five to eight. Science concepts are presented in a way that makes them accessible to students and easier to understand. Use our resource effectively for whole-class, small group and independent work. Color mini posters, Rubric, Crossword, Word Search, Comprehension Quiz and Answer Key are all included. All of our content meets the Common Core State Standards and are written to Bloom's Taxonomy and STEM initiatives. This thesis investigates the timing and source(s) of water and volatile elements to the inner solar system by studying the basaltic meteorites angrites and eucrites. In chapters 2 and 3, I present the results from angrite meteorites. Chapter 2 examines the water and volatile element content of the angrite parent body and I suggest that some water and other volatile elements accreted to inner solar system bodies by ~2 Myr after the start of the solar system. Chapter 3 examines the D/H of this water and I suggest it is derived from carbonaceous chondrites. Chapter 4, 5,
6, and 7 addresses eucrite meteorites. Chapter 4 expands on existing models to explain geochemical trends observed in eucrites. In Chapter 5, I examine the water and F content of the eucrite parent body, 4 Vesta. In chapter 6, I determine the source of water for 4 Vesta and determine that carbonaceous chondrites delivered water to this body. Chapter 7 discusses degassing on 4 Vesta while it was forming. Discovering the Universe: From the Stars to the Planets engages students with an inquiry-based exploration of the universe and the scientific process. Developed with a “big picture” approach, the text first explains how the stars, the galaxies, and the entire universe formed, and then discusses planets and other components of our solar system. Students follow this natural conceptual progression within a proven learning method designed to address misconceptions and build a deep understanding of science and the world around us. Origins of Life: A Cosmic Perspective presents an overview of the concepts, methods, and theories of astrobiology and origins of life research while presenting a summary of the latest findings. The book provides insight into the environments and processes that gave birth to life on our planet, which naturally informs our assessment of the probability that has arisen (or will arise) elsewhere. In addition, the book encourages readers to go beyond basic concepts, to explore topics in greater depth, and to engage in lively discussions. The text is intended to be suitable for mid- and upper-level undergraduates and beginning graduate students and more generally as an introduction and overview for researchers and general readers seeking to follow current developments in this interdisciplinary field. Readers are assumed to have a basic grounding in the relevant sciences, but prior specialized knowledge is not required. Each chapter concludes with a list of questions and discussion topics as well as suggestions for further reading. Some questions can be answered with reference to material in the text, but others require further reading and some have no known answers. The intention is to encourage readers to go beyond basic concepts, to explore topics in greater depth, and, in a classroom setting, to engage in lively discussions with class members. The new edition of UNIVERSE means the same proven Seeds/Backman approach and trusted content, fully updated with the latest discoveries and resources to meet the needs of today’s diverse students. Available with InfoTrac Student Collections http://gocengage.com/infotrac. Important Notice: Media content referenced within the product description or the product text may not be available in the ebook version. It presents equations and derivations starting from a level that permits one to see the underlying physical ideas. There is no other book that does this on the market. The book presents an up-to-date overview on all essential topics but is concise where possible to keep it a practical resource for courses. The book is based on extensive experience in the classroom. Its contents have been field-tested for years by students. Since the first edition of this book appeared in 1990, planetology has seen a number of fascinating discoveries that have increased our knowledge of the Solar System. These have come from both ground- and space-based observational programmes. Although some space probe missions have ended in failure, even they have added to our store of information about the planetary environment. The Galileo probe, despite being crippled by its incompletely deployed main antenna, has already achieved some spectacular results. For the first time we have obtained pictures of asteroids, with the images that Galileo returned of Gaspra, Ida, and the latter’s satellite, Dactyl. The main objective, the dropping of an instrumented capsule into Jupiter’s atmosphere, and prolonged in-situ investigation of the planet, will take place at the end of 1995. Saturn’s turn will come early in the next century with the Cassini mission (to be launched in 1997), which will study the planet for an extended period and attempt to land the Huygens probe on the surface of Titan. NASA’s Magellan mission proved to be a great success, with its highly detailed radar mapping of the surface, and atmospheric studies. The exploration of Mars was less fortunate with the failure of both space probes of the Soviet Phobos mission, as well as NASA’s Mars Observer probe. Despite this set back, plans are in hand for future, collaborative exploration of the planet, using both surface stations (possibly active rovers), surface penetrators and balloon probes, as well as orbiters. Long before Galileo published his discoveries about Jupiter, lunar craters, and the Milky Way in the Starry Messenger in 1610, people were fascinated with the planets and stars around them. That interest continues today, and scientists are making new discoveries at an astounding rate. Ancient lake beds on Mars, robotic spacecraft missions, and new definitions of planets now dominate the news. How can you take it all in? Start with the new Encyclopedia of the Solar System, Second Edition. This self-contained reference
follows the trail blazed by the bestselling first edition. It provides a framework for understanding the origin and evolution of the solar system, historical discoveries, and details about planetary bodies and how they interact—and has jumped light years ahead in terms of new information and visual impact. Offering more than 50% new material, the Encyclopedia includes the latest explorations and observations, hundreds of new color digital images and illustrations, and more than 1,000 pages. It stands alone as the definitive work in this field, and will serve as a modern messenger of scientific discovery and provide a look into the future of our solar system. · Forty-seven chapters from 75+ eminent authors review fundamental topics as well as new models, theories, and discussions · Each entry is detailed and scientifically rigorous, yet accessible to undergraduate students and amateur astronomers · More than 700 full-color digital images and diagrams from current space missions and observatories amplify the chapters · Thematic chapters provide up-to-date coverage, including a discussion on the new International Astronomical Union (IAU) vote on the definition of a planet · Information is easily accessible with numerous cross-references and a full glossary and indexRichly illustrated with full-color images, this book is a comprehensive, up-to-date description of the planets, their moons, and recent exoplanet discoveries. This second edition of a now classic reference is brought up to date with fascinating new discoveries from 12 recent Solar System missions. Examples include water on the Moon, volcanism on Mercury's previously unseen half, vast buried glaciers on Mars, geysers on Saturn's moon Enceladus, lakes of hydrocarbons on Titan, encounter with asteroid Itokawa, and sample return from comet Wild 2. The book is further enhanced by hundreds of striking new images of the planets and moons. Written at an introductory level appropriate for undergraduate and high-school students, it provides fresh insights that appeal to anyone with an interest in planetary science. A website hosted by the author contains all the images in the book with an overview of their importance. A link to this can be found at www.cambridge.org/solarsystem.This book investigates Venus and Mercury prospective energy and material resources. It is a collection of topics related to exploration and utilization of these bodies. It presents past and future technologies and solutions to old problems that could become reality in our life time. The book therefore is a great source of condensed information for specialists interested in current and impending Venus and Mercury related activities and a good starting point for space researchers, inventors, technologists and potential investors. Written for researchers, engineers, and businessmen interested in Venus and Mercury exploration and exploitation. The second edition of Solar System Astrophysics: Background Science and the Inner Solar System provides new insights into the burgeoning field of planetary astronomy. As in the first edition, this volume begins with a rigorous treatment of coordinate frames, basic positional astronomy, and the celestial mechanics of two and restricted three body system problems. Perturbations are treated in the same way, with clear step-by-step derivations. Then the Earth's gravitational potential field and the Earth-Moon system are discussed, and the exposition turns to radiation properties with a chapter on the Sun. The exposition of the physical properties of the Moon and the terrestrial planets are greatly expanded, with much new information highlighted on the Moon, Mercury, Venus, and Mars. All of the material is presented within a framework of historical importance. This book and its sister volume, Solar System Astrophysics: Background Science and the Inner Solar System, are pedagogically well written, providing clearly illustrated explanations, for example, of such topics as the numerical integration of the Adams-Williamson equation, the equations of state in planetary interiors and atmospheres, Maxwell's equations as applied to planetary ionospheres and magnetospheres, and the physics and chemistry of the Habitable Zone in planetary systems. Together, the volumes form a comprehensive text for any university course that aims to deal with all aspects of solar and extra-solar planetary systems. They will appeal separately to the intellectually curious who would like to know how just how far our knowledge of the solar system has progressed in recent years. In recent years, planetary science has seen a tremendous growth in new knowledge. Deposits of water ice exist at the Moon's poles. Discoveries on the surface of Mars point to an early warm wet climate, and perhaps conditions under which life could have emerged. Liquid methane rain falls on Saturn's moon Titan, creating rivers, lakes, and geologic landscapes with uncanny resemblances to Earth's. Vision and Voyages for Planetary Science in the Decade 2013-2022 surveys the current state of knowledge of the solar system and recommends a suite of planetary science flagship
missions for the decade 2013-2022 that could provide a steady stream of important new discoveries about the solar system. Research priorities defined in the report were selected through a rigorous review that included input from five expert panels. NASA's highest priority large mission should be the Mars Astrobiology Explorer Cacher (MAX-C), a mission to Mars that could help determine whether the planet ever supported life and could also help answer questions about its geologic and climatic history. Other projects should include a mission to Jupiter's icy moon Europa and its subsurface ocean, and the Uranus Orbiter and Probe mission to investigate that planet's interior structure, atmosphere, and composition. For medium-size missions, Vision and Voyages for Planetary Science in the Decade 2013-2022 recommends that NASA select two new missions to be included in its New Frontiers program, which explores the solar system with frequent, mid-size spacecraft missions. If NASA cannot stay within budget for any of these proposed flagship projects, it should focus on smaller, less expensive missions first. Vision and Voyages for Planetary Science in the Decade 2013-2022 suggests that the National Science Foundation expand its funding for existing laboratories and establish new facilities as needed. It also recommends that the program enlist the participation of international partners. This report is a vital resource for government agencies supporting space science, the planetary science community, and the public. Given the universal interest in whether extraterrestrial life has developed or could eventually develop, it is vital that an examination of planetary habitability go beyond simple assumptions. This book has resulted from a workshop at the International Space Science Institute (ISSI) which brought together experts to discuss the multi-faceted problem of how the habitability of a planet co-evolves with the geology of the surface and interior, the atmosphere, and the magnetosphere. Astrobiology is the study of the origin, evolution, distribution, and future of life in the universe. It is an inherently interdisciplinary field that encompasses astronomy, biology, geology, heliophysics, and planetary science, including complementary laboratory activities and field studies conducted in a wide range of terrestrial environments. Combining inherent scientific interest and public appeal, the search for life in the solar system and beyond provides a scientific rationale for many current and future activities carried out by the National Aeronautics and Science Administration (NASA) and other national and international agencies and organizations. Requested by NASA, this study offers a science strategy for astrobiology that outlines key scientific questions, identifies the most promising research in the field, and indicates the extent to which the mission priorities in existing decadal surveys address the search for life's origin, evolution, distribution, and future in the universe. This report makes recommendations for advancing the research, obtaining the measurements, and realizing NASA's goal to search for signs of life in the universe. The Earth has limited material and energy resources. Further development of the humanity will require going beyond our planet for mining and use of extraterrestrial mineral resources and search of power sources. The exploitation of the natural resources of the Moon is a first natural step on this direction. Lunar materials may contribute to the betterment of conditions of people on Earth but they also may be used to establish permanent settlements on the Moon. This will allow developing new technologies, systems and flight operation techniques to continue space exploration. In fact, a new branch of human civilization could be established permanently on Moon in the next century. But, meantime, an inventory and proper social assessment of Moon's prospective energy and material resources is required. This book investigates the possibilities and limitations of various systems supplying manned bases on Moon with energy and other vital resources. The book collects together recent proposals and innovative options and solutions. It is a useful source of condensed information for specialists involved in current and impending Moon-related activities and a good starting point for young researchers. Volcanism and tectonism are the dominant endogenic means by which planetary surfaces change. This book aims to encompass the broad range in character of volcanism, tectonism, faulting and associated interactions observed on planetary bodies across the inner solar system - a region that includes Mercury, Venus, Earth, the Moon, Mars and asteroids. The diversity and breadth of landforms produced by volcanic and tectonic processes is enormous, and varies across the inner solar system bodies. As a result, the selection of prevailing landforms and their underlying formational processes that are described and highlighted in this volume are but a primer to the expansive field of planetary volcanism and tectonism. This Special Publication features 22 research articles about volcanic and tectonic processes manifest
across the inner solar system. This book is an appealing, concise, and factual account of the chemistry of the solar system. It includes basic facts about the chemical composition of the different bodies in the solar system, the major chemical processes involved in the formation of the Sun, planets, and small objects, and the chemical processes that determine their current chemical make-up. The book summarizes compositional data but focuses on the chemical processes and where relevant, it also emphasizes comparative planetology. There are numerous informative summary tables which illustrate the similarities (or differences) that help the reader to understand the processes described. Data is presented in graphical form which is useful for identifying common features of the major processes that determine the current chemical state of the planets. The book will interest general readers with a background in chemistry who will enjoy reading about the chemical diversity of the solar system's objects. It will serve as an introductory textbook for graduate classes in planetary sciences but will also be very popular with professional researchers in academia and government, college professors, and postgraduate fellows.

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