The New Solar System

Edited by J. Kelly Beatty, Brian O'Leary, and Andrew Chaikin

What *is* The New Solar System – how is it different from the one we have pondered for aeons and struggled to comprehend since the invention of the telescope? The New Solar System is one seen close up, one probed by interplanetary spacecraft. These electromechanical marvels have sampled the atmospheres of the planets, tasted their soil, and swum through sheets of electrically charged particles.

The New Solar System is also full of unanticipated beauty, mystery and enigma, and the key to answering some of our most profound questions: How did the Sun and planets form, how did they evolve, what might be the ingredients for life both here and in other systems that almost certainly circle distant countless stars?

The bodies within The New Solar System – Sun, planets and their moons, asteroids, and comets – have now become available for exploration, not merely passive observation. We have flown around them, walked on them, dug in them; we have learned much. So much, in fact, that it is possible to say – for the first time in human history – that we understand, at least in outline if not sometimes in detail, how the solar system came to be and how its parts evolved.

All this wonderful knowledge and insight has been gathered in a remarkably short time. The swell began in the 1940's with the efforts of a handful of planetary scientists; it flowered during the era surrounding the "race" for the Moon between the United States and the Soviet Union. But, sadly, the first great era of space exploration has ended, culminating with the fantastically successful flybys of Jupiter and Saturn by the Voyager 1 and 2 spacecraft. To be sure, these and other still-operating probes will continue to send information as they move ever farther away from the Sun; but the new, revolutionary spacecraft to replace them are being prepared at but a trickle of the previous pace.

Summarized in this book are the fruits from the first decades of space exploration – the most bountiful era ever experienced in science. Join 21 of the pioneers who conceived the missions, designed the experiments, and analyzed the data. Their stories of discovery and insight will prevail for many years.

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The structure and evolution of normal galaxies

Edited by S. M. Fall and Professor D. Lynden-Bell

This book is based on the major contributions to a NATO advanced study institute held at the Institute of Astronomy, University of Cambridge, in late 1980. The book discusses the dynamical and chemical evolution of galaxies, setting this in the context of their formation, evolution and interactions.

Research on galaxies is one of the most active fields in astronomy and it has a large and growing field of participants. Several developments within the last few years have changed our ideas about galaxies in fundamental ways. For example, heavy halos have been discovered around disk galaxies, it has been found that elliptical galaxies rotate slowly, and it is now known that the intergalactic medium has a high abundance of heavy elements. These and other developments have led to many new ideas about the origin, structure, and evolution of galaxies.

With its several review articles, each written by an expert, this book provides a guide to our present knowledge of galaxies, that will be invaluable to graduate students and professional astronomers.

Interiors of the planets

Professor A. H. Cook

Planets have excited the minds of man since prehistory. In our own time planetary science has become a rapidly developing area of astronomical research, as the instruments carried by space craft have vastly increased our knowledge of planetary surfaces and interiors. The rocky planets of the inner solar system bear countless craters, scars of their encounters with innumerable meteorites, although the active surface of the Earth has contrived to erase these features from our own planet. The outer giants, particularly Jupiter, have vigorous atmospheres, while Io, a satellite of Jupiter, has sulphur volcanoes.

Within our solar system we find a surprising diversity of planetary structure. Some planets are active, some have atmospheres, and some have substantial magnetic fields. Space craft data, the results of laboratory experiments on planetary materials, and the theory of the behaviour of solids and liquids at very high pressures now make it possible to construct models for the interiors of planets.

In this book Alan Cook explains how the mechanical properties of the planets are determined, how planetary materials behave at high pressure, and how celestial mechanics and the quantum physics of highly condensed matter may be combined to determine the general constitution of the planets.

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